World Health Organization
Regional Office for the Eastern Mediterranean

المجلة الصحية لشرق المتوسط

# EMHJ

## Eastern Mediterranean Health Journal

## La Revue de Santé de la Méditerranée orientale

Sources of air pollution
The effect of environmental degradation on health, including from air pollution, can be fatal. Sustainable development saeeks to advance human development without jeopardizing the future of the planet and future generations. The Rio+20 United Nations Conference on Sustainable Development is being held from 20 to 22 June, and health is at its heart as better health is an indicator of what sustainable development can and should achieve.

Volume 18 / No. 6
June / Juin

2012

المجلد الثامن عشر / عدد ٦
حزيران / يونيو

## المجلة الصحية لشرق المتوسط

هى المجلة الرسمية التى تصدر عن المكتب الإقليمى لشرق المتوسط بمنظمة الصحة العالمية. وهى منبر لتقديم السياسات والمبادرات الجديدة فى الخدمات الصحية والترويج لها، ولتبادل الآراء والمفاهيم والمعطيات الوبائية ونتائج الأبحاث وغير ذلك من المعلومات، وخاصة ما يتعلق منها بإقليم شرق المتوسط. وهى موجهة إلى كل أعضاء المهن الصحية، والكليات الطبية وسائر المعاهد التعليمية، وكذا المنظمات غير الحكومية المعنية، والمراكز المتعاونة مع منظمة الصحة العالمية والأفراد المهتمين بالصحة فى الإقليم وخارجه.

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ISSN 1020-3397

Cover designed by Diana Tawadros
Internal layout designed by Emad Marji and Diana Tawadros
Printed by WHO Regional Office for the Eastern Mediterranean

Eastern Mediterranean Health Journal

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EMHJ

La Revue de Santé de la Méditerranée orientale

Vol. 18 No. 6 • 2012 • المجلد الثامن عشر عدد ٦

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## Letter from the Editor

This month, the Rio+20 United Nations Conference on Sustainable Development is being held from 20 to 22 June and marks 20 years since the first Rio conference on Environment and Development in 1992. The well-being of human beings underpinned the agenda at the 1992 Rio conference and is at the heart of sustainable development. A key theme of Rio+20 is the concept of "green economy" that seeks to improve human well-being and social equity, and at the same time lower the risks of environmental degradation.

Outdoor air pollution is an obvious example of environmental degradation and is a major public health problem. It can cause respiratory, cardiovascular and other diseases and is estimated to result in 1.3 million deaths a year globally. The pollutants of public health concern include particulate matter and carbon monoxide, and the Eastern Mediterranean Region has among the highest levels of particulate matter.

Motor vehicles are one of the main emitters of air pollutants and WHO is exploring how the situation can be improved and health enhanced through greener development. For example, clean transit and walking/cycling schemes can not only reduce deaths and illnesses from air pollution but by increasing physical activity, can also lead to a reduction in many noncommunicable diseases, a clear win–win situation.

In this issue, 2 papers from Tehran looked at the adverse effects of air pollution on human health. One examined the effect of air pollutants on low birth weight and found that carbon monoxide increased the risk of low birth weight, especially in the second trimester; none of the other pollutants examined had any significant effect. The second study assessed the short-term effect of air pollution on the onset of acute coronary syndrome in patients admitted with a first coronary episode. The authors report that the risk of acute coronary syndrome significantly increased with elevated concentrations of carbon monoxide the day before the event but not with particulate matter, and that women were more susceptible than men.

The issue also includes paper from Yemen on the prevalence of and risk factors for hepatitis B and C infection among blood donors. It found that 5.1% and 1.3% of donors were positive for hepatitis B and C respectively. History of previous blood donation was associated with lower odds of infection, while history of blood transfusion, dental treatment and malaria increased the likelihood of infection. World Blood Donor Day is celebrated annually on 14 June to draw attention to the ever important need for safe blood and blood products. The theme this year is "Every blood donor is a hero" and highlights that giving blood is a worthy and praiseworthy thing to do.

## رسالة من المحرر

يُعْقَدُ في هذا الشهر مؤتمر الأمم المتحدة حول التنمية المستدامة [المضمونة الاستمرار] (ريو20+) في المدة 20–22 حزيران/ يونيو، احتفاءً بالذكرى العشرين لانعقاد مؤتمر الأمم المتحدة الأول حول البيئة والتنمية في ريو دي جانيرو عام 1992. وقد كانت معافاة الناس هي السمة الأبرز في جدول أعمال مؤتمر ريو عام 1992، وهي في الوقت نفسه جوهرُ التنمية المستدامة. ويدور أحد الموضوعات الرئيسية لمؤتمر ريو20+ حول مفهوم "الاقتصاد الأخضر"، الذي يسعى إلى تحسين معافاة الناس والمساواة الاجتماعية، كما يسعى في الوقت نفسه إلى تقليص مخاطر التدهور البيئي.

ويُعَدُّ تلوُّث الهواء خارج المباني مثالاً واضحاً على التدهور البيئي، وهو يمثِّل مشكلة رئيسية من مشكلات الصحة العمومية، إذ يمكن أن يسبِّب أمراض الجهاز التنفسي والأمراض القلبية الوعائية، وغيرها من الأمراض، وتدل التقديرات على أن تلوث الهواء يتسبب في 1.3 مليون وفاة كل عام على المستوى العالمي. ومن الملوثات التي تثير القلق في الصحة العمومية المواد الجسيماتيَّة وأحادي أكسيد الكربون، ويُعَدُّ إقليم شرق المتوسط من بين الأقاليم التي تصل فيها مستويات المواد الجسيماتيَّة إلى أعلى مستوياتها.

ثم إن المَرْكبات الآلية هي مصدر من المصادر الرئيسية لانبعاث الملوثات في الهواء، وتستقصي منظمة الصحة العالمية كيفية تحسين الأوضاع وتعزيز الصحة من خلال تنمية أكثر اخضراراً. فعلى سبيل المثال؛ فإن أنظمة النقل النظيف الذي لا يلوث البيئة والمشي وركوب الدراجات لا يقتصر تأثيرها على خفض معدلات الوفيات والأمراض الناجمة عن تلوث الهواء، ولكنها تزيد من النشاط البدني، ممَّا قد يؤدي إلى خفض الإصابة بالكثير من الأمراض غير السارية، وهو ما يعود بالفائدة من جميع الأوجه.

وفي هذا العدد مقالتان من طهران تتناولان التأثيرات الضائرة لتلوث الهواء على صحة الإنسان. إذ تتناول إحداهما تأثير ملوثات الهواء على نقص الوزن عند الولادة، وتبيَّن منها أن أحادي أكسيد الكربون يزيد من اختطار نقص وزن المواليد عند ولادتهم، ولاسيّما عند التعرض له في الأُثلوث الثاني من الحمل (أي الشهر الرابع والخامس والسادس)، ولم يكن لأي ملوِّث آخر تناولته المقالة أي تأثير يُعْتَدُّ به. أما المقالة الثانية فتقيِّم التأثير القصير الأمد لتلوث الهواء على بدء ظهور المتلازمة التاجية الحادة لدى المرضى الذين أُدخلوا المستشفى بسبب إصابتهم بالنوبة الأولى من المتلازمة التاجية. وقد ذكر الباحثون أن خطر المتلازمة التاجية الحادة قد زاد زيادة يُعْتَدُّ بها مع ارتفاع تركيزات المادة أحادي أكسيد الكربون في اليوم الذي سبق الإصابة بالنوبة، وليس بارتفاع تركيزات المواد الجسيماتيَّة، وأن النساء كُنَّ أكثر تعرُّضاً لهذا الخطر من الرجال.

ويتضمَّن هذا العدد أيضاً مقالة من اليمن حول انتشار التهاب الكبد "بي" و"سي" وعوامل اختطار العدوى بهما بين المتبرعين بالدم. وقد وجدت هذه المقالة أن 5.1٪ من المتبرعين بالدم إيجابيون لالتهاب الكبد "بي" وأن 1.3٪ منهم إيجابيون لالتهاب الكبد "سي"، وأن سوابق التبرع بالدم قد ترابطت مع نقص احتمالات العدوى، أما سوابق تَلَقِّي نقل الدم، أو معالجة الأسنان أو الملاريا فقد زادت من احتمال العدوى.

ويُحتفَل باليوم العالمي للمتبرعين بالدم في 14 حزيران/ يونيو كل عام لجذب انتباه الناس إلى الحاجة التي لا حدَّ لها إلى الدم المأمون وإلى منتجات الدم المأمونة. وشعارُه لهذا العام هو "كل متبرع بالدم بطل" تأكيداً على أن التبرُّع بالدم عمل يستحق العناء والثناء.

# Effect of air pollution on onset of acute coronary syndrome in susceptible subgroups

*M. Qorbani,[1,3] M. Yunesian,[2] A. Fotouhi,[3] H. Zeraati[3] and S. Sadeghian[4]*

**تأثير تلوث الهواء على المتلازمة التاجية الحادة في المجموعات الفرعية الحسَّاسة للمخاطر**

مصطفى قُرباني، مسعود يونسيان، أكبر فتوحي، حجة زراعتي، سعيد صادقيان

**الخلاصة:** على الرغم من أن التعرُّض الطويل الأمد لملوثات الهواء يترابط مع زيادة في أمراض القلب وما ينجم عنها من وفيات، إلا أن هناك معلومات قليلة متاحة حول التأثيرات القصيرة الأمد لتلوث الهواء. من أجل ذلك أجريَتْ هذه الدراسة المستعرضة للعلاقة بين مستويات المواد الجُسَيماتيَّة ($PM_{10}$) وأحادي أكسيد الكربون وبين دخول المستشفى بسبب المتلازمة التاجية الحادة، وذلك في طهران، في جمهورية إيران الإسلامية. وقد أجرَى الباحثون مقابلات مع مئتين وخمسين مريضاً كانوا يعانون من أول نوبة من نوبات المتلازمة التاجية الحادة، كما حصل الباحثون على معطيات من سجلات المستشفى، ومن شركة مراقبة جودة الهواء في طهران. وقد لُوحظ ترابُطٌ يُعْتَدُّ به إحصائياً بين حدوث المتلازمة التاجية الحادة وبين ارتفاع تركيزات أحادي أكسيد الكربون في اليوم السابق لحدوث المتلازمة (OR = 1.18؛ فاصلة الثقة 95٪: 1.03–1.34) في حين لم يلاحظ ترابُط يُعتدُّ به مع المواد ولكنه لم يرتبط بمواد الجسيماتيَّة $PM_{10}$ (OR = 1.00؛ فاصلة الثقة 95٪: 0.99–1.02). كما وجد الباحثون أن التصنيف بحسب العمر والجنس والسكري وفرط ضغط الدم والتدخين لا يؤثر على النتائج، ولكن النساء كُنَّ أكثر تأثراً من الرجال بمستويات أحادي أكسيد الكربون (نسبة الأرجحية للنساء/ الرجال OR = 1.68؛ فاصلة الثقة 95٪: 1.25–2.26).

ABSTRACT While long-term exposure to air pollutants is associated with an increase in heart diseases and mortality, little information is available about the short-term effects of air pollution. This case–crossover study assessed the relationship of particulate matter ($PM_{10}$) and carbon monoxide (CO) levels with hospital admission for acute coronary syndrome in Tehran, Islamic Republic of Iran. We interviewed 250 patients with a first episode of acute coronary syndrome and obtained data from hospital records and Tehran Air Quality Control Company. The risk of acute coronary syndrome was significantly associated with elevated concentrations of CO the day before the event (OR 1.18; 95% CI: 1.03–1.34) but not significantly with $PM_{10}$ (OR 1.00; 95% CI: 0.99–1.02). Stratification by age, sex, diabetes, hypertension and smoking status did not affect the results, but women were more susceptible than men to CO levels (OR for women/men 1.68; 95% CI: 1.25–2.26).

**Effet de la pollution atmosphérique sur la survenue d'un syndrome coronarien aigu dans des sous-groupes vulnérables**

RÉSUMÉ Alors qu'une exposition à long terme aux polluants atmosphériques est associée à une augmentation des pathologies cardiaques et de la mortalité, peu de données sont disponibles sur les effets à court terme de la pollution atmosphérique. La présente étude de cas croisés a recherché la relation entre les taux de particules, de monoxyde de carbone et le nombre des admissions à l'hôpital pour un syndrome coronarien aigu à Téhéran (République islamique d'Iran). Nous avons interrogé 250 patients présentant un premier épisode de syndrome coronarien aigu et avons obtenu des données à partir des dossiers hospitaliers et de la société de contrôle de la qualité de l'air à Téhéran (*Tehran Air Quality Control Company*). Le risque d'un syndrome coronarien aigu était fortement associé à des concentrations élevées de monoxyde de carbone le jour précédent l'événement (O.R. 1,18 ; IC à 95 % : 1,03–1,34) mais faiblement associé aux taux de particules (O.R. 1,00 ; IC à 95 % : 0,99–1,02). La stratification par âge, par sexe, par l'état diabétique ou hypertendu et par le statut tabagique n'influait pas sur les résultats. En revanche, les femmes étaient plus vulnérables que les hommes aux niveaux de monoxyde de carbone (O.R. pour les femmes/hommes 1,68 ; 95 % IC à 95 % : 1,25–2,26).

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Received: 22/06/10; accepted: 31/08/10

## Introduction

Epidemiological studies worldwide have shown that exposure to high concentrations of air pollutants are associated with an increase in heart diseases and mortality [1–4]. Nevertheless, little information about the short-term effects of air pollution is available using a methodology that minimizes the personal characteristics of patients as confounders (case–crossover design). The harmful effects of particulate matter up to 10 μm in size ($PM_{10}$) and carbon monoxide (CO) concentrations have been shown in multiple studies of hospital admissions for respiratory and heart diseases [1–5]. These results suggest that air pollution is a risk factor for respiratory disease and acute cardiovascular events. More recently studies have shown susceptibility of some subgroups to the effect of air pollution [6–8]. For example, Zanobetti et al. reported that patients with diabetes might be more susceptible to heart diseases associated with particulate matter [9].

Acute coronary syndrome (ACS) includes unstable angina and myocardial infarction (MI). In both conditions the coronary artery blood flow is impaired due to arteriosclerosis or thrombosis. In the Islamic Republic of Iran Hosseinpoor et al. showed that hospital admissions for angina pectoris in Tehran increased with increasing CO but did not relate to $PM_{10}$ levels (using a time-series approach [10]). In the present study in Tehran we investigated the effect of air pollution (CO and $PM_{10}$ levels) in the 24 hours before the onset of ACS and whether the classic risk factors of ACS (age, sex, diabetes, hypertension and smoking status) acted as potential effect modifiers.

## Methods

We used a case–crossover design to evaluate the association between 24-hour average concentrations of CO and $PM_{10}$ and risk of hospital admission for ACS. The study was conducted from 4 April to 10 September 2007.

### Sample

All 250 patients with their first episode of ACS who were emergency admissions to Tehran heart centre were interviewed. Interviews were conducted by trained research nurses on the emergency ward as soon as possible after the admission. For inclusion in the study, patients were required to have following criteria: typical symptoms of ACS onset (while in Tehran city); positive ECG (ST segment elevation or T inversion); creatine kinase level ≥ 1 above the upper limit of normal for the hospital laboratory performing the test; and the ability to complete a structured interview.

### Data collection

We considered the classic risk factors of ACS (age, sex, diabetes, hypertension and smoking status) as potential effect modifiers. The information on hypertension, diabetes and smoking status was taken from the hospital database.

Hourly and daily air pollution measurements were taken from the Tehran Air Quality Control Company. This company has 7 fixed and 2 portable monitoring stations within the city. We computed local daily mean values of $PM_{10}$ and CO using an algorithm that accounted for the different monitor-specific means and variances [11]. $PM_{10}$ concentration was measured continuously with beta-ray atomic absorption and CO concentration was measured with a continuous non-dispersive infrared analyser. The $PM_{10}$ series had some occasional missing observations, and we replaced the missing values with the predicted values from a regression where we controlled for season and weather variables and which have been shown to be a good predictor of fine particle concentration.

### Statistical analysis

The analysis of case-crossover data is similar to stratified data analysis [12–14]. For each subject, data on pollutants in a case period 24 hours before the onset of ACS was matched to data for a control period exactly a week before. This allowed us to control for confounders due to the day of onset of ACS. Conditional logistic regression analysis was fitted to the data to calculate the odds ratio (OR) and 95% confidence interval (CI) [15]. Exposures to $PM_{10}$ and CO were entered as continuous variables in the model. Relative humidity and temperature were included continuously as confounding variables in a conditional logistic model. Holiday status of that day of the week was analysed in 3 categories (holiday, day after holiday and other). Due to the lack of normal distribution of the data Wilcoxon test for paired samples was used to compare independent variables in the case and control periods.

Stratified analysis was used to assess the effect modification of the association between onset of ACS and CO and $PM_{10}$ exposure. We considered age (≤ 60 and > 60 years), sex, smoking status, diabetes and hypertension as probable effect modifiers. Smoking status was analysed in 3 categories: never smoker, current smoker and ex-smoker. Hypertension was defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg (in physician's notes) or use of antihypertensive drugs. Diabetes was determined based on fasting blood sugar level > 126 mg/dL or use of antidiabetic medication. These results were presented as OR and 95% CI. *P*-values < 0.05 were considered statistically significant. Analyses were conducted using *Stata/SE*, version 10.0 software.

## Results

Among 250 participants, 20% were current smokers, 41% were ex-smokers and

the rest were never smokers (Table 1). One-quarter (24%) were hypertensive and 34% had diabetes. The sex distribution of participants was approximately equal (51% male versus 49% female). The mean age of the study group was 63 (SD 14) years and 58% of subjects were ≤ 60 years old.

Table 2 show the distribution of 24-hour average concentration of pollutants (CO and $PM_{10}$), relative humidity and temperature in the case and control periods. A statistically significant difference between the case and control periods was seen only in mean daily concentration of CO.

Table 3 summarizes the association between air pollutants (CO and $PM_{10}$ as continuous measures) and the risk of onset of ACS. A statistically significant relationship was seen only for elevated risks of ACS and mean daily concentration of CO. The OR was 1.18 (95% CI: 1.03–1.35) unadjusted and 1.18 (1.03–1.35) when adjusted for temperature, humidity and holiday status. The 24-hour average concentration of $PM_{10}$ also showed a positive association but did not reach statistical significance.

The relationship between CO level and ACS was not significantly affected by age, smoking status, diabetes or hypertension ($P > 0.05$) (Table 1). However, there was as association of CO level and ACS with patient's sex. Stratified analyses by age, sex, diabetes, hypertension and smoking status are displayed in Table 4. The risk for women was significantly greater than for men with regard to CO level (OR 1.68; 95% CI: 1.25–2.26) (interaction *P*-value < 0.001). Stratification by these potential effect modifiers did not change the relationship between $PM_{10}$ and ACS.

## Discussion

Although prior evidence have shown that elevated levels of particulate matter are linked with MI and cardiovascular diseases [16,17], this study could not demonstrate any association between an increase in 24-hour average concentration of $PM_{10}$ and ACS on the day before onset of the event. Even stratification of cases by effect modifiers did not change this association.

In this study a high 24-hour average concentration of CO on the day before onset was associated with ACS. This result was consistent with Hosseinpoor et al.'s results in Tehran which showed a positive association between CO and angina pectoris in a retrospective time–series study [10]. Adjustment for weather conditions and holiday status did not change this association dramatically. Women had a higher OR for the association between CO level and ACS compared with men.

As Tehran is a big city with more than 10 million inhabitants, a large number of people may be exposed to air pollution and may be affected as a consequence of high levels of air pollutants. Although the concentration of pollutants such as CO in ambient air may not be especially high most of the time, we can expect a considerable rise in admissions due to the huge number of people exposed, keeping in mind

**Table 1 Demographic characteristics of patients with first episode of acute coronary syndrome according to mean levels of particulate matter ($PM_{10}$) and carbon monoxide (CO) in the case period (24-hours before event) and control period (1 week before)**

| Variable | No. of patients | % | Mean (SD) CO level (ppm) | | Mean (SD) $PM_{10}$ level (μg/m³) | |
|---|---|---|---|---|---|---|
| | | | Case period | Control period | Case period | Control period |
| ***Sex*** | | | | | | |
| Male | 129 | 51 | 3.71 (2.43) | 3.18 (2.32) | 46.5 (26.3) | 39.6 (22.7) |
| Female | 121 | 49 | 3.89 (2.38) | 3.09 (2.30) | 46.7 (25.6) | 39.5 (23.2) |
| ***Age (years)*** | | | | | | |
| ≤ 60 | 143 | 58 | 3.79 (2.44) | 3.15 (2.31) | 46.4 (25.8) | 39.6 (22.7) |
| > 60 | 107 | 42 | 3.80 (2.41) | 3.12 (2.39) | 46.9 (25.8) | 39.7 (22.9) |
| ***Smoking status*** | | | | | | |
| Smoker | 49 | 20 | 3.88 (2.41) | 3.11 (2.31) | 46.6 (27.0) | 39.8 (22.8) |
| Ex-smoker | 103 | 41 | 3.77 (2.37) | 3.17 (2.34) | 46.7 (26.1) | 39.6 (23.0) |
| Never smoker | 98 | 39 | 3.78 (2.39) | 3.15 (2.32) | 46.4 (27.9) | 39.6 (23.1) |
| ***Diabetes*** | | | | | | |
| Yes | 85 | 34 | 3.85 (2.41) | 3.09 (2.37) | 46.4 (26.2) | 40.5 (22.0) |
| No | 165 | 66 | 3.69 (2.44) | 3.17 (2.32) | 46.7 (25.9) | 39.1 (22.9) |
| ***Hypertension*** | | | | | | |
| Yes | 65 | 24 | 3.82 (2.40) | 3.13 (2.30) | 46.5 (25.7) | 40.6 (22.8) |
| No | 185 | 76 | 3.71 (2.39) | 3.14 (2.34) | 46.6 (25.7) | 39.2 (22.5) |

*SD = standard deviation.*

**Table 2 Distribution of mean levels of particulate matter ($PM_{10}$) and carbon monoxide (CO) and weather conditions in the case period (24-hours before event) and control period (1 week before) for patients with first episode of acute coronary syndrome (*n* = 250)**

| Variable | Case period Mean (SD) | Control period Mean (SD) | *P*-value[a] |
|---|---|---|---|
| CO level (ppm) | 3.79 (2.37) | 3.14 (2.29) | 0.01 |
| $PM_{10}$ level μ)g/m$^3$) | 46.6 (25.5) | 39.6 (22.0) | 0.18 |
| Temperature (°C) | 20.2 (4.5) | 19.8 (4.5) | 0.48 |
| Humidity (%) | 35.3 (18.5) | 34.1 (14.4) | 0.57 |

[a]*Wilcoxon test*
*SD = standard deviation.*

that the odds ratio was not so small. So these effects may be of significant public health importance because exposure to CO is ubiquitous and involuntary in big cities such as Tehran.

Our results are consistent with Sullivan et al.'s results [6]. They did not demonstrate any association between levels of particulate matter and MI. Stratification of cases by age, diabetes and hypertension did not modify this association, which agrees with our results. However, our results concerning the association between $PM_{10}$ and ACS contradict the results of Peters et al. in Boston and D'Ippoliti et al. in Rome, who showed positive associations between total suspended particulate levels and MI [7,16]. Differences in fine particulate matter composition between cities may explain this discrepancy. Particulate matter in Tehran is low in sulfates [18]. Analyses of particulate matter in Canada demonstrated that sulfate in particulate matter has a direct association with cardiovascular disease [19]. Another reason for differences between our results and Peters et al. and D'Ippoliti's studies is that these studies assessed all particulate matters and $NO_2$ as pollutants. As $NO_2$ is converted to nitrates and it contributes to fine particle mass, it may explain the difference.

Sensitivity of susceptible subgroups to air pollution is has been debated and few studies have been performed to clarify this ambiguous point [8,20,21]. The effect modification by sex that was seen in our data (with a stronger effect among women) is not surprising given similar results already observed in other studies on air pollution and respiratory and cardiovascular disease mortality [22–24]. One explanation of women's greater response to air pollution may be their bronchial hyper-responsiveness to soot and pollutants [25]. Stratification by diabetes, hypertension, smoking status and age did not change the associations and ORs in our study.

Estimates for the association between $PM_{10}$ and ACS were similar among those with or without the potential effect modifiers. Zanabetti et al. demonstrated that diabetic patients are more susceptible to cardiovascular events (and hospital admissions) as a result of particulate matter exposure [26]. There is a need for further research on effect modifiers.

The most advantageous feature of the case–crossover design used in our study is that it minimized the probability of confounding by individual variables [13,14]. Confounding may occur because of time-varying risk factors [27,28], such as time of day or weather conditions, which were considered in the multivariate analysis. As individuals comprise study units in this type of study, this approach can assess effect modification by within-person factors; however, the statistical power of the method is lower than in time-series analysis [29,30]. The main problem of this design is the selection of the control period [31,32]. Levy et al. presented a time-stratified method that seems to give the least biased strategy [33].

Our study used the data available from multiple air pollution monitoring stations spread throughout the city area that enabled us to determine a reasonable estimate of the level of exposure of the participants. We examined patients with their first ACS event. These strategies might have increased the possibility of finding an association. There are some limitations to our study, however, that may originate from unidirectional case–crossover studies. Such designs might be sensitive to trends in the exposure and the outcome [27,28]. There is the possibility of downward bias in this study due to the relatively short interval (1 week) between the hazard and control periods that may lead to low variability of exposure. Another factor is that we were not able to include the levels of fine particulates ($PM_{2.5}$) in the analysis. Including only patients able to complete structured interview may have lead to the exclusion of more serious cases of ACS. This may bias our results to null, because the more severe cases are expected to have stronger association with air pollution. The physicians and research team in

**Table 3 Odds ratio for 24-hour mean levels of particulate matter ($PM_{10}$) and carbon monoxide (CO) for patients with first episode of acute coronary syndrome (*n* = 250)**

| Pollutant | Unadjusted OR (95% CI) | Adjusted OR (95% CI)[a] |
|---|---|---|
| CO level (ppm) | 1.18 (1.03–1.35) | 1.18 (1.03–1.35) |
| $PM_{10}$ level μ)g/m$^3$) | 1.00 (0.99–1.02) | 1.00 (0.99–1.02) |

[a]*Adjusted for temperature, humidity and holiday status.*
*OR = odds ratio; CI = confidence interval.*

**Table 4 Association between levels of particulate matter ($PM_{10}$) and carbon monoxide (CO) by individual characteristics (effect modifiers) for patients with first episode of acute coronary syndrome**

| Variable | $PM_{10}$ level | | CO level | |
|---|---|---|---|---|
| | OR (95% CI) | *P*-value | OR (95% CI) | *P*-value |
| Diabetes (yes vs no) | 1.00 (0.97–1.03) | 0.87 | 1.20 (0.92–1.56) | 0.17 |
| Hypertension (yes vs no) | 0.98 (0.95–1.01) | 0.27 | 1.11 (0.83–1.47) | 0.48 |
| Age > 60 (yes vs no) | 0.99 (0.97–1.01) | 0.55 | 1.13 (0.86–1.48) | 0.36 |
| Female (vs male) | 0.98 (0.95–1.01) | 0.39 | 1.68 (1.25–2.26) | < 0.01 |
| Never smoker (vs smoker) | 1.00 (0.97–1.03) | 0.81 | 0.77 (0.51–1.17) | 0.23 |
| Ex-smoker (vs smoker) | 0.98 (0.95–1.01) | 0.39 | 0.82 (0.43–1.56) | 0.35 |

*OR = odds ratio; CI = confidence interval.*

this study were not informed about air pollution conditions at the time of data collection and so we would not expect considerable information bias to occur. Although we measured and adjusted for probable confounders in our study, random error in measurement of these might have occurred, and this could increase the residual confounding.

In conclusion, this study provides evidence that short-term exposure to elevated concentrations of CO can trigger ACS and that women are more susceptible than men.

## Acknowledgements

The Tehran University of Medical Sciences supported this research. We thank the Tehran Heart Centre and Tehran Air Quality Control Company for their contributions.

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***Transport (road transport): shared interests in sustainable outcomes* (Social Determinants of Health Sectoral Briefing Series, 3)**

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# Air pollution and low birth weight: a historical cohort study from Tehran

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**تلوث الهواء وانخفاض وزن الوليد: دراسة أترابية من طهران**

مرضية عربان، نور السادات كريمان، صديقه السادات طوافيان، سعيد متصدي زرندي، حميد علوي مجد، فرخنده أمين شكروي

**الخلاصة:** جرى تصميم هذه الدراسة الأترابية لتوضيح الترابُط بين تلوث الهواء وبين انخفاض وزن الوليد عند ولادته بين الأمهات اللاتي تمت إحالتهنّ إلى مستشفيات طهران في عام 2007. وقد اختيرت 225 امرأة حاملاً تأهلن للدراسة، كن يعشن أثناء الحمل في محيط خمسة كيلومترات من محطة رصد تلوث الهواء. وجُمِعت المعطيات عن طريق المقابلات وسجلات المستشفيات. وجرى تحديد التعرُّض لكل ملوِّث لدى كل امرأة على حدة طوال فترة حملها، وفي كل أُثلوث (ثلاثة أشهر) من الحمل. وأُعدَّت نماذج للتعرُّضات بحسب فئات المتغيرات باستخدام مدى الشريحة الربعية البينية في نموذج التحوف اللوجستي. وأظهرت النتائج ترابُطاً يُعْتَدُّ به بين التعرُّض لأحادي أكسيد الكربون وبين انخفاض وزن الوليد عند الولادة (OR = 2.08؛ فاصلة الثقة 95٪: 1.70–4.60)، ولاسيَّما أثناء الأُثلوث الثاني من الحمل (OR = 3.96؛ فاصلة الثقة 95٪: 1.83–12.5). واستنتج الباحثون أن التعرُّض لتلوث الهواء أثناء الحمل يمكن أن يترابط مع قلة وزن المولود.

ABSTRACT This historical cohort study was designed to clarify the association between air pollution and low birth weight (LBW) amongst women referred to Tehran hospitals in 2007. In total, 225 eligible pregnant women who lived within 5 km of an air pollution monitoring station during their pregnancy were selected for the study. Data were collected via interview and hospital records. Exposure to each pollutant was estimated for each woman individually throughout her pregnancy and for each trimester. Exposures were modelled as categorical variables using inter-quartile ranges in a logistic regression model. The results showed a significant association between exposure to CO and LBW (OR = 2.08, 95% CI: 1.70–4.60), particularly during the second trimester (OR = 3.96, CI: 1.83–12.5. We conclude that exposure to air pollution during pregnancy may be associated with LBW.

**Pollution atmosphérique et faible poids de naissance : une étude de cohorte historique à Téhéran**

RÉSUMÉ La présente étude de cohorte historique a été conçue pour clarifier l'association entre la pollution atmosphérique et le faible poids de naissance des enfants nés de mères orientées vers des hôpitaux de la ville de Téhéran en 2007. Au total, 225 femmes enceintes éligibles et vivant dans un rayon de cinq kilomètres d'une station de surveillance de la pollution atmosphérique pendant leur grossesse ont été sélectionnées pour participer à l'étude. Les données ont été recueillies au moyen d'un entretien et des dossiers hospitaliers. L'exposition à chaque polluant a été estimée pour chaque femme individuellement, tout au long de la grossesse et pour chaque trimestre. Les expositions ont été modélisées en tant que variables nominales avec des plages interquartiles dans un modèle de régression logistique. Les résultats ont révélé qu'il existait une association significative entre l'exposition au monoxyde de carbone et un faible poids de naissance (O.R. = 2,08 ; IC à 95 % : 1,70–4,60), notamment pendant le deuxième trimestre (O.R. = 3,96 ; IC : 1,83–12,5). Nous en avons conclu qu'une exposition à la pollution atmosphérique au cours de la grossesse peut être associée à un faible poids de naissance.

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Received: 30/09/10; accepted: 08/11/10

## Introduction

Low birth weight (LBW) is known as one of the most important factors associated with prenatal and neonatal mortality, and has been established as a determinant of neonatal mortality [1]. It is also significantly associated with infant and childhood morbidities, ranging from pulmonary infection to myocardial infarction, stroke, hypertension and diabetes [2–4]. Given the importance of LBW consequences, assessing its' risk factors is guaranteed.

As previously reported, low socioeconomic status, drug addiction, maternal malnutrition and anaemia, maternal age, weight gain during pregnancy as well as birth order are significantly associated with LBW [5,6].

Although several studies have examined the relationship between maternal exposure to air pollution and LBW [7–15], a definitive association between exposure during pregnancy and LBW is still not established [14]; some researchers identified a relationship [15] but others did not [13]. The trimester-specific findings from these studies are inconsistent, and the most vulnerable trimester of pregnancy has not been identified. Furthermore, the most critical problem in these studies is that they did not control the other risk factors of LBW beyond air pollution exposure.

Tehran, the capital city of the Islamic Republic of Iran, is one of the most polluted cities in the world [16]. Given the importance of LBW consequences and the probably effect of exposure to pollutants on birth weight, we aimed to examine the association between ambient air pollution and LBW among babies born to women referred to Tehran hospitals.

## Methods

A historical cohort study was conducted in the maternity wards of 6 teaching hospitals affiliated to medical science universities in Tehran. The ethics committee of Shaheed Beheshti University of Medical Sciences approved the study.

Data on all singleton term births (≥ 37 gestational weeks) of eligible pregnant women who gave birth between 1 June and 30 September 2007 were obtained through interviewing the women and from hospital puerperal records of mothers and their babies. We chose this study period because it covered the most polluted season in the year. Women were eligible for the study if they were living within 5 km of a unique air pollution monitoring station, were aged 18–35 years and had had at least 2 prenatal care visits during their pregnancy. Women were excluded from the study if they had a history of pregnancy complication such as gestational diabetes; pregnancy-induced hypertension; cardiovascular, renal or pulmonary disease; anaemia during pregnancy; a history of recurrent abortion, infertility or previous LBW baby; experience of severe stress during pregnancy; or being an active/passive smoker or drug abuser.

All women referred to the maternity hospitals and who complied with inclusion/exclusion criteria during the study period were entered into the study.

Monitoring data from Tehran Air Quality Control Company were used to estimate mean exposure rates during the whole pregnancy and for each trimester. The parameters of air pollutants were measured for each individual mother. Daily data were available for $PM_{10,}$ $SO_2$ exposure, while $NO_2$ and $O_3$ exposure were measured hourly and CO exposure was measured every 8 hours. To estimate exposure to each pollutant over the pregnancy period and each trimester, the residential address during pregnancy was considered. The distance between the participants' address and the closest monitoring data was determined using GIS programming. In cases where the addresses were assigned for more than 1 monitoring station, we used the data of the closest one.

After sampling, risk factors for low birth weight other than air pollution, such as maternal age, maternal education, maternal job, socioeconomic factor, stress status, number of prenatal care visits, weight gain during pregnancy, gestational age, sex of the baby and planned pregnancy were analysed and it did not show any statistical significance between LBW and normal birth weight groups. The mean score of stress status was measured by Holmes and Rahe stress scale) [17,18].

Logistic regression analysis was conducted to examine the predictive effect of air pollution on LBW. To do this analysis, birth weight was considered a dependent variable and was categorized into 2 groups: < 2500 g and ≥ 2500 g. Other variables were entered into the model as key independent variables. Trimester exposures were modelled as categorical variables using inter-quartile ranges (IQRs). Odds ratios (ORs) of LBW with 95% confidence interval (CI) were calculated. This method has been applied in previous air pollution studies [13,14].

### Analysis

Analyses were done using chi-squared, *t*-test and logistic regression with *SPSS* software, version 15. $P < 0.05$ was considered statistically significant.

## Results

In total, 225 pregnant women were examined in this study. Mean age was 25.8 [standard deviation (SD) 4.6] years and mean duration of pregnancy 39 (SD 1.2) weeks. The mean birth weight of the babies was 3.12 (SD 0.49) kg. Only 35 women gave birth to LBW babies. Table 1 presents the demographic characteristics of the women who had babies with low and normal birth weight. There were no significant differences between the 2 groups in terms of demographic characteristic ($P \geq 0.05$).

**Table 1 Demographic characteristics of women who had normal weight (NBW) babies and those who had babies with low birth weight (LBW)**

| Variable | NBW (*n* = 190) | LBW (*n* = 35) | *P*-value |
|---|---|---|---|
| | Mean (SD) | Mean (SD) | |
| Maternal age[a] (years) | 26 (4.5) | 24 (4.8) | 0.10 |
| Stress scoring[a] | 47 (4.1) | 46 (9.1) | 0.96 |
| Number of prenatal care visits[a] | 10.8 (2.9) | 10.1 (3.0) | 0.22 |
| Weight gain during pregnancy (kg)[a] | 12.7 (5.7) | 11.8 (4.2) | 0.35 |
| Gestational age (weeks)[a] | 39.1 (1.1) | 38.1 (1.6) | 0.1 |
| | % | % | |
| ***Maternal education***[b] | | | 0.18 |
| No education | 6 | 6 | |
| Primary school | 34 | 18 | |
| High school | 23 | 30 | |
| Above high school | 37 | 46 | |
| ***Maternal job***[b] | | | 0.26 |
| Working in the home | 97 | 95 | |
| Employed outside the home | 3 | 5 | |
| Birth order[b] (first born) | 54 | 65 | 0.26 |
| Infant sex[b] (male) | 57 | 43 | 0.20 |
| Planned pregnancy[b] (yes) | 72 | 68 | 0.66 |

[a]*Student t-test.*
[b]$\chi^2$ *test.*
*SD = standard deviation.*

Table 2 shows mean exposure to pollutants and the inter-quartile range during the whole pregnancy as well as the crude OR for LBW. In order to determine the most vulnerable trimester of pregnancy, further assessment of exposure to pollutants during the different trimesters of pregnancy was made (Table 3). From the data in both tables, CO exposure was a significant risk factor for LBW during the whole pregnancy (OR = 2.08, 95% CI: 1.7–4.6, *P* = 0.03) and in the second trimester (OR = 3.96, 95% CI: 1.83–12.5, *P* = 0.02). Mothers who had a higher level of CO exposure during the second trimester of pregnancy were at greater risk of delivering an LBW baby. None of the other pollutants was significantly associated with LBW.

## Discussion

We examined the association between air pollutants and birth weight. The LBW rate was 15.6%, higher than the 5.2% reported in a previous study in Tehran [15]. The difference might be due to the sample size: our study was much smaller, 225 women versus 4734 women.

Several reports support the possibility of a negative effect of CO exposure on birth weight [6,11,19,20]. Our study indicated that exposure to ambient CO levels during pregnancy was associated with LBW. This finding of an inverse association between maternal CO exposure during pregnancy and LBW is consistent with some reports in previous studies [14,21]. Furthermore, the present study showed a significant association between maternal exposure during the second trimester of pregnancy and LBW. In contrast with this, some studies [14,21] found that there was the association between exposure to pollutants during the third trimester and LBW, while another study reported such an association in the first trimester [8]. This inconsistency between different studies might be due to different times of year when the studies were carried out as pollution levels vary with season. However in this study we controlled for certain other risk factors which might influence birth weight.

No significant association was observed between other pollutants such as $PM_{10,}$ $SO_{2,}$ $NO_2$ and $O_3$ and LBW. Although in a previous review study it was concluded that $PM_{10}$ had an effect on LBW [22], we found no significant association in this regard. The postulated mechanism for the effect of $PM_{10}$ is that $PM_{10}$ may bind to placental growth factor resulted in decreased fetal–placental exchange of oxygen and nutrients, nutrient and oxygen supply during gestation are key factors regulating fetal growth rate [23]. If this is true, a probable justification for this contrasting result is that there would necessarily be a threshold effect [8], but in our study the level of exposure to $PM_{10}$ may have been under the threshold level.

Additionally, the current study showed there was no significant association between exposure to $O_3$ and

**Table 2 Mean and inter-quartile range (IQR) of pollutant level and odds ratio (OR) for low birth weight during the whole pregnancy period**

| Pollutant | Pollutant level | | OR (95% CI) | *P*-value |
|---|---|---|---|---|
| | Mean (SD) | IQR | | |
| CO (ppm) | 4.5 (0.9) | 0.8 | 2.08 (1.70–4.6) | 0.03* |
| $PM_{10}$ (μg/m³) | 48.6 (6.4) | 2.2 | 0.63 (0.40–1.14) | 0.14 |
| $SO_2$ (ppb) | 33.0 (17.3) | 12.5 | 1.20 (0.93–2.85) | 0.53 |
| $NO_2$ (ppb) | 63.0 (11.4) | 10.5 | 1.10 (0.63–1.92) | 0.72 |
| $O_3$ (ppb) | 18.5 (5.5) | 1.7 | 1.75 (0.83–3.70 | 0.14 |

**Significant at P < 0.05.*
*SD = standard deviation; CI = confidence interval; ppm = parts per million; ppb = parts per billion.*

**Table 3 Logistic regression analysis results for low birth weight (< 2500 g) per interquartile range increase in pollutants for each trimester**

| Pollutant | *P*-value | OR | 95% CI |
|---|---|---|---|
| | | **First trimester** | |
| CO | 0.24 | 1.90 | 0.89–3.90 |
| $PM_{10}$ | 0.34 | 0.63 | 0.40–1.14 |
| $SO_2$ | 0.53 | 1.48 | 0.93–2.85 |
| $NO_2$ | 0.62 | 1.19 | 0.63–1.92 |
| $O_3$ | 0.14 | 1.85 | 0.83–3.70 |
| | | **Second trimester** | |
| CO | 0.02* | 3.96 | 1.83–12.5 |
| $PM_{10}$ | 0.90 | 0.63 | 0.52–1.84 |
| $SO_2$ | 0.18 | 1.48 | 0.8–3.85 |
| $NO_2$ | 0.20 | 1.92 | 0.83–3.92 |
| $O_3$ | 0.28 | 1.45 | 0.33–1.43 |
| | | **Third trimester** | |
| CO | 0.85 | 1.09 | 0.43–2.88 |
| $PM_{10}$ | 0.43 | 0.73 | 0.32–1.64 |
| SO2 | 0.14 | 0.54 | 0.23–1.24 |
| $NO_2$ | 0.38 | 0.72 | 0.34–1.51 |
| $O_3$ | 0.51 | 0.76 | 0.33–1.45 |

**Significant at P < 0.05.*
*OR = odds ratio; CI = confidence interval.*

LBW although a previous study found the association significant [11]. This inconsistency might be due to different average rates of exposure to $O_3$: in the previous study the mean exposure was 50 ppb but in our study this was only 18.5 ppb.

No significant association was observed between $SO_2$ /$NO_2$ and LBW, in line with the findings of earlier studies [11,13].

This study had several strengths. First, this is one of the few studies excluding a number of confounding variables affecting LBW, therefore the effects of potential risk factors of LBW were controlled. Second, data collection in this study was done precisely through interviewing the women as well as looking for the participants' records to obtain more accurate data, while the previous studies used just birth data records that might be poorly completed [24]. Third, reliable measurements of criteria pollutant concentrations were obtained from several air monitoring stations in Tehran to achieve accurate exposure rates. Additionally, this is the only study that investigated all criteria of pollutants such as CO, $PM_{10,}$ $SO_{2,}$ $NO_2$ and $O_{3.}$ Finally, in this study babies that were born in summer, the most polluted season, were included because seasonal variation in reproductive outcomes has been well documented [20].

However, this study had a limitation that could be the same of all such studies. The ambient air pollution measurements from stationary air pollution monitoring may not represent actual individual exposure. Measurement of individual exposure is not feasible [24].

Air pollution is one of the most important environmental and public health issues. Considering the impact of air pollution on birth weight, pregnant women, as an at risk group, should be trained and advised during pregnancy to limit their exposure to highly polluted areas of the city. Health workers should prepare accessible booklets regarding the effects of air pollution on health. Midwives could also play a key role in informing pregnant women about air pollution hazards and their effects on pregnancy outcome, like LBW.

In conclusion, we have demonstrated that exposure to current levels of CO pollution in Tehran throughout pregnancy, and especially in the second trimester, was strongly associated with LBW. Since LBW is the most important factor related to neonatal mortality and morbidity, our findings have critical public health implications. Nevertheless, further studies are needed to confirm fetal susceptibility to ambient air pollution since our study is one of only a few that have been carried out in the Middle East.

## Acknowledgements

The authors wish to express their deepest appreciation to those women who participated in this study. The authors also thank the personnel of Tehran Air Quality Control Company for their kind assistance, especially Dr Rashidi and Mr Najafi for allowing the researchers to access the exposure data.

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# Impact of twice weekly versus daily iron supplementation during pregnancy on maternal and fetal haematological indices: a randomized clinical trial

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**أثر التـزويد بالحديد مرتين أسبوعياً مقابل مرة يومياً خلال الحمل على الـمَنَاسب الدموية في الأمهات والأجنة: دراسة سريرية معشاة**

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**الخلاصة:** لايزال فقر الدم بعَوَز الحديد شائعاً بوصفه أحد مضاعفات الحمل في جمهورية إيران الإسلامية، على الرغم من التـزويد الروتيني اليومي بالحديد. وقد هَدَفَتْ هذه الدراسة السريرية الـمُعَشَّاة إلى دراسة مدى كفاءة وتحمل التـزويد بالحديد مرتين أسبوعياً مقابل مرة يومياً أثناء الحمل. وقد شملت الدراسة ثلاث مئة وسبعين حاملاً تم اختيارهنَّ عشوائياً لتلقِّي إما جرعة واحدة يومياً أو جرعتين أسبوعياً من التـزويد بالحديد أثناء الحمل. ولم يجد الباحثون اختلافاً يُعْتَدُّ به إحصائياً في مستوى الهيموغلوبين والهيماتوكريت في بداية الحمل وعند الولادة لدى المجموعتين، ولو أن تركيزات الفرِّيتين عند الولادة كانت أخفض لدى مجموعة الـمَرَّتَيْن بالأسبوع، ولو أن ذلك لم يَصِلْ إلى حدوث نقص فيريتين الدم (لأقل من 15 مكروغرام/لتر) لدى أي من المجموعتين، كما كان معدّل تكرار الغثيان والقيء والإمساك أدنَى بدرجة يُعْتَدُّ بها إحصائياً لدى المجموعة التي تتناول الحديد مرتين في الأسبوع. وكان وزن المواليد وطولهم عند ولادتهم أعلى بقدر يُعْتَدُّ به لدى المجموعة التي تتناول الحديد مرة واحدة يومياً، فإذا لم تكن الأمهات مصابات بفقر الدم، فإن جرعة أصغر من الحديد قد تكون كافية، وقد تقي من مضاعفات فرط الحديد.

ABSTRACT A randomized clinical trial examined the efficiency and tolerability of twice weekly versus daily iron supplementation during pregnancy. A total of 370 pregnant women were randomly assigned to receive either daily or twice weekly iron supplementation during pregnancy. There were no significant differences in initial and delivery haemoglobin and haematocrit levels between the 2 groups. Ferritin concentrations were significantly lower in the twice weekly group at delivery, but hypoferritinaemia (ferritin < 15 µg/L) was not observed in either group. The frequency of nausea, vomiting and constipation were significantly lower in the twice weekly group. Birth weight and length were significantly higher in the daily supplemented group. In non-anaemic mothers, a smaller dose of iron may be sufficient and also might prevent the complications of iron excess.

**Impact d'une prise de complément en fer bihebdomadaire par rapport à une prise quotidienne pendant la grossesse sur des indices hématologiques maternels et fœtaux : une étude clinique randomisée**

RÉSUMÉ Une étude clinique randomisée a examiné l'efficacité et l'innocuité d'une prise bihebdomadaire de complément en fer par rapport à une prise quotidienne pendant la grossesse. Au total, 370 femmes enceintes ont été réparties aléatoirement dans un groupe recevant soit une dose quotidienne de complément en fer, soit une dose bihebdomadaire pendant leur grossesse. Aucune différence significative n'a été observée entre les taux d'hémoglobine et d'hématocrite relevés au début de l'étude et ceux analysés à l'accouchement dans les deux groupes. Les concentrations de ferritine étaient nettement inférieures à l'accouchement dans le groupe recevant deux doses par semaine, mais aucun groupe n'a présenté de cas d'hypoferritinémie (ferritine < 15 µg/l). La fréquence des nausées, des vomissements et de la constipation était significativement moindre dans le groupe aux prises bihebdomadaires. Le poids et la taille du fœtus à la naissance étaient significativement supérieurs dans le groupe bénéficiant d'un complément quotidien. Chez les mères non anémiques, une faible dose de fer peut être suffisante et permettrait aussi de prévenir les complications relatives à un excès en fer.

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Received: 18/10/10; accepted: 25/01/11

## Introduction

Despite widespread preventive programmes, iron-deficiency anaemia during pregnancy is still prevalent and is associated with adverse pregnancy outcomes for both mother and newborn [1–4]. Poor client compliance with national iron supplementation protocols because of side-effects, especially gastrointestinal (GI) complications such as nausea, vomiting and constipation, is suggested as one of the main reasons for the inefficiency of these programmes [5]. Several studies indicate that iron absorption could improve if iron supplements were administered intermittently, matched with mucosal regeneration time of the intestine, which in turn diminishes side-effects and enhances compliance rates [1,6]. Interaction of iron with other micronutrients especially zinc, and also the postulated relationship between high-dose iron supplementation and pregnancy complications such as gestational diabetes, preterm labour and low birth weight, suggest that the amount of iron recommended in the current protocol is too high [3,7–10]. A number of researchers propose that weekly iron supplementation is a reasonable alternative to daily supplementation in terms of haematological indices as well as side-effects [2,6,10,11].

The controversy regarding maintaining the effectiveness of iron supplementation when reducing the dose has not been solved yet [1,12]. Although routine daily iron supplementation from the 4th month of pregnancy is a standard part of prenatal care, iron deficiency anaemia is still a commonly reported complication of pregnancy in the Islamic Republic of Iran [13]. The aim of our study was to examine the efficiency and tolerability of twice weekly versus daily iron supplementation during pregnancy in a sample of Iranian women and present an alternative method for preventing iron-deficiency anaemia and improving maternal and fetal outcomes.

## Methods

A randomized clinical trial was carried out at Imam Hospital in Sari, a coastal city in the north of Islamic Republic of Iran.

### Sample

For a significance level of 0.05 and power 90% and to find a 15% difference in the prevalence of side-effects between 2 groups, the number of subjects required in each set was 171. Between February and November 2009, 370 pregnant women were selected at the prenatal clinic of the hospital. Inclusion criteria were: age between 18–35 years, parity < 4, singleton pregnancy, normal body mass index (BMI) (19.8–25 kg/m$^2$), haemoglobin 10.5–13.2 g/dL, gestational age 14–20 weeks and no history of high-risk pregnancy, smoking or drug abuse.

### Data collection

The goals and design of the study were explained by a trained midwife to the women and after obtaining verbal consent baseline sociodemographic and reproductive data were collected. Eligible women were randomly assigned to receive either daily iron supplementation (1 × 150 mg ferrous sulfate tablet containing 50 mg elemental iron and 1 × 1 mg folic acid tablet per day) or twice weekly iron supplementation (1 × 150 mg ferrous sulfate tablet containing 50 mg elemental iron and 1 × 1 mg folic acid tablet on Mondays and Thursdays) from week 20 of pregnancy until delivery. Without blinding, random allocation was done according to the day of week a pregnant woman attended the clinic: clients on even days were assigned to the daily group and attendees on odd days were allocated to the twice weekly group. Mothers of both groups received routine care and were followed up until delivery.

Haemoglobin (Hb) and ferritin concentrations were measured at delivery for mothers, and after birth from the cord blood for neonates. Ferrous sulfate supplements for both groups (Rouz Darou, Tehran) was distributed through primary health care centres and clinics free of charge. Mothers were given a form to record the number of tablets taken and to flag listed side-effects on a daily basis and to return it at monthly and then weekly prenatal visits. All mothers took part in an educational programme on nutrition in pregnancy.

Maternal and paired cord blood Hb values were determined by the cyanmethohaemoglobin method. A complete blood count was done using an automatic cell counter (T890, Coulter) and serum ferritin was assessed by radioimmunoassay (Gamma Counter System, Kontron). The Center for Disease Control (CDC) Standard reference values for Hb (< 10.5 g/dL in the second trimester and < 11 g/dL in the third trimester for anaemia during pregnancy) and ferritin (ferritin < 15 μg/L for iron deficiency) were used.

The study was approved by the ethics committee of Tarbiat Modares University and registered at the Iranian Registry of Clinical trials (Irct ID: IRCT138802131641N4).

### Data analysis

Statistical analysis was done using the chi squared, Mann–Whitney and Kolmogorov–Smirnov tests to compare the daily and twice weekly supplementation groups. The association between primary BMI, total pregnancy weight gain, gestational age at delivery, type of iron supplementation and birth weight was assessed by linear logistic regression model.

## Results

A total of 365 mothers were included in the final analysis of side-effects (173 in the daily group and 192 in the twice weekly group). Two mothers from the daily group were excluded due to unrelated reasons (1 case of preeclampsia-related intrauterine growth retardation which resulted in preterm delivery

before week 34; and 1 case of idiopathic thrombocytopenic purpura). At the time of delivery 168 and 192 maternal Hb values and 131 and 146 maternal ferritin values were available for analysis in the daily and twice weekly groups respectively. A total of 130 and 151 cord blood samples were analysed for Hb and ferritin concentrations respectively from both groups.

The sociodemographic and reproductive characteristics of the studied women are shown in Table 1. The women in the 2 groups did not differ significantly in terms of age, job, education, parity, BMI or baseline Hb concentration. The mean age of mothers was 26.3 (SD 4.1) years and the mean years of formal education were 9.1 (SD 3.5) years. Most of the studied women were housewives (97.5%).

There was no difference between the groups in the prevalence of side-effects at entry. However, the frequency of nausea, vomiting and constipation were significantly lower in the twice weekly group at both week 24 and week 36 of pregnancy (Table 2). Nevertheless, the occurrence of heartburn did not differ between the 2 groups at the 2 measured intervals.

Table 3 shows the haematological characteristics at delivery of the 2 supplement groups for both maternal and cord blood. There were no differences in initial and delivery Hb and in haematocrit levels between the 2 groups. Moreover, at delivery, the prevalence of maternal anaemia (i.e. Hb < 11 g/dL) was not significantly different between the 2 groups ($P = 0.21$). While ferritin concentrations were significantly lower in the twice weekly group at delivery ($P < 0.001$), hypoferritinaemia (maternal ferritin < 15 μg/L) was not observed in either group. Ferritin measurement was added to the protocol after the start of the study, so we did not have data for baseline ferritin values for all mothers.

The anthropometric indices of the newborns are presented in Table 4. Although there were no low-birth-weight newborns in the 2 groups, birth weight and length were significantly higher in the daily supplement group ($P < 0.001$ and $P < 0.016$ respectively) taking into account that gestational age, sex ratio and maternal weight gain were similar in the 2 groups.

Multiple logistic regression analysis showed that the only factor affecting birth weight was the supplementation method ($P < 0.001$) (Table 5).

**Table 1 Characteristics of the studied pregnant women by iron supplementation regimen**

| Variable | Total ($n = 365$) | | Iron supplementation regimen: Daily ($n = 173$) | | Iron supplementation regimen: Twice weekly ($n = 192$) | | *P*-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | |
| ***Age (years)*** | | | | | | | 0.96[a] |
| < 25 | 126 | 34.2 | 64 | 37.0 | 62 | 31.8 | |
| 25–30 | 157 | 42.7 | 73 | 42.2 | 84 | 43.1 | |
| > 30 | 85 | 23.1 | 36 | 20.8 | 49 | 25.1 | |
| ***Education*** | | | | | | | 0.99[a] |
| Primary | 88 | 24.0 | 41 | 23.7 | 47 | 24.5 | |
| Secondary | 262 | 71.6 | 124 | 71.7 | 137 | 71.4 | |
| University | 16 | 4.4 | 8 | 4.6 | 8 | 4.2 | |
| ***Husband's education*** | | | | | | | 0.98[a] |
| Primary | 105 | 28.7 | 45 | 26.0 | 60 | 30.8 | |
| Secondary | 243 | 65.8 | 115 | 66.5 | 128 | 65.6 | |
| University | 20 | 5.5 | 13 | 7.5 | 7 | 3.6 | |
| ***Job*** | | | | | | | 0.87[b] |
| Housewife | 357 | 97.6 | 169 | 97.7 | 190 | 97.4 | |
| Employed | 9 | 2.4 | 4 | 2.3 | 5 | 2.6 | |
| ***Parity*** | | | | | | | 0.41[b] |
| 0–1 | 315 | 86.3 | 152 | 87.9 | 163 | 83.4 | |
| 2–3 | 50 | 13.7 | 21 | 12.1 | 29 | 15.1 | |
| | Mean (SD) | | Mean (SD) | | Mean (SD) | | |
| ***BMI (kg/m²)*** | 23.4 (1.7) | | 23.4 (1.8) | | 23.5 (1.7) | | 0.58[c] |
| ***Haemoglobin (g/dL)*** | 11.9 (0.7) | | 11.9 (0.7) | | 11.9 (0.7) | | 0.34[c] |

*[a]Kolmogorov-Smirnov test; [b]Chi-squared test; [c]Mann–Whitney test.*
*SD = standard deviation; BMI = body mass index.*

**Table 2 Gastrointestinal side-effects of iron supplementation at different stages of pregnancy by mothers' iron supplementation regimen**

| Stage of pregnancy/ symptoms | Iron supplementation regimen | | RR (95% CI) |
|---|---|---|---|
| | Daily No. (*n* = 173) | Twice weekly No. (*n* = 192) | |
| ***Week 24*** | | | |
| Nausea | 28 | 4 | 7.7 (2.7–21.7) |
| Vomiting | 12 | 1 | 13.3 (1.7–101.3) |
| Constipation | 19 | 9 | 2.3 (1.1–5.0) |
| Heartburn | 34 | 39 | 1.0 (0.6–1.5) |
| ***Week 36*** | | | |
| Nausea | 19 | 4 | 5.2 (1.8–15.1) |
| Vomiting | 8 | 1 | 8.8 (1.1–70.2) |
| Constipation | 16 | 7 | 2.5 (1.1–6.0) |
| Heartburn | 36 | 38 | 1.0 (0.7–1.6) |

*RR = relative risk; CI= confidence interval.*

## Discussion

Twice weekly iron supplementation has been shown to be effective in the prevention of iron deficiency anaemia in non-pregnant women, children and adolescent girls [2,14,15]. The present study results confirmed that it is also useful during pregnancy in low-risk non-anaemic pregnant women and their newborns. Ferritin measurement was added to the protocol after the start of the study, so we had no baseline ferritin values for mothers. However the randomization process and the observed homogeny of the baseline characteristics of the 2 groups suggest that initial ferritin values may not have been different between the 2 groups. Hypoferritinaemia, which is presumed to be an indicator for iron deficiency, was not observed in either of the groups. Nevertheless, lower levels of ferritin in mothers supplemented twice weekly may cause postpartum anaemia for them, which we have not investigated. Several studies of anaemic pregnant women also reported comparable increments of Hb comparing the 2 supplementation methods [6,8,10]. Both groups had similar rates of anaemia at delivery, providing evidence that low doses of iron during pregnancy could be beneficial in preventing anaemia. A number of studies showed that reducing the iron dose or intermittent prescriptions are less effective in improving Hb and iron status than a daily standard dose (30–60 mg elemental iron) [1,8,12]. However, this difference was small, with no reported significant effect on pregnancy outcomes and might be related to factors other than type of iron regimen, such as pre-pregnancy haematological status, nutritional behaviour, diet during pregnancy and the prevalence of iron deficiency or other micronutrient deficiencies [16].

Nutritional status was not taken into account in this study, since the population of our sample came from a rather homogenous low socioeconomic status urban population using public health care services. However, pregnancy may change nutritional habits and mothers may be more careful about their nutrition in this period, which could influence the iron stores in the body and consequently affect our results.

The most common micronutrients in addition to iron and folic acid that

**Table 3 Haematological indices of maternal and cord blood by mothers' iron supplementation regimen**

| Variable | Iron supplementation regimen | | | | *P*-value |
|---|---|---|---|---|---|
| | Daily | | Twice weekly | | |
| | Median | IQR | Median | IQR | |
| ***Maternal blood*** | | | | | |
| Haemoglobin (g/dL) | 12.2 | 1.5 | 12.1 | 1.7 | 0.43 |
| Haematocrit (%) | 35.6 | 3.6 | 35.8 | 4.4 | 0.59 |
| Ferritin (µg/L) | 61 | 44 | 36 | 31 | < 0.001 |
| ***Cord blood*** | | | | | |
| Haemoglobin (g/dL) | 14.7 | 0.9 | 14.5 | 1 | 0.08 |
| Haematocrit (%) | 42.9 | 3.4 | 42.1 | 3.6 | 0.76 |
| Ferritin (µg/L) | 102 | 78 | 121 | 88 | 0.1 |
| ***Indices*** | **No.** | **%** | **No.** | **%** | |
| Maternal anaemia | 14 | 8.3 | 24 | 12.3 | 0.21 |
| Maternal serum ferritin < 45 µg/L | 47 | 35.9 | 76 | 52.1 | 0.007 |
| Cord serum ferritin < 100 µg/L | 59 | 44.0 | 66 | 43.7 | 0.95 |

*IQR = interquartile range.*

**Table 4 Anthropometric characteristics of the studied newborns and outcomes in terms of pregnancy weight gain and sex ratio of newborn by mothers' iron supplementation regimen**

| Variable | Iron supplementation regimen | | | | *P*-value[a] |
|---|---|---|---|---|---|
| | Daily (*n* = 168) | | Twice weekly (*n* = 193) | | |
| | Median | IQR | Median | IQR | |
| ***Anthropometric characteristics*** | | | | | |
| Head circumference (cm) | 34 | 1 | 34 | 1 | 0.246 |
| Height (cm) | 50 | 2 | 50 | 2 | 0.018 |
| Weight (g) | 3400 | 237 | 3300 | 475 | < 0.001 |
| ***Gestational age (days)*** | 275 | 11 | 274 | 11 | 0.787 |
| ***Outcome*** | | | | | |
| Maternal pregnancy weight gain (kg) | 13 | 3 | 12 | 3 | 0.068 |
| Sex ratio (boy/girl) | 1.2 | | 0.9 | | 0.28 |

[a]*Mann–Whitney test.*
*IQR = interquartile range.*

have been studied in Iranian pregnant women are zinc and vitamin A [17]. Very high rates of deficiency were reported for both of these. Since iron supplementation during pregnancy is a part of routine prenatal care, and non-organic iron interferes with zinc absorption, low serum levels of zinc may be expected. However, several studies showed that multiple micronutrient supplementations are not superior to iron or iron and folic acid supplementation in anaemia during pregnancy. Iron consumption was not supervised directly in our study, but we believe that adherence to both protocols was high and can be attributed to appropriate education, reinforcement calls between visits and the special importance given to it during prenatal visits. The fact that compliance with treatment is related to more important factors than gastrointestinal tract side-effects has been reported by other researchers [5,8]. A lower prevalence of gastrointestinal side-effects were reported by the twice weekly supplemented mothers, which is in line with other studies that reported reducing iron dose or intermittent prescription could decrease these complications [15,18,19]

The relationship of maternal anaemia and cord blood iron status has been established in several studies [20]. In the present study, cord blood Hb and ferritin concentrations were not different between the 2 supplemented groups, while maternal ferritin levels were lower in the twice weekly group, confirming the efficiency of twice weekly iron consumption in preventing fetal anaemia and iron deficiency in the absence of maternal hypoferritinaemia. This is consistent with other studies which showed that even with mild maternal anaemia, the fetal haematological condition remains normal [21]. Higher levels of ferritin in cord blood can be attributed to active transport of iron to the fetus. Nevertheless, several studies have shown that in severe maternal anaemia these active pathways may fail [22,23].

There were no low-birth-weight infants in either group. The restricted inclusion criteria for the study that recruited only low-risk mothers might be responsible. However, the median birth weight and height in the daily supplemented group were significantly higher than in the twice weekly group, which supports the results of other studies [4,24]. The mechanism of the influence of iron on fetal growth is not well established. It seems that regardless of maternal anaemia, iron supplementation is beneficial to the fetus in terms of anthropometric indices at birth. On the other hand, the increased risk of low birth weight following excess iron consumption is reported by others [25].

Several important issues should be kept in mind concerning anaemia in the Islamic Republic of Iran. Flour fortification with iron and folic acid is a practised nationwide and all products in the country are made with fortified flour. Thus we assumed that exposure to fortified products was the same for participants of both groups. There are many other factors affecting the prevalence of anaemia, in particular, intestinal parasitic infections. In the past, hookworm infections were very common in Mazandaran province (Sari is the capital

**Table 5 Results of linear regression analysis for prediction of newborn birth weight**

| Variable | B | SE (B) | β | *P*-value |
|---|---|---|---|---|
| BMI (kg/m$^2$) | 11.46 | 8.62 | 0.069 | 0.18 |
| Pregnancy weight gain (kg) | –3.59 | 7.18 | 0.026 | 0.61 |
| Gestational age at delivery (days) | 1.4 | 1.79 | 0.040 | 0.43 |
| Type of iron supplementation | 121.6 | 29.9 | 0.210 | < 0.001 |

*BMI = body mass index; SE (B) = standard error of B.*

city). But based on recent published research, the prevalence of these infections seems to have decreased [26] and they are more common in rural areas and in children. On the other hand, there is evidence in the literature to support the assumption that the most common cause of anaemia in pregnant women is iron-deficiency anaemia. All supplementation programmes are based on this assumption. The results of this study suggest that iron supplementation is not the only solution for combating anaemia in pregnant women.

Our study had several limitations that might affect the comparability of our results. Due to financial issues, blinding was not done, baseline ferritin values were not checked and the number of pills consumed was not supervised directly. On the other hand, the sample size was reasonably large, which makes our comparisons reliable. The results of our study confirm other research showing that current iron supplementation dose is not suitable for all mothers. It seems that in non-anaemic mothers, a smaller dose of iron is sufficient, and that this might also prevent complications of iron excess. Nonetheless, further studies are needed to suggest any change in current protocol for iron supplementation in Islamic Republic of Iran.

## Acknowledgements

This study was funded by Tarbiat Modares University research office as part of a Midwifery Master of Science dissertation.

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# Knowledge, attitudes and practices towards family planning among women in the rural southern region of Jordan

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**المعارف والمواقف والممارسات نحو تنظيم الأسرة بين النساء في المناطق الريفية الجنوبية في الأردن**

عليا محادين، أريج خليل، أيمن حمدان منصور، توكيكو ساتو، أتسوكو إيموتو

**الخلاصة:** هناك نقص في المعطيات حول تنظيم الأسرة بين النساء في المناطق الريفية والنائية في الأردن. وقد استكشفت هذه الدراسة انتشار الاستفادة من المعارف والمواقف في مجال تنظيم الأسرة بين النساء الريفيات في الأردن. وأجريَت دراسة وصفية لـ 807 امرأة متزوجة في عمر 15–49 سنة في مسح منـزلي في تسع وعشرين قرية في المنطقة الجنوبية من الأردن. وكانت أكثر وسائل منع الحمل المستخدمة هي أقراص منع الحمل الفموية (31.1٪)، واللولب (24.8٪)، والعزل (بسحب القضيب) (19.5٪). ومن النساء اللاتي تم مقابلتهن، كان هناك 37٪ يلجأن حالياً إلى منع الحمل، وكان أهم مبرِّرَيْن لعدم استخدام موانع الحمل هو حمل المرأة (11٪) أو قيامها بالإرضاع من الثدي (10٪)، ولم تبلغ أي من النساء عن أن الحصول على موانع الحمل أو أن تكلفتها هي العائق أمام استخدامها، في حين أن معارضة الزوج أو أفراد الأسرة أو الأسباب الدينية كانت سبباً لدى أقل من 1٪ من النساء. ووافقت حوالي 95٪ من النساء على أن اللجوء إلى تنظيم الأسرة له فوائد صحية إيجابية. وتدل هذه النتائج على الحاجة إلى مزيد من التوعية بين هؤلاء النساء.

ABSTRACT Data about family planning among women in rural and remote areas of Jordan are lacking. This study explored the prevalence of use and knowledge and attitudes towards family planning among rural Jordanian women. A descriptive study was conducted with 807 ever-married women aged 15–49 years in a household survey of 29 villages in the southern region of Jordan. The most common contraceptive methods ever used were oral contraceptive pills (31.1%), intrauterine device (24.8%) and withdrawal (19.5%). Of the women interviewed, 37% were currently using contraception. Being pregnant (11%) and breastfeeding (10%) were the most reported reasons for not using contraceptives. None of the women reported obtaining supplies or the cost of them as barriers, while opposition from husband or family members or religious reasons were reported by less than 1% of the women. About 95% of the women agreed that using family planning had positive advantages for health. The results highlight some educational needs among these women.

**Connaissances, attitudes et pratiques des femmes en matière de planification familiale dans le sud rural de la Jordanie**

RÉSUMÉ Les données des femmes habitant dans des zones rurales et reculées de la Jordanie sur la planification familiale sont insuffisantes. La présente étude a évalué la prévalence de l'utilisation de la planification familiale par des femmes jordaniennes en milieu rural, ainsi que leurs connaissances et leurs attitudes en la matière. Une étude descriptive a été menée auprès de 807 femmes mariées ou l'ayant été, âgées entre 15 et 49 ans lors d'une enquête auprès des ménages dans 29 villages de la région sud de la Jordanie. Les méthodes de contraception les plus fréquemment utilisées étaient les contraceptifs oraux (31,1 %), les dispositifs intra-utérins (24,8 %) ou le retrait (19,5 %). Pendant l'étude, 37 % des femmes interrogées utilisaient une méthode de contraception. Être enceinte (11 %) et allaiter (10 %) étaient les raisons les plus fréquentes pour ne pas utiliser de méthode contraceptive. Aucune des femmes n'a déclaré que l'obtention des produits contraceptifs ou leur coût représentait un obstacle, alors qu'une opposition de l'époux ou de membres de la famille, ou des motifs religieux constituaient des entraves pour moins de 1 % des femmes. Environ 95 % des femmes étaient d'accord pour affirmer que le recours à la planification familiale représentait un avantage positif pour la santé. Les résultats mettent en évidence certains besoins éducatifs des femmes interrogées.

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Received: 28/04/10; accepted: 22/07/10

## Introduction

The literature provides considerable baseline data on the benefits of family planning on women's health. The practice of family planning helps in reducing the rates of unintended pregnancies, of maternal and child mortality and of induced abortions [1]. In addition, using contraceptives has been shown to promote a woman's sense of autonomy and increase her ability to make decisions in other areas of her life [2–4].

Reproductive health for a woman includes her ability to space, delay or limit children, as well as her experience with infertility, child loss or planned or unplanned childlessness [2,3]. Although around half of married women worldwide now use a modern method of contraception, an estimated 200 million women in the world who wish to stop having children or delay their next birth for at least 2 years are not using an effective contraceptive method [5,6]. According to the Jordan Population and Family Health Survey (JPFHS) [7], 57% of ever-married women in the country are currently using a method of family planning, and of them 42% are using modern contraceptives. Contraceptive use demonstrates regional variability when rural and urban areas are compared. The level of contraceptive use was higher among women living in urban areas (57%) than those in rural areas (51%) [8]. Women in urban areas tended to use modern methods more than those living in rural areas (43% and 36% respectively). The intrauterine device (IUD) was the method most used by married women (22%) followed by the oral contraceptive pill (8%).

Although studies have been made about contraceptive use and related issues in the urban areas of Jordan, data about women in rural and remote areas of the country are lacking. Women living in rural areas may be more influenced by traditional gender roles than women in urban areas, and this might affect their family planning and pregnancy decisions. The aims of this study were to explore the level of knowledge about family planning methods among rural Jordanian women, the prevalence of use, preferences and reasons for using family planning methods and their attitudes towards family planning.

## Methods

### Study design

The study utilized a descriptive design to gather information related to use, knowledge and attitudes toward family planning methods among rural women in the southern region of Jordan. Data were collected using structured interviews.

### Sample and setting

Prior to data collection, ethical approval of the study was obtained from the Higher Population Council and Ministry of Health. A stratified random sampling technique was used to recruit the women. The inclusion criteria were ever-married women aged 15–49 years. No exclusion criteria were used, in order to maximize participation and the range of responses. The Jordan Department of Statistics provided household lists of 29 villages using stratified random sampling of 74 villages located in the southern Jordan governorates where village health centres operated. Twelve villages from Karak, 4 villages from Tafieleh, 9 villages from Ma'an and 4 villages from Aqaba were chosen according to the population size of the governorate. The Department of Statistics provided the housing block maps and the name list of the household heads that lived in these houses. Eleven households were randomly selected from each 80 blocks. Each interviewing team was assigned 2 to 3 blocks per day in the study area. The interviewers visited the assigned households and interviewed eligible respondents; if there were no eligible respondents at the household visited the house next door was visited. If no eligible women were found, the interview was abandoned.

In the field, a total of 915 ever-married women were selected for interviews from the selected households in Al-Karak ($n$ = 364), Al-Tafielah ($n$ = 89), Ma'an ($n$ = 328) and Aqaba ($n$ = 134). Among them, 10 women declined to be interviewed and another 98 women were not interviewed as they claimed to be outside the eligible age range, away from home or sick. A total of 807 women were successfully interviewed by trained interviewers at their home.

### Data collection

The trained interviewers explained to the women the purpose of the study, its significance and what was expected from them and answered the women's questions. Women were assured about the confidentiality of the study data and informed that they would be asked questions related to their reproductive health. On receiving the signed consent form, the data were collected using a structured interview.

The interviews took 30 minutes to complete. The survey was developed by the research team utilizing a thorough review of the literature and a review of tools available at the Ministry of Health and the Higher Population Council in Jordan. The survey was in Arabic language. Pilot testing of the survey was carried out to check for understanding and clarity. The women were asked about what family planning methods they had ever used, their knowledge related to contraceptive use (25 items) and their attitudes toward using contraceptive methods (15 items). In addition,. The survey also collected information about the demographic characteristics of the women (age, woman's level of education, working status, marital status, length of stay in the present address, husband's level of education, relationship to members of household, numbers of live births and infant mortality). The demographic information was obtained from an investigator-developed subject profile.

### Statistical analysis

The data were analysed using *SPSS*, version 15.0. Descriptive statistics are reported: frequency distributions and mean and standard deviation (SD). Student t-test for 2 independent samples was used to test differences among reproductive health domains in relation to selected demographic characteristics of the women.

## Results

### Demographic characteristics of study participants

The mean age of the women was 34.6 (SD 8.5) years. Among the 807 women who responded to the survey, 85.0% were married, 2.7% were widowed and 0.4% were divorced. Many of these women had lived in other villages prior to their current residence (16.6%), while 1.7% had lived in Amman (the capital) and 10.3% had lived in a city other than Amman. With regards to education, 71.6% had ever been to school while 28.4% had not. Among those who had schooling, about three-quarters had high secondary or lower level of education. Of the women's husbands 73.0% had received some schooling.

### Knowledge about concept of family planning

The women were asked an open-ended question about what family planning meant to them. The results showed that the concept of family planning was not well understood by women in the southern region of Jordan. Some women said that family planning meant spacing between births (338, 36.9%) and others reported that it meant spacing between pregnancies (225, 24.8%). However, 80 (8.7%) of the women said that they did not know what family planning was. The women were then asked if they had hear about any method of family planning. While 727 of the total respondents (91.4%) knew at least one method of contraception, 77 (8.4%) of the women did not know any methods (the remainder answered "don't know").

### Prevalence of contraceptive use

The survey showed that 336 (37.0%) of the women had ever used a contraceptive method compared with 397 (43.8%) who never used any method (the remaining women did not respond).

Women who had used family planning were asked what method they had ever used. Ever-use of contraceptive methods showed that oral contraceptive pills and the IUD were the most used methods (31.1% and 24.6% respectively) (Table 1). One-fifth of the women ($n$ = 176, 19.4%) had ever used withdrawal (external ejaculation) as a family planning method. Injections as a method of contraception were not common among the women (10.1%). Female and male sterilization were rarely used methods (4.2% and 0.4% respectively)

The IUD and withdrawal were the most commonly used current methods, by 89 (27.7%) and 72 (22.4%) women respectively.

### Knowledge about side-effects of contraceptives

Table 1 shows that 36.6% and 33.2% of the women had knowledge about the side-effects of oral contraceptive pills and the IUD respectively. These proportions were similar to the frequencies of women who had ever-used these methods. However, a slightly higher proportion of women (16.4%) stated that they had knowledge about the side-effects of injections than those who had ever-used this method.

**Table 1 Prevalence of ever-use of contraceptive methods among ever-married women in the southern region of Jordan ($n$ = 807)**

| Contraceptive method | Using contraceptive | | Knowledge about side-effects | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Oral contraceptive pill | 285 | 35.3 | 296 | 36.7 |
| IUD | 225 | 27.9 | 268 | 33.2 |
| Withdrawal | 176 | 21.8 | 141 | 17.5 |
| Male condom | 97 | 12.0 | 185 | 22.9 |
| Injection | 92 | 11.4 | 133 | 16.5 |
| Female sterilization | 38 | 4.7 | 29 | 3.6 |
| Calendar method | 27 | 3.3 | 36 | 4.5 |
| Lactation amenorrhea method | 21 | 2.6 | 25 | 3.1 |
| Female condom | 9 | 1.1 | 6 | 0.7 |
| Implantation | 8 | 1.0 | 17 | 2.1 |
| Foam | 8 | 1.0 | 8 | 1.0 |
| Male sterilization | 4 | 0.5 | 14 | 1.7 |

*IUD = intrauterine device.*

### Reasons for not using contraceptives

Reasons for not using contraceptives were investigated in an open-ended question to women not using them (Table 2). The reasons were categorized into 4 major categories: fertility-related reasons, methods-related reasons, opposition to use and lack of knowledge. The most common reasons were fertility-related (318 women, 39.4%). Within this category, pregnancy and breastfeeding were the most reported reasons for not using contraception (12.8% and 10.9% respectively). None of the women reported that lack of knowledge about contraceptive methods or obtaining them were a barrier to contraception use. Only 3 women (0.37%) reported their husbands' opposition to using contraceptives as a reason and only 1 woman (0.12%) was not using contraceptives for religious reasons. None of the women mentioned availability of health care services as a possible reason for not using contraceptives, while only 4 women (0.5 %) identified difficulties in reaching a health care centre.

**Table 2 Reasons for not using contraceptives among ever-married women in the southern region of Jordan ($n$ = 807)**

| Reason for not using contraceptives | No. | % |
|---|---|---|
| ***Fertility-related reasons*** | | |
| Currently pregnant | 103 | 12.8 |
| Currently breastfeeding | 88 | 10.9 |
| Had difficulties getting pregnant | 43 | 5.3 |
| Want to get pregnant | 36 | 4.5 |
| Irregular sexual relationship | 19 | 2.4 |
| Not currently married | 14 | 1.7 |
| Had hysterectomy | 11 | 1.4 |
| Menopausal | 4 | 0.5 |
| No sexual contact | 0 | 0.0 |
| Total | 318 | 39.4 |
| ***Methods-related reasons*** | | 0.0 |
| Health reasons | 27 | 3.3 |
| Afraid of side-effects | 12 | 1.5 |
| Difficulty in getting to the health centre | 4 | 0.5 |
| No appropriate methods available | 4 | 0.5 |
| Effects on normal body functions | 4 | 0.5 |
| No family planning service available at health centre | 0 | 0.0 |
| Cost | 0 | 0.0 |
| Total | 51 | 6.3 |
| ***Opposition to use of contraceptives*** | | 0.0 |
| Personal opposition | 3 | 0.4 |
| Husband's opposition | 3 | 0.4 |
| Other people's opposition (rumours) | 3 | 0.4 |
| Religious reasons | 1 | 0.1 |
| Family member(s) opposition | 0 | 0.0 |
| Total | 10 | 1.2 |
| ***Information-related reasons*** | | 0.0 |
| Don't know method | 0 | 0.0 |
| Don't know where to get contraceptives | 0 | 0.0 |
| Total | 0 | 0.0 |

### Attitudes towards family planning

In general, the women expressed a positive attitude towards family planning (Table 3). Over 95% agreed about the benefits of spacing children and family planning for the health of the child and mother. However, there was some disagreement about the time to start family planning, as 63.7% of them agreed to start family planning immediately only after the birth of the first child.

Of 417 women who answered the question about husband's support, a majority reported that their husbands supported the use of family planning (78.2%). Both they and their husband agreed on the number of children they were planning for in 61.4% of cases (492/801).

### Sources of information about family planning

Of the 540 women who answered the question about sources of information on family planning, television was the most commonly reported source of information about family planning (61.9%), followed by health workers (60.3%) and newspapers (16.1%) and radio (10.6%). Other sources made a minimal contribution (workers in family planning, workers in other organizations, husband, relatives, friends, school or library) (11.4%).

## Discussion

This study addressed issues related to the health of Jordanian women in rural areas and attempted to understand these women's family planning needs. The study revealed that women in rural areas of the southern region of Jordan had incomplete knowledge about the concept of family planning and some women (8.7%) stated that they did not know what family planning referred to. In addition, 8.4% of them claimed

**Table 3 Attitudes toward family planning among ever-married women in the southern region of Jordan (*n* = 807)**

| Item | Agree | | Don't know | | Disagree | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| If the parents postpone the next child, the woman will have better health | 785 | 97.3 | 13 | 1.6 | 6 | 0.7 |
| Parents have to make a 2-year space between pregnancies | 785 | 97.3 | 9 | 1.1 | 10 | 1.2 |
| If there is spacing, the child will be in better health | 779 | 96.5 | 15 | 1.9 | 10 | 1.2 |
| I think parents have to use family planning methods to prevent pregnancies | 733 | 90.8 | 38 | 4.7 | 33 | 4.1 |
| Using family planning methods just after delivery will prevent unplanned pregnancies | 637 | 78.9 | 56 | 6.9 | 111 | 13.8 |
| I think it is appropriate to start family planning immediately after the first child | 513 | 63.6 | 55 | 6.8 | 235 | 29.1 |
| Female sterilization (tubal ligation) is one way to avoid pregnancy | 221 | 27.4 | 80 | 9.9 | 502 | 62.2 |

never to have heard about any method of avoiding pregnancy. The study indicated that the most reported source of information about family planning was television, while health workers were the second most common source of information. This indicates a pressing need to educate these women about the concept of family planning and available methods to avoid pregnancy. The 2007 JPFHS revealed that 12% of married women in Jordan had an unmet need for family planning, 5% for spacing and 7% for limiting births [7]. Unmet need was highest among those with no education, and among those in the poorest households. It also varied by governorate.

Nevertheless, the great majority of the women in this study were familiar with the concept of family planning; 91.4% had ever heard of methods to avoid pregnancy and more than one-third were currently using a contraceptive method. However, almost half of women (43.4%) of reproductive age were not using any family planning method. When women were asked to state their reasons for not using contraceptive methods, none of them reported not knowing about family planning methods or where to get them. This indicates that these women had access to information related to contraceptive use and knew where to obtain them. Cost and lack of family planning services were also not reported as barriers, while reasons such as family members' or husbands' opposition or religious reasons were reported by less than 1% of women.

The prevalence of contraceptive use showed that the most commonly used methods of contraception among women in southern rural Jordan were oral contraceptives, IUD and withdrawal. Female sterilization was only used by 4.2% of women, suggesting a possible lack of knowledge about this method. These findings are consistent with a previous study which found that Jordanian Muslim women preferred IUD as a contraceptive method and that they believed that the IUD had fewer side-effects than oral contraceptives [9].

Although women reported using predominantly modern methods, a high proportion (19.5%) relied on the withdrawal method. Interestingly among this study sample 32.3% and 29.5% had knowledge about the side-effects of oral contraceptive pills and the IUD respectively. The similar frequencies of using methods and having knowledge about their side-effects indicate that women had good knowledge about the methods of contraceptives that they use. However, the high frequency of knowledge about the most used methods and the very low frequency of knowledge about the least used methods also indicates that women might lack knowledge about the options available for contraception. This may be related to the types of services and supplies at the health centres and family planning centres. Women are coming from areas of rural poverty and this may explain the tendency to use the cheapest or free contraceptive methods such as oral contraceptives pills, condoms and withdrawal, and avoid using more costly methods. Although the ministry of health provides family planning services at all primary and comprehensive health care services, only 54% of women in Jordan used this service [7]. This raises the issue whether women have sufficient knowledge about the availability of family planning services and whether enough importance is given to postpartum follow-up in which women have the opportunity to be introduced to family planning methods. These questions need further investigation.

Although women in our study had a positive attitude toward contraceptive use, a high percentage of women actually did not practise it. Some reasons were logical and related to pregnancy and menopause; however, other reasons, such as health reasons, might need further investigation.

## Conclusion

Women in the southern region of Jordan showed positive attitudes and knowledge about contraceptive use. However, the prevalence of use of different methods highlight some educational needs among the women; fro example, women may lack the appropriate information and knowledge about female sterilization. Although women value family planning for the health of the mother and the child, they still may have problems of understanding reasons for using family planning. Health professionals should seize the opportunity to plan for educational programmes and counselling sessions for women in these areas.

## Acknowledgement

This study was funded by the Japan International Cooperation Agency, Amman, Jordan.

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# Seroprevalence of tetanus antibodies among pregnant women in Duhok Governorate, Iraq

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**معدّل الانتشار المصلي لأضداد الكُزاز لدى الحوامل في محافظة دهوك في العراق**

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**الخلاصة:** إن تمنيع الأمهات بذوفان الكزاز TT هو الأكثر فعالية في اتّقاء كزاز الوليد. وتدل المعطيات في العراق على انخفاض معدّل التلقيح في محافظة دهوك. وقد قيَّمت هذه الدراسة التلقيح بذوفان الكزاز بين ست مئة امرأة حامل اختارهن الباحثون عشوائياً من بين الحوامل اللائي يراجعن مستشفى أزادي التعليمي في دهوك للولادة فيه، وذلك بتحديد معدَّل الانتشار المصلي بالقياس بطريقة الممتز المناعي المرتبط بالإنزيم ELISA، وسوابق التلقيح بذوفان الكزاز. وقد استخدم الباحثون معايير منظمة الصحة العالمية للمستويات الواقية لتحديد معدّل الانتشار المصلي وسوابق التلقيح. وفي المجمل، كان لدى 90٪ من النساء الـمَوَاخض (الآتيات للولادة) مستويات واقية من مضاد ذوفان الكزاز في مقابل 55٪ اعتُبرن مَحْمِيّات من الإصابة بحسب سابقة التلقيح. وكانت معدّلات المناعة لدى النساء اللاتي لم يتلقَّيْن أيّ تلقيح بذوفان الكزاز 28.0٪، ولدى من تلقَّيْن جرعة واحدة 92.6٪، ولدى من تلقَّيْن جرعتين اثنتَيْن 100.0٪، ولدى من تلقَّيْن ثلاث جرعات فأكثر 99.0٪. وكانت الفئات ذوات المناعة المصلية الأخفض في مَنْ أعمارهنّ أقل من 25 سنة، وفي اللاتي لم يسبق لهن تَلَقِّي التلقيح، وفي اللاتي يعشن في مناطق أكر وبادراش وشيخان في دهوك. وقد تخطت المناعة ضد الكزاز التي قيست بمعدّلات الانتشار المصلي لمستويات أضداد الكزاز تلك المستويات التي تم تقديرها بسوابق التلقيح، ممَّا يدلُّ على ضرورة استخدام الواسمات المصلية بدلاً من سوابق التلقيح في تحديد حالة المناعة.

ABSTRACT Maternal immunization with tetanus toxoid (TT) is the most effective was to prevent neonatal tetanus. In Duhok, Iraq data indicate low vaccination coverage. This study assessed TT immunization status among 600 randomly selected pregnant women attending Azadi teaching hospital, Duhok for delivery, by both tetanus antibody seroprevalence and TT history. WHO criteria for protective levels were used for seroprevalence and vaccination history. Overall, 90% of the women at delivery had protective tetanus antitoxin titres compared to only 55% considered protected according to their vaccination history. Immunity rates for women who had received no TT vaccination, 1 dose, 2 doses and ≥ 3 doses were 28.0%, 92.6%, 100.0% and 99.0% respectively. Groups with lower serological immunity levels were women aged less than 25 years, those reporting no history of vaccination and those living in Akre, Bardarash or Shekhan districts of Duhok. Tetanus immunity determined by seroprevalence of tetanus antitoxin levels exceeded that estimated by vaccination history, and serological markers should be used instead of vaccination history in determining immunity status.

**Séroprévalence des anticorps antitétaniques chez des femmes enceintes dans le Gouvernorat de Duhok (Iraq)**

RÉSUMÉ La vaccination des mères par l'anatoxine tétanique est la méthode la plus efficace de prévention du tétanos néonatal. À Duhok (Iraq), les données indiquent que la couverture vaccinale est faible. La présente étude a évalué le statut vaccinal pour l'anatoxine tétanique de 600 femmes enceintes sélectionnées aléatoirement et consultant l'hôpital universitaire Azadi à Duhok, pour leur accouchement. La méthode ELISA a permis de déterminer la séroprévalence de l'anatoxine tétanique et les antécédents des patientes en la matière. Les critères de l'Organisation mondiale de la Santé pour les taux protecteurs ont été utilisés pour la séroprévalence et les antécédents de vaccination. Globalement, 90 % des femmes à l'accouchement avaient des titres d'antitoxine tétanique protecteurs par rapport à seulement 55 % des femmes considérées comme protégées selon leurs antécédents de vaccination. Les taux d'immunité chez les femmes n'ayant pas reçu de vaccination antitétanique, ou ayant reçu une dose, deux doses ou trois doses ou moins représentaient 28,0 %, 92,6 %, 100,0 % et 99,0 % respectivement. Les groupes présentant les niveaux d'immunité sérologiques les plus faibles étaient composés de femmes de moins de 25 ans ou n'ayant jamais été vaccinées ou vivant dans les districts d'Akre, de Bardarash ou de Shekhan du gouvernorat de Duhok. L'immunité antitétanique déterminée par la séroprévalence des taux d'antitoxine tétanique surpassait celle estimée à partir des antécédents de vaccination. Par conséquent, les marqueurs sérologiques devraient être utilisés à la place des antécédents vaccinaux pour déterminer le statut immunitaire.

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Received: 27/03/11; Accepted: 19/05/11

## Introduction

Neonatal tetanus is still a relatively common disease with high mortality among neonates in several developing countries, including Iraq. Incidence rates of more than 1 per 1000 live births are documented in some areas [1], and the disease is responsible for about 14% of all annual neonatal deaths, claiming about 180 000 lives worldwide every year [2,3]. The disease can, however, be easily prevented mainly by maternal immunization with tetanus toxoid (TT) vaccine and by aseptic obstetric and postnatal care practices [4]. The efficacy of the TT vaccine before and during pregnancy in preventing neonatal tetanus has been demonstrated [5–7]. Although subject to debate, measurement of tetanus antitoxin specific IgG has been used as a monitor of protection and various studies suggest that the minimum level of antibody required for protection is 0.01 IU/mL [8].

According to the Duhok Directorate of Health, coverage of TT2+ (2 or more TT injections) for 2007 was 30.0%, for 2008 was 31.7% and for 2009 was 32.7%. However, this cannot be considered an indicator of the immunity situation due to recording, reporting and coverage calculation constraints [9]. In Iraq the multiple indicator cluster survey (MICS) implemented in 2006 showed that the percentage of mothers with a birth in the last 12 months protected against tetanus was 61.4% for Iraq, 59.4% for Kurdistan and 50.1% for Duhok province [10]. The World Health Organization (WHO) standard 30 clusters survey conducted by the Regional Ministry of Health and UNICEF in Kurdistan in 2007 showed that the percentage of mothers protected against tetanus at the time of delivery was 31.3% for Duhok, 52.6% for Sulemaniya and 58.4% for Erbil [11].

This low protection was considered one of the main obstacles facing the Expanded Programme on Immunization (EPI) in Duhok Governorate. However, it was thought that these figures did not indicate the real coverage or immunity against tetanus in the governorate. Exhaustive literature searches could not trace any previous study in Iraq that assessed serological immunity against neonatal tetanus apart from 1 study that assessed the efficacy of the vaccine in 1996 [12].

The aim of this study therefore was to determine the seroprevalence of tetanus antitoxin levels among pregnant women in Duhok, and its relation to TT history, age and residence.

## Methods

### Study design and setting

A cross-sectional seroprevalence study was conducted in Duhok Governorate/Iraqi Kurdistan Region. The Governorate is composed of 7 districts: Duhok, Shekhan, Sumel, Zakho, Amedy, Akre and Bardarash. Participants were enrolled at Azadi Teaching Hospital which is the only tertiary hospital in the governorate. It receives referred labour cases (normal, complicated and emergency) from all districts.

### Study sample

The sample comprised women attending Azadi teaching hospital for delivery between 16 March and 2 May 2009 and who were eligible for inclusion. A woman was considered eligible when prepared for admission to the delivery room (for second stage management) or to the operation theatre (for caesarean section). Exclusion criteria were: pregnant women attending from other provinces, and cases with blood sampling errors including inadequate volume, and haemolysed, lipaemic and icteric samples.

### Sample size and enrolment

The estimated mid-year population of Duhok Governorate for 2008 was 985 946 with 39 438 expected annual deliveries [9]. The required sample size was determined according to the formula [13]: $n = (z^2 \times 1-a/2)(1-p)/(e^2 \times p)$, where $(z^2 \times 1-a/2)$ = 95% confidence interval, a = alpha level (0.05), $p$ is the assumed prevalence of immunity against tetanus (0.31) [11], and e is the relative precision (0.15). Thus the estimated sample size was 380. The number was increased to increase sample homogeneity and sampling proportional to district size was done to enhance representativeness.

A systematic random sampling procedure was used to enrol every fourth eligible pregnant women until the assigned proportion for each district was achieved. Thus a total of 600 eligible pregnant women were included in the study.

### Determination of immune status

Immune status for tetanus was assessed in 2 ways.

*Anti-tetanus-IgG antibody level*. In accordance with WHO standards, IgG levels > 0.15 IU/mL were considered protective [8].

*Vaccination history*. In accordance with WHO recommendations, women were considered immune if they had received: i) 2 doses of TT vaccine in the current pregnancy, or ii) 1 dose in the current pregnancy and ≥ 1 previously, or iii) no doses in current pregnancy but ≥ 2 doses previously. Women were considered non-immune at the time of the current delivery if they had received: i) 1 dose only of TT vaccine in the current pregnancy or previously, or ii) no doses in the current pregnancy and ≥ 2 doses previously but not within the expected period of protection at the time of the last delivery, or iii) no doses in current pregnancy and ≥ 2 doses previously but the date of and years since the last dose was not remembered, or iv) no doses in the current pregnancy or previously [14].

### Data collection

A detailed immunization history of the mothers was obtained either from her

immunization card, if available, or otherwise according to her recollection of immunization.

A 5 mL blood sample was drawn into a clean plain tube without anticoagulant and incubated in a water bath at 37 °C for optimal separation followed by centrifugation at 2000–3000 rpm for 10 minutes. The sera were separated in plain tubes. Then 1 mL serum was transferred to a crayon vial (special laboratory tube fit for deep freezing and long-distance transportation) and stored at –40 °C until transferred by air in a cool-box with frozen ice packs to the WHO regional laboratory in Muscat, Oman for estimation of tetanus antitoxin IgG level. The SERION ELISA classic Tetanus IgG kit was used (Virion\Serion, Germany). The ELISA assay procedure was carried out using BioMérieux ELISA reader 25 with Lab Systems Inc. well washer 4 [8].

### Ethical considerations

The study was approved by the Research Ethics Committee. Women were informed about the objectives of study and their written consent to participate obtained. None refused to participate.

### Data analysis

Data were analysed using *SPSS*, version 16 and *Epi Info*, version 3.5.1. For categorical variables, frequency and proportions were computed, and proportions were compared using the chi-squared test. A *P*-value less than 0.05 was considered statistically significant.

## Results

Over 50% of the pregnant women enrolled were aged 18–29 years. The majority (87%) were housewives and about 50% were illiterate. About 75% of the women reported seeking antenatal care services during the current pregnancy.

Table 1 shows serum levels of tetanus antitoxin IgG. The first 2 groups were seronegative with titres up to 0.15 IU/mL; they represented 10.0 % of the sample with the rest considered immune, with IgG antibody levels > 0.15 IU/mL. The majority of women (63.7%) had anti-tetanus IgG antibody levels > 1.0 IU/mL.

Table 2 shows that seropositivity increased with increasing age as reflected by the high non-immune rates (20.8%) in the age group under 18 years compared to those ≥35 years (4.2 %).

Table 3 shows antibody levels by district. The highest rate of immunity was among women from Amedy (94.4%), followed by Duhok (94.0%), Sumel (93.9%) and Zakho (89.7%); the lowest rate was among women from Akre (80.8%).

Table 4 shows that among women who never received TT vaccination during pregnancy or adulthood, only 28% were immune, compared with 92.6% and 100% for those receiving 1 and 2 TT doses respectively. It also shows that only 13.8% of those who did not receive vaccination during the current pregnancy were non-immune, and this decreased to 3.6% and 0.0% among those who received 1 and 2 doses of TT respectively in the current pregnancy.

Table 5 shows the correlation between tetanus immunity according to TT history and immunity according to anti-tetanus IgG seroprevalence. According to mothers' verbal histories, 331 (55.2 %) were considered protected at the time of their current delivery. Two women were later found to be non-immune by blood test. The other 329 were divided into 3 subcategories: first, those reported to have received 2 injections of TT during their current pregnancy 105 (17.5 % of the total sample); second, those reported to have received 1 TT dose during their current pregnancy and at least 1 dose previously 69 (11.5%). Third, those with no vaccination in the current pregnancy but with ≥ 2 TT injections previously and still within the protection time 155 (25.8%).

**Table 1 Distribution of study sample by tetanus antitoxin IgG level**

| IgG level (IU/mL) | No. (%) | Cumulative % |
|---|---|---|
| < 0.016 | 5 (0.8) | 0.8 |
| 0.016–0.15 | 55 (9.2) | 10.0 |
| 0.16–0.5 | 69 (11.5) | 21.5 |
| 0.51–1.0 | 89 (14.8) | 36.3 |
| 1.1–5.0 | 268 (44.7) | 81.0 |
| > 5.0 | 114 (19.0) | 100 |
| Total | 600 (100) | |

**Table 2 Tetanus immunity (IgG > 0.15 IU/mL) among the study sample by age group**

| Age group (years) | Immunity status | | Total |
|---|---|---|---|
| | Immune | Non immune | |
| | No. (%) | No. (%) | |
| < 18 | 19 (79.2) | 5 (20.8) | 24 |
| 18–24 | 126 (83.4) | 25 (16.6) | 151 |
| 25–29 | 177 (90.3) | 19 (9.7) | 196 |
| 30–34 | 104 (94.5) | 6 (5.5) | 110 |
| 35 + | 114 (95.8) | 5 (4.2) | 119 |
| Total | 540 (90.0) | 60 (10.0) | 600 |

*$\chi^2 = 17.333$, df = 4, P = 0.002.*

**Table 3 Tetanus immunity (IgG > 0.15 IU/mL) among the study sample by district**

| District | Immunity status | | Total |
|---|---|---|---|
| | Immune | Non-immune | |
| | No. (%) | No. (%) | |
| Amedy | 51 (94.4) | 3 (5.6) | 54 |
| Duhok | 158 (94.0) | 10 (6.0) | 168 |
| Sumel | 62 (93.9) | 4 (6.1) | 66 |
| Zakho | 113 (89.7) | 13 (10.3) | 126 |
| Shekhan | 47 (87.0) | 7 (13.0) | 54 |
| Bardarash | 46 (85.2) | 8 (14.8) | 54 |
| Akre | 63 (80.8) | 15 (19.2) | 78 |
| Total | 540 (90.0) | 60 (10.0) | 600 |

*$\chi^2 = 14.698$, df = 6, P = 0.023.*

There were 269 (44.8%) women considered non-immune at the time of the current delivery according to their self-reported TT history: 75 reported never having had a TT injection, and 166 reported having had ≥ 2 injections but were no longer within the period of protection at time of the current delivery, or the date of and years since the last TT dose was not remembered.

Despite the high rates of non-immunity according to vaccination history, there were high rates of serological immunity. Only those who had never received TT vaccination in their current pregnancy or previously had low immunity 28.0% (21 mothers out of 75 who reported such history).

## Discussion

Part of the national immunization programme in Iraq is providing vaccination to all pregnant women during the second and third trimesters of pregnancy. It is usually difficult to assess coverage reliably on the basis of reports of TT doses administered and determination of tetanus antitoxin levels is the most reliable indicator yielding a more accurate estimate of protection; it is also a good way to monitor the effectiveness of any vaccination strategy for pregnant women [15,16].

Data from the EPI unit during the last 10 years indicate that TT1 and TT2+ coverage rates for both pregnant women and women of child-bearing age never reached 50% in Duhok [17]. Previous studies that estimated tetanus immunity in Duhok and in the Kurdistan region by vaccination coverage rates, revealed that tetanus immunization was inadequate [11]. The only serological study carried out in Duhok in 1996 assessed the efficacy of the vaccine and campaigns. It was based on a passive haemagglutination assay and could not estimate the prevalence among pregnant women because the study enrolled a total of 268 previously vaccinated individuals. The study, nevertheless, showed that 40 out of 50 women (80%) had protective antibody levels which, > 0.01 IU/mL according to the assay used [12].

Tetanus immunity status among pregnant women in this study was analysed in reference to TT vaccinations regardless of diphtheria, pertussis, tetanus (DPT)/diphtheria, tetanus (DT) vaccinations in their childhood because dependence on childhood vaccination history could have resulted in added recall bias.

Indirect ELISA techniques are simple, sensitive, rapid and inexpensive tools for mass screening of the population but are generally less specific than the *in vivo* neutralization method. Good correlation between the indirect ELISA and neutralization assays has been demonstrated, although this is

**Table 4 Tetanus immunity (IgG > 0.15 IU/mL) among the study sample by number of TT doses received**

| No. of doses of TT | Immunity status | | Total | $\chi^2$ | *P*-value |
|---|---|---|---|---|---|
| | Immune | Non-immune | | | |
| | No. (%) | No. (%) | | | |
| ***Ever received*** | | | | | |
| 0 | 21 (28.0) | 54 (72.0) | 75 | 3.674 | < 0.0001 |
| 1 | 25 (92.6) | 2 (7.4) | 27 | | |
| 2 | 104 (100) | 0 (0.0) | 104 | | |
| > 2 | 390 (99.0) | 4 (1.0) | 394 | | |
| ***In current pregnancy*** | | | | | |
| 0 | 355 (86.2) | 57 (13.8) | 412 | 22.16 | < 0.0001 |
| 1 | 80 (96.4) | 3 (3.6) | 83 | | |
| 2 | 105 (100.0) | 0 (0.0) | 105 | | |
| Total | 540 (90.0) | 60 (10.0) | 600 | | |

*TT = tetanus toxoid.*

**Table 5** **Tetanus antitoxin seroprevalence (IgG > 0.15 IU/mL) by TT vaccination history**

| TT history | Seropositivity | | Total | *P*-value[a] |
|---|---|---|---|---|
| | Immune No. (%) | Non- immune No. (%) | | |
| ***Considered immune at time of current delivery*** | | | | |
| 2 doses in current pregnancy | 105 (100.0) | 0 (0.0) | 105 | 0.046 |
| 1 dose in current pregnancy and ≥ 1 previously | 69 (97.2) | 2 (2.8) | 71 | |
| None in current pregnancy, but ≥ 2 previously (and the mother still in the expected period of protection at time of her current delivery) | 155 (100) | 0 (0.0) | 155 | |
| Total for immune cases at time of delivery according to TT history | 329 (99.4) | 2 (0.6) | 331 | |
| ***Considered non-immune at time of current delivery*** | | | | |
| 1 dose only in current pregnancy or previously | 26 (92.9) | 2 (7.1) | 28 | <0.001 |
| 0 doses in current pregnancy and ≥ 2 previously, but the mother no longer in the expected period of protection at time of current delivery | 41 (100.0) | 0 (0.0) | 41 | |
| 0 doses in current pregnancy and ≥ 2 previously, but date of and years since last dose not remembered | 123 (98.4) | 2 (1.6) | 125 | |
| 0 doses in current pregnancy or previously | 21 (28.0) | 54 (72.0) | 75 | |
| Total for non-immune at time of delivery according to TT history | 211 (78.4) | 58 (21.6) | 269 | |
| ***Grand total*** | 540 (90.0) | 60 (10.0) | 600 | |

[a] *Fisher exact test.*
*TT = tetanus toxoid.*

generally when antibody concentrations are above 0.16–0.2 IU/mL [18]. Indirect ELISA, however, overestimates titres lower than this range when compared to the neutralization assay [19]. An antitoxin concentration above 0.15 IU/mL is the preferred correlate of protection based on the results of ELISA [8,20], which was applied in our study as a cut-off point between immune and non-immune cases.

In Ankara, Turkey a similar study using ELISA testing in pregnant women at the time of delivery revealed an immunity rate of 69% using a cut-off level ≥ 0.6 IU/mL. Other studies have investigated the community in general and not just pregnant women or women of child bearing age, also using ELISA testing and a 0.15 IU/ml cut-off; thus an immunity rate of 80% was found in the Kocaeli region in Turkey [21], 68% in Egypt [22] and 72% in the Unites States of America [23]. In our study using the same test procedure and cut-off level, however, the immunity rate was higher (90%). This may be attributed to different time periods of the studies; the previous studies were conducted between 2002 and 2005, while our study was done in 2009 after extensive WHO efforts to include TT vaccination for pregnant females in the routine EPI programme in Iraq.

Despite the high antitoxin seroprevalence in the present study, only 54.8 % of the mothers were considered protected according to their immunization history, which similar to what has been found in previous local surveys [10,11]. Only 10% of the sample were seronegative (≤ 0.15 IU/mL). This finding contrasts with the large number of women who were considered non-immune at the time of current delivery. This discrepancy highlights the mismatch between the proposed protective antibody cut-off level and the immunity status gauged by reasonably dependable history data. It is interesting to note that if the cut-off level were raised to 1.0 IU/ml, the non-immune women would constitute 36.3% of the sample, which represents a better match between serological protection and history data.

In contrast to several previous studies, antibody protective levels increased with increasing age [21]. This may be due to the fact that our study included only pregnant women, i.e. only those of child-bearing age (15 to 49 years), and those were the ages of women who were included in the neonatal tetanus elimination programme initiated in the early 1980s. The lower rate of immunity exhibited by those under 18 years of age (79.2%) may be attributed to the waning immunity from their uncompleted TT vaccination or to childhood DPT vaccination.

For mothers who reported receiving no vaccination, only 28.0% were found immune by IgG level. This is consistent with results obtained in other studies such as in Turkey [21] and the Central

African Republic [14]. Underreporting of TT doses may be the main reason.

Overall sample assessment by vaccination history revealed 55.2% immune. Almost all mothers who were expected to be immune at delivery according to their immunization history (99.4%) showed high immunity status reflected by antibody titres of more than 0.15 IU/mL. This was found even among those who had received no vaccination during the current pregnancy, but apparently had achieved the IgG threshold earlier. On the other hand 78.4 % who were not expected to be immune at delivery according to their immunization history had high antibody titres including even 28% of those with no vaccination history. These results are similar to those found in the Central African Republic [14]. This may be due to underreporting or to their past childhood immunization with DPT.

## Conclusions and recommendations

Tetanus immunity determined by serological markers exceeds that estimated by vaccination history and those reported by the previous local surveys. Accordingly, and if facilities and resources are available, it is advisable to depend on seroprevalence of antibody titres especially when data recorded on cards are not easily available.

## Acknowledgement

We would like to thank WHO for help in the analysis of the samples at their central laboratory in Muscat, Oman.

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# Child physical abuse in Bahrain: a 10-year study, 2000–2009

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**الإيذاء الجسدي للطفل في البحرين: دراسة على مدى عشر سنوات، 2000-2009**

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**الخلاصة:** في سبيل تحسين فهمنا للإيذاء الجسدي للطفل، وتقدير جسامته، والتعرُّف على الأعراض التي تظهر على ضحاياه عند قُدُومهم إلى المستشفى وعلى خصائص هؤلاء الضحايا وخصائص أُسَرِهِمْ ومُضطهديهم، أجرَت الباحثتان مراجعة استعادية قيّمتا فيها على مدى عشر سنوات (2000-2009) مئتين وسبعة وثلاثين طفلاً تعرّضوا للإيذاء الجسدي، وذلك في مستشفى للرعاية الثالثية في البحرين. وقد كان متوسط عمر الأطفال سبع سنوات، وكان 58٪ منهم من الذكور. وأما العدد السنوي للحالات التي أبلغ عنها فقد ارتفع من إحدى عشرة حالة في عام ألفين إلى أربع وخمسين حالة في عام 2009. ولوحظت مظاهر الإيذاء الجلدية في 59.0٪، والكسور في 10.5٪، وإصابات الرأس في 9.7٪. وكان 89٪ من المعتدين البالغين، والذكور (64٪)، والمعروفون منهم للطفل (98٪). ولقد تم تحويل 48٪ من الحالات الى جهات إنفاذ القانون. وأبعد حوالي 10٪ من الأطفال من بيئة الإيذاء. واستنتجت الباحثتان أن الزيادة في حالات الإيذاء الجسدي للأطفال التي أبلغ عنها تستوجب تعزيز خدمات حماية الأطفال.

ABSTRACT To improve the understanding of child physical abuse, assess its magnitude, and identify the presentations and the characteristics of the victims, their families and the offenders, we carried out a retrospective review of 237 child physical abuse cases evaluated over 10 years (2000–2009) in a tertiary hospital in Bahrain. Mean age of the children was 7 years, 58% were males. The annual number of reported cases increased from 11 in 2000 to 54 in 2009. Skin manifestations were seen in 59.0%, fractures in 10.5% and head injuries in 9.7%. The perpetrators were adults (89%), males (64%) and known to the child (98%). Referral to law enforcement was made in 48% of the cases. About 10% of the children were removed from the abusive environment. The increase in reported cases of child physical abuse calls for strengthening of child protection services.

**Violence physique infligée à l'enfant à Bahreïn : une étude sur 10 ans, 2000–2009**

RÉSUMÉ Pour accroître les connaissances sur la violence physique infligée à l'enfant, évaluer l'ampleur du phénomène, relever les présentations des victimes et les caractéristiques de ces dernières ainsi que celles de leur famille et des agresseurs, nous avons mené un examen rétrospectif de 237 cas de violence physique infligés à l'enfant, évalués sur dix ans (2000-2009) dans un hôpital de soins tertiaires à Bahreïn. L'âge moyen des enfants était sept ans, et 58 % étaient de sexe masculin. Le nombre annuel de cas notifiés est passé de 11 en 2000 à 54 en 2009. Des manifestations cutanées ont été observées dans 59,0 % des cas, des fractures dans 10,5 % des cas et des blessures à la tête dans 9,7 %. Les agresseurs étaient des adultes (89 %), de sexe masculin (64 %) et étaient connus de l'enfant (98 %). La police a été contactée dans 48 % des cas. Environ 10 % des enfants ont été soustraits de l'environnement violent où ils vivaient. L'augmentation des cas notifiés de violence physique infligée à l'enfant appelle un renforcement des services de protection en la matière.

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Received: 25/08/10; accepted: 10/11/10

## Introduction

Child abuse and neglect (CAN) is a universal problem. The United Nations (UN) Secretary General's 2006 study on violence against children uncovered the magnitude of child maltreatment and the gross violation of children's rights across the globe [1]. Physical violence as defined by the United Nations study is "the intentional use of physical force against a child that either results in or has a high likelihood of resulting in harm to the child's health, survival, development or dignity" [1].

CAN is a major public health and social problem with devastating short and long-term consequences. Most children will have minor injuries but many might also have serious and life-threatening conditions and some may even die. Long-term consequences of CAN may manifest as mental diseases such as depression and psychosis or physical illnesses such as diabetes mellitus, heart disease and cancer, which can manifest 50 years after the occurrence of abuse [2].

A study in the United States of America (USA) showed that nearly 3 million children experienced CAN as defined by the Endangerment Standard Definition of maltreatment [3]. Over half of these children were physically abused (57%), more than a third (36%) were emotionally abused and around a fifth (22%) were sexually abused. An international collaborative study documented mothers' use of harsh or moderate forms of physical punishments by 4% of American women, 4% of Chileans, 21% of Filipinos, 26% of Egyptians and 36% of Indians [4]. It clearly shows that the rate of physical abuse is over 6 times greater in Egypt and 9 times greater in India than in the USA and Chile. Another study of abuse among 555 adolescent students in Beni Suef, Egypt, documented an overall abuse prevalence of 36.6% [5]. A cross-sectional study of schoolchildren in Alexandria, Egypt, revealed that more than a third were disciplined physically in the form of beating; a few were also burned or tied up [6].

In a study that provided an overview of the problem and patterns of child abuse and neglect in the 7 countries of the Arabian Peninsula, CAN was documented in Bahrain, Saudi Arabia, Kuwait, Oman and Yemen [7]. A more recent study conducted in Saudi Arabia from 2000 to 2008 reported 133 cases of CAN [8]. A retrospective study on a random sample of 1897 female university students in Jeddah reported exposure to physical and emotional child abuse by 45.1% and 50.6% of students respectively, and 2.9% reported exposure to forced contact sexual assault [9].

Further evidence comes from a survey of 117 paediatricians in Kuwait in which 50% reported having encountered at least 1 case of abuse and up to 3 cases of neglect in the preceding year [10]. Physical punishment as a means of child discipline was supported by 86% of parents in another Kuwaiti survey [11].

In Bahrain, in a study conducted from 1991 to 2001, 60 children were seen in Sulmaniya Medical Complex with the diagnosis of child physical abuse. The most common manifestations were bruises in 45% and burns in 27%; fractures were identified in 25% and head injuries in 19%; 3 cases had abdominal injuries and 4 patients died [12]. Another study in Bahrain documented the widespread use of corporal punishment of girls at schools and homes [13].

The aforementioned research findings about CAN dispel the myth that child abuse is rare in our region. Furthermore, it uncovers the limited information known about the phenomenon of CAN and the gaps in our knowledge. This study is an attempt to fill some of the gaps and to effectively address the problem. In addition, our findings may have implications for the health of the population and the health system policy in Bahrain. The results are expected to potentially contribute to decision-making related to health care, social policy and legal reforms related to child protection.

The general objective of this study was to improve the understanding of the phenomenon of child physical abuse in Bahrain. Specific objectives were to assess the magnitude of child physical abuse and to identify the presentations, family characteristics, and profiles of the abused and the offenders and identify the various forms of interventions.

## Methods

Sulmaniya Medical Complex is the main secondary and tertiary care general hospital in Bahrain with about 1000 beds, of which 135 are paediatric beds. The Child Protection Unit at the hospital is run by a multidisciplinary team providing full assessment and treatment for all cases of CAN referred to the hospital. The team includes paediatricians, child psychiatrists, social workers and nurses.

We carried out this descriptive, retrospective review of the Child Protection Unit medical records of child physical abuse cases evaluated over the 10 years from January 2000 to December 2009.

The operational definition of child physical abuse adopted in the current study was "child abuse that results in physical injuries, including fracture, burns, bruises, welts, cuts, and internal injuries. It also includes shaking, deliberate poisoning, suffocation, drowning, and "fictitious disorders by proxy" [14].

Data collection was done by the 2 investigators and involved reviewing all patients' files, recording the required data and coding it carefully. Data management and analysis was done using *SPSS*, version 17 for Windows. The coded data were entered by 2 data entry specialists. Data were checked for accuracy and errors of coding by the

data entry specialists and the authors independently. Data were inspected carefully and frequency distribution done for all variables; any odd codes or items were double checked and corrected or deleted accordingly. This process extended from July 2009 to June 2010.

The study included all children from birth to below 18 years of age who were evaluated by the Child Protection Unit for physical abuse, with or without sexual abuse. Cases with sexual abuse only were excluded because the focus of this report was child physical abuse. Cases that had signs and symptoms indicative of diseases mimicking child abuse or incidental injuries were excluded.

The key elements included were the demographic data, family, child and perpetrators characteristics, the nature of injuries to the child, and interventions. The nature of father's job was used as a general measure of socioeconomic status. Highly paid jobs were managers and professionals such as doctors, engineers and lawyers. Moderately paid jobs included teachers and supervisors. Low-paid jobs were labouring and other blue collar jobs.

In this review of medical records, the identity of the patients was kept strictly confidential. Institutional scientific and ethical clearance for this research proposal was obtained from the Health Research Committee at Sulmaniya Medical Complex. This study was not funded by any funding agency and there was no conflict of interest to be declared by the authors.

## Results

The records over a 10-year period, January 2000–December 2009, were reviewed. The total number of children was 237, 152 (64%) of them had physical abuse only and 85 (36%) were subjected to both physical and sexual abuse. Abuse was classed as certain in 204 (86%), very suspicious in 23 (10%) and suspicious in 10 (4%) of the cases. Unsubstantiated cases were not included and their details were unknown because they were not included in the child abuse register. Details of the abused children's demographics are presented in Table 1. The vast majority (88%) of the cases were in children aged 12 years or under and some 28% were preschoolers.

Over the 10 years there was a clear increase in the number of cases, in particular after 2005, from 11 cases per year in 2000 to 54 in 2009 (Table 2). Child physical abuse occurred in all areas of Bahrain; however, in order of frequency, Manama, Muharraq, Northern area and Hamad Town had higher numbers than other regions and this corresponds with the higher population density in those areas [15].

Sources of referrals are presented in Table 3. Most of the referrals came from other departments at SMC. It is noticeable that referrals from schools were very small, only 3%. This is questionable taking in consideration that almost 100% of children in the community go through the school system and spend 6-8 hours daily.

Skin manifestations were the most frequent presentation of child physical abuse (59.0%), followed by swellings

**Table 1 Sociodemographic characteristics of the 237 abused children in Bahrain, 2000–2009**

| Characteristic | No. | % |
|---|---|---|
| ***Sex*** | | |
| Male | 137 | 58 |
| Female | 100 | 42 |
| ***Nationality*** | | |
| Bahraini | 204 | 86 |
| Non-Bahraini | 33 | 14 |
| ***School and age (years)*** | | |
| Preschool < 3 | 64 | 28 |
| Kindergarten 3–< 6 | 15 | 7 |
| Primary school 6–12 | 121 | 53 |
| Intermediate 13–15 | 25 | 11 |
| Secondary 16–18 | 3 | 1 |
| Unknown | 9 | 4 |

*Mean age was 7 years (range 1 day–17 years).*

**Table 2 Prevalence of child physical abuse documented at Sulmaniya Medical Complex, Manama, Bahrain, by year**

| Year | No. | % |
|---|---|---|
| 2000 | 11 | 4.6 |
| 2001 | 19 | 8.0 |
| 2002 | 16 | 6.8 |
| 2003 | 14 | 5.9 |
| 2004 | 8 | 3.4 |
| 2005 | 11 | 4.6 |
| 2006 | 34 | 14.3 |
| 2007 | 41 | 17.3 |
| 2008 | 29 | 12.2 |
| 2009 | 54 | 22.8 |
| Total | 237 | 100.0 |

**Table 3 Sources of referral to the Child Protection Unit of Sulmaniya Medical Complex of the 237 abused children in Bahrain, 2000–2009**

| Source | No. | % |
|---|---|---|
| Other departments in Sulmaniya Medical Complex | 97 | 41 |
| Local health centre | 33 | 14 |
| Centre for child protection | 32 | 13 |
| Police | 21 | 9 |
| Public prosecutor | 4 | 2 |
| School | 7 | 3 |
| Private clinic or hospital | 3 | 1 |

**Table 4 Child physical abuse presentation in 237 abused children in Bahrain, 2000–2009**

| Presentation | No. | % |
|---|---|---|
| Bruises | 93 | 39.0 |
| Swelling | 45 | 19.0 |
| Burn | 31 | 13.0 |
| Fractures | 25 | 10.5 |
| Head injury | 23 | 9.7 |
| Cuts | 17 | 7.2 |
| Skull fracture[a] | 11 | 4.6 |
| Abdominal injury | 3 | 1.3 |

[a] *Included in head injury.*

**Table 5 Characteristics of the families of the 237 abused children in Bahrain, 2000–2009**

| Characteristic | No. | % |
|---|---|---|
| ***Socioeconomic status***[a] | | |
| Low | 124 | 53.0 |
| Middle | 71 | 31.0 |
| High | 23 | 10.0 |
| Parents divorced | 63 | 27.0 |
| ***Father's wives*** | | |
| 1 | 181 | 80.0 |
| ≥ 2 | 17 | 7.0 |
| ***Father unemployed*** | 27 | 12.0 |
| ***Alcohol abuse*** | | |
| Father | 51 | 21.0 |
| Mother | 9 | 3.8 |
| ***Drug abuse*** | | |
| Father | 21 | 8.9 |
| Mother | 6 | 2.5 |
| ***Criminal record*** | | |
| Father | 39 | 16.5 |
| Mother | 9 | 3.8 |

[a] *Some data are missing.*

(19.0%) fractures (10.5%) and head injuries (9.7%) (Table 4). Four fatal cases occurred in infants under 1 year of age who presented with apnoea, seizures and coma, with head injury as the cause of death.

Family characteristics are shown on Table 5. The rate of illiteracy among fathers and mothers were 16.0% and 11.7% respectively. The average number of children was 4 per family, with a range of 1–16.

Perpetrators came from all socioeconomic and education levels, and no specific pattern emerges (Table 6).

Fathers were the most common physical abusers (36%), followed by mothers (28%) (Table 7). Overall, 193 (98%) of the abusers were well known to the child.

Children received medical care in 196 (83%) cases and surgical treatment in 23 (10%). Additionally, 171 (72%) were referred for psychiatric assessment/treatment and 204 (86%) for social intervention. Social intervention starts with full assessment of socioeconomic status and provides support and guidance in child rearing, family counselling and the referral to various ministries for financial and housing advice, child placement and legal support.

Referral to the police and public prosecution was done in 114 (48%) and 66 (28%) of the cases respectively; 30 (13%) of these reached the court and 25 (10.5%) were removed from the abusive environment, either by removing the child from the family or by granting custody to the non-abusive parent or to a grandmother by public prosecutors or a court order.

## Discussion

This study revealed a clear increase in the number of reported child physical abuse cases over the 10 years covered in the study. A similar trend of increase in the number of reported cases of CAN

**Table 6 Characteristics of the offenders in the cases of 237 abused children in Bahrain, 2000–2009**

| Characteristic | No. | % |
|---|---|---|
| ***Nationality*** | | |
| Bahraini | 104 | 44 |
| Non-Bahraini | 36 | 15 |
| Unknown | 97 | 41 |
| ***Sex*** | | |
| Male | 139 | 64 |
| Female | 78 | 36 |
| ***Age*** | | |
| Adult | 183 | 89 |
| Adolescent | 20 | 10 |
| Other child | 3 | 1.5 |
| ***Education*** | | |
| Illiterate | 16 | 10 |
| Primary education | 64 | 41 |
| Secondary education | 43 | 27 |
| College graduate | 32 | 20 |
| Drop-out | 3 | 2 |
| Unknown | 79 | 33 |
| ***Alcohol abuse*** | 37 | 16 |
| ***Drug abuse*** | 17 | 7 |
| ***Criminal record*** | 47 | 20 |

was documented in a similar previous study in Bahrain [12]. This increase may reflect a genuine rise in the incidence of child physical abuse or it may reflect an improvement in recognition and referral of cases by professionals, which can be attributed to the upsurge in national and international interest and professional educational activities about CAN. Any such improvement in reporting may also be due to the increase in public consciousness as a result of increasing media reporting and awareness campaigns.

**Table 7 Offender's relationship to the child in the cases of 237 abused children in Bahrain, 2000–2009**

| Relationship | No. | % |
|---|---|---|
| Father | 70 | 36 |
| Mother | 54 | 28 |
| Teacher | 12 | 6 |
| Housemaid/babysitter | 11 | 6 |
| Other relative | 10 | 5 |
| Step-father | 9 | 5 |
| Step-mother | 8 | 4 |
| Sibling | 7 | 4 |
| Stranger | 4 | 2 |
| School friend | 3 | 1.5 |
| Neighbour | 2 | 1 |
| Family friend | 2 | 1 |
| School employee | 1 | 0.5 |
| Total | 193 | 100 |

*In 44 cases, the relationship was unknown or unrecorded.*

A similar trend was documented in a study done in Saudi Arabia from 2000 to 2008 in which the number of referred CAN cases increased 10-fold [8]. Internationally, the World Perspectives on Child Abuse report indicated that two-thirds of the responding professionals from 58 countries around the globe reported that the number of child abuse cases has increased in their countries [16].

Similarly, in the USA, there was an unrelenting rise in the incidence of child maltreatment. However, the 2005 national incidence study of CAN reported for the first time a reversal in this trend [3].

Males represented 58% and females 42% of the children in this study. This over-representation of males is consistent with the previous report about child physical abuse in Bahrain in which 63% were males and 37% were females [12]. However, this is a departure from international data which indicate that females were the main victims in CAN [1,3] The exact cause is unclear; some cultural factors may play a role. Further study is needed to understand this phenomenon.

Furthermore, a global perspective on corporal punishment and gender is highlighted recently by a study based on interviews conducted with 1398 mothers, 1146 fathers, and 1417 children (age range 7–10 years) in China, Colombia, Italy, Jordan, Kenya, the Philippines, Sweden, Thailand, and the United States. Across the entire sample, 54% of girls and 58% of boys had experienced mild corporal punishment, and 13% of girls and 14% of boys had experienced severe corporal punishment Overall, boys were more frequently punished physically than were girls. This is compatible with the findings in our study [17].

The main victims of child physical abuse in our study were children 6–12

years followed by children under 3 years, diminishing with increasing age. This is compatible with the observation in most international studies in which younger children are at more risk of all forms of CAN. Preschoolers, however, were fewer than primary school children in this study. This might reflect a genuine low risk of abuse or it may be because the very young are less verbal and/or less likely to be visible to professionals or adults outside the family circle. This finding means that focusing preventive measures on preschoolers and primary school children and their families would address over 80% of at-risk children.

Most of the referrals in this study came from governmental medical facilities. However, it is noticeable that referral from schools was only 3% and from private clinics and hospitals only 1%. This is atypical because schools are expected to be the main source of referral due to the intensive daily contact with almost all children, especially in Bahrain where the student enrolment rate is over 100% annually [18]. In contrast, in the USA school staff predominated as a source of recognition of maltreated children, recognizing 52% of the children who suffered harm standard maltreatment [3]. It is not clear if this study finding of low referral is due to the lack of recognition of child physical abuse by school staff and private sector medical personnel or to unwillingness to refer cases or to both factors. None-the-less, this finding clearly indicates that the vast majority of child physical abuse cases is not addressed and emphasizes the need for a mandatory reporting law.

It is well documented in studies of child physical abuse around the world that skin manifestations were the most frequent presentation. The rate of fractures in this study was 10.5% and head injury was 9.7%. This is lower than the rate documented in the previous study (25% and 19% respectively) [12]. In comparison, a retrospective study from Egypt evaluated 41 cases of child deaths from family violence and found that the highest incidence occurred in those aged 3–6 years (39.0%) [19]

The parents of 27% of the children were divorced; this is much higher than the reported rate of divorce (15%) among the general population in Bahrain [18]. Unemployment rate among the fathers of abused children was 12%, which is more than double the official unemployment rate estimate among the general population of Bahrain [18]. Low socioeconomic status is overrepresented in this study sample (53%), however, all socioeconomic classes were represented and it is probably safe to say that although lower socioeconomic class might put children at greater risk of CAN, higher socioeconomic class does not guarantee the child's safety. This highlights the multifactorial risk factors of CAN.

The rate of illiteracy among the fathers (16%) is more than double the rate of adult illiteracy among the general population in Bahrain, which is 7.5% for males over 15 years of age [15]. However, mother's illiteracy rate was 11.7%, which is actually lower than the 17% rate among the general females population over 15 years of age [15]. It is also lower than the fathers of the children in the study sample. However, the general population illiteracy rate was obtained from the last census, 2001, and most likely the rates have changed since then.

Substance abuse and criminal records were reported among the fathers and mothers of this study sample. Although no data available about the general population for comparison, these rates might underestimate the size of the problem because the study depended on the parents' report.

Most of the known physical abusers were male adults. The predominance of male perpetrators is well documented in CAN studies throughout the world, especially where patriarchal attitudes prevail [1]. In the USA, male offenders were more frequent than females (62% versus 41%) and similar to this study, the proportion of male perpetrators was even greater in the child sexual abuse category (87% males versus 11% females) [3]. Similarly, in the study from Egypt the majority of perpetrators of fatal cases were males (75.62%) [19]. Therefore, including males as a target group in preventive measures is essential in the quest to combat CAN.

We found that biological parents were responsible for 64% of child physical abuse, and overall 98% of the abusers were well known to the child and supposed to be a source of trust and security rather than intimidation and threat. Similarly, a study of female university students in Jeddah revealed that parents and siblings were the main perpetrators of both physical and emotional abuse [9] Likewise, in a USA study biological parents were responsible for 81% of the maltreatment [3].

Perpetrators in this study came from various educational backgrounds and from all socioeconomic classes, once again emphasizing that there is no specific distinguishing attribute or profile for offenders: they come from all walks of life. In this study, 10.5% of the children were removed from the abusive environment. In comparison, in the 2000 study [12] none of the abused children were removed from the family.

Overall, there has been an improvement in responding to CAN in Bahrain; this may be attributed to better communication between professionals from different sectors and disciplines and to the existence of intervention guidelines and the establishment in May 2007 of the Child Protection Centre, a multidisciplinary facility under the auspices of the Ministry of Social Development. The centre provides social, psychological and medical assessment and treatment for children. In addition, female police officers are available to interview the child in the presence of the social worker in the centre.

Despite the improvement in response to CAN in Bahrain and the availability of basic child protection services, there is still a long way to go. Our study is most likely to have revealed only the tip of the iceberg and there are many more unrecognized victims. A negligible number of cases were referred from schools; cases reaching court are limited, and the rate of indictment is low. To protect children, as a minimum, there is a need to meet the commitment to children as stipulated in the UN Convention on the Rights of the Child [20] and treat children truly as rights holders entitled to protection not less than, and ideally more than, adults.

To sum up, this study revealed a steady increase in reported cases of child physical abuse which calls for strengthening of child protection services. To reduce the number of missed cases, there is a need for mandatory reporting law. There is a need for emphases on multidisciplinary team work. Further studies based on general population surveys are needed to more accurately identify the scope of CAN, risk factors and the protective factors in the family and community.

### Study limitations

Using the father's job as a convenient indicator of socioeconomic status limits the validity of this measurement. The study addressed cases that had been reported to Child Protection Unit in a medical facility; therefore, it is most likely to underestimate the true incidence of child maltreatment. In addition, it overestimates the severity of CAN because cases were from

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# Physical, mental, emotional and social health status of adolescents and youths in Benghazi, Libya

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**الحالة الصحية البدنية والنفسية والعاطفية والاجتماعية للمراهقين والشباب في بنغازي، ليبيا**

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**الخلاصة:** تمثِّل المراهقة والشباب مرحلتَيْن من مراحل الحياة الحافلة بالفرص الكبيرة التي يمكن اقتناصُها لتخفيف الاحتياجات الصحية المستقبلية. وقد أجرى الباحثون دراسة مستعرضة لتقييم الحالة الصحية البدنية والنفسية والعاطفية والاجتماعية للمراهقين والشباب الذين يَرْتادون جامعتين كبيرتين في مدينة بنغازي في ليبيا، وللتعرف على المتغيرات التي تصاحب أوضاعهم الصحية. وقد عَمَدَ الباحثون إلى الاعتيان أخذ العينات الطَبَقي لاختيار ثلاث مئة وثلاثة وثمانين طالباً وطالبة تتراوح أعمارهم بين 17 و24 عاماً، وتمَّ جَمْعُ المعطيات من خلال مقابلات أجروها مع الطلاب وجهاً لوجه، ومن خلال استبيانات تُستكمَل ذاتياً. وتبين أن المشكلات الصحية الرئيسية تتمثَّل في الاكتئاب، والقلق، والألم، والانزعاج، وأن مَنْ يُعاني منها من الإناث هنّ أكثر من الذكور. وتبين أيضاً أن الصحة النفسية لديهم هي في مرحلة انتقالية بحسب نظرية التطور العاطفي لداموروسكي (التفكك التلقائي المتعدد المستويات). وكان لدى الإناث مستويات أعلى من التطور العاطفي. كما تبيَّن للباحثين أن النشاط البدني المنتظم قد كان يمارَس من قِبَل 34.7٪ من إجمالي الطلبة المَدْروسين (25.8٪ من الإناث)، وأن 17.2٪ من العينة هم من المدخِّنين. وقد تَمَثَّل النشاط الاجتماعي الرئيسي في زيارة أفراد العائلة.

ABSTRACT Adolescence and youth are stages of life that offer great opportunities for reduction of future health needs. A cross-sectional study was carried out to assess the physical, mental, emotional and social health status of adolescents and youths attending 2 large universities in Benghazi city, Libya, and to determine variables associated with their health status. Stratified sampling was used to select 383 students aged 17–24 years and data were collected by face-to-face interview and self-administered questionnaires. Major health problems were depression/anxiety and pain/discomfort, and these were suffered by significantly more females than males. Mental health was at the transitional stage in Dabrowski's emotional development theory (spontaneous multilevel disintegration). Females had higher levels of emotional development. Regular physical activity was practised by 34.7% overall (25.8% of women) and 17.2% were smokers. The main social activity was visiting family members.

**Santé physique, mentale, psychologique et sociale des adolescents et des jeunes à Benghazi (Libye)**

RÉSUMÉ L'adolescence et la jeunesse sont des époques de la vie qui permettent de réduire de manière importante les futurs besoins en matière de santé. Une étude transversale a été menée pour évaluer la santé physique, mentale, psychologique et sociale des adolescents et des jeunes fréquentant deux grandes universités de la ville de Benghazi (Libye) et pour déterminer les variables associées à leur état de santé. Un échantillonnage stratifié a été utilisé pour sélectionner 383 étudiants âgés de 17 à 24 ans. Des données ont été collectées lors d'une entrevue individuelle et par auto-questionnaires. Les principaux problèmes de santé étaient la dépression/l'anxiété et la douleur/l'inconfort, et ces maux affectaient davantage les filles que les garçons. Leur santé mentale se situait à un stade de transition dans la théorie du développement de Dabrowski (désintégration multiniveaux spontanée). Le développement affectif était plus avancé chez les femmes. Parmi les participants, 34,7 % au total pratiquaient une activité physique (25,8 % des filles) et 17,2 % étaient fumeurs. L'activité sociale principale consistait à rendre visite aux membres de la famille.

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Received: 28/11/10; accepted: 24/01/11

## Introduction

Adolescence and youth are stages of life that offer great opportunities for health interventions that focus on influencing healthy attitudes and behaviours [1–6]. The 42nd World Health Assembly recognized the importance of targeting youth as a critical element for the health of future generations through their health actions, choices and behaviours [4]. Attending to the causes of future morbidity aims to reduce the preventable risks due to smoking, drug use, poor diet, low physical activity and factors leading to psychiatric morbidity [1]. Major transitions, such as habit formation, patterns of behaviour and relationships that develop during adolescence affect not only young people's current functioning and opportunities but also the quality of their adult lives [5].

Efforts are being made at national and international levels to address health issues of relevance to adolescent and youth populations and attempting to pave the way for a smooth transition to adulthood through strengthening social and health services to meet adolescents' health and development needs [7]. Little is known about the health status of young people in Libya. The current study was therefore carried out with the aim of assessing the health status (physical, mental, emotional and social) of adolescents and youths in Benghazi city, Libya and to determine variables relevant to their health status.

## Methods

This cross-sectional study of a sample of students from 2 universities—Al Arab Medical and Garyounis (now a single university)—was conducted from January to February 2010.

### Sample

Assuming that age distribution of the Benghazi population was similar to that of Libya as a whole, i.e. 16.5% aged 17–24 years, the population in Benghazi in this age range was estimated to be 111 367 (total population of Benghazi was 674 951 as of 2006 census) [8]. Nearly half of population of Benghazi aged 17–24 years were students of these 2 universities. Applying the sample size calculation for a margin of error acceptable as 5% with confidence level 95%, the minimum required sample size was 383 [9]. Garyounis and Al Arab Medical Universities had a total student population of 42 688. The sample of students was stratified according to faculty and sex and was selected through random sampling interval using random number tables. Respondents were selected from the campus (outside classrooms) during working days.

### Tools

The health status of adolescents and youths in this study was assessed from the perspectives of physical and mental, emotional and social health.

#### *Physical and mental health*

After collecting general socioeconomic data, physical and mental health status was assessed by 3 subscales. The first section covered self-perceived health, diseases in the last year, hospitalizations in the last year (both clinical and psychiatric), current use of medication or undergoing treatments and medical history and a self-rating of general health (4-point scale: excellent, very good, good and poor). The second was respondents' experience of current health complaints (yes/no) and the type. The third was health status today, which was measured using a standardized tool, the health status index questionnaire [10] covering self-perceptions about 5 health indicators: mobility, self-care, usual activities, pain/discomfort and anxiety/depression), each scored on a 3-point scale. In addition, the respondents were asked to rate their health status today on a scale ranging from 0–100. The EQ-5D tool [10] was translated into Arabic language for this study.

#### *Emotional health*

Emotional health was assessed and described according to Dabrowski's emotional development scale that describes stages of integration and disintegration [11,12]. This scale has 5 levels of positive disintegration of emotions: primary integration; unilevel disintegration; spontaneous multilevel disintegration; organized multilevel disintegration; and secondary integration. This 26-item scale was divided into 2 parts: emotional functions; and emotional–cognitive functions. The total emotional score was calculated by adding scores of all the 26 items, both emotional functions and emotional cognitive functions [11]. Since the total score ranged from 26–130, it was assumed that a person scoring a maximum of 26 remained at primary integration level; between 27–52, unilevel disintegration level; between 53–78, spontaneous multilevel disintegration level; between 79–104, organized multilevel disintegration level and 105–130, secondary integration level.

#### *Social health*

Respondents' lifestyles were assessed in 4 dimensions: physical activity; eating habits; social activities; and substance use. A tool with open-ended questions was developed to collect relevant information on physical activities, food habits (primary meals, secondary meals, eating out and usual drinks), social activities and habits (smoking, alcohol and drugs).

### Data collection

Data collection was carried out privately after assuring respondents about confidentiality of the information collected. Information on health status and socioeconomic background were collected through face-to-face interviews by researchers at the student campuses of these universities. The Health Status Index and Emotional Development Scale were supplied as self-administered questionnaires. Respondents were

**Table 1** Basic characteristics of respondents

| Characteristic | Males (*n* = 154) | | Females (*n* = 229) | | Total (*n* = 383) | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| ***Age (years)*** | | | | | | |
| 17–19 | 46 | 29.9 | 71 | 31.0 | 117 | 30.5 |
| 20–24 | 108 | 70.1 | 158 | 69.0 | 266 | 69.5 |
| ***Year of study*** | | | | | | |
| 1–2 | 105 | 68.2 | 159 | 69.4 | 264 | 68.9 |
| 3+ | 49 | 31.8 | 69 | 30.1 | 118 | 30.8 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |
| ***Father's education*** | | | | | | |
| Primary | 10 | 6.5 | 11 | 4.8 | 21 | 5.5 |
| Middle | 17 | 11.0 | 36 | 15.7 | 53 | 13.8 |
| Intermediate | 39 | 25.3 | 54 | 23.6 | 93 | 24.3 |
| University | 88 | 57.1 | 128 | 55.9 | 216 | 56.4 |
| ***Mother's education*** | | | | | | |
| Primary | 29 | 18.8 | 35 | 15.3 | 64 | 16.7 |
| Middle | 25 | 16.2 | 43 | 18.8 | 68 | 17.8 |
| Intermediate | 55 | 35.7 | 68 | 29.7 | 123 | 32.1 |
| University | 45 | 29.2 | 82 | 35.8 | 127 | 33.2 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |
| ***Father's occupation*** | | | | | | |
| Teacher in school | 9 | 5.8 | 11 | 4.8 | 20 | 5.2 |
| University teacher | 4 | 2.6 | 1 | 0.4 | 5 | 1.3 |
| Engineer | 12 | 7.8 | 15 | 6.6 | 27 | 7.0 |
| Physician | 5 | 3.2 | 8 | 3.5 | 13 | 3.4 |
| Police | 8 | 5.2 | 16 | 7.0 | 24 | 6.3 |
| Clerical and lower grades | 52 | 33.8 | 80 | 34.9 | 132 | 34.5 |
| Lawyer | 2 | 1.3 | 2 | 0.9 | 4 | 1.0 |
| Business | 35 | 22.7 | 60 | 26.2 | 95 | 24.8 |
| Other work | 3 | 1.9 | 6 | 2.6 | 9 | 2.3 |
| Retired | 18 | 11.7 | 25 | 10.9 | 43 | 11.2 |
| Unemployed | 5 | 3.2 | 3 | 1.3 | 8 | 2.1 |
| No answer | 1 | 0.6 | 2 | 0.8 | 3 | 0.8 |
| ***Mother's occupation*** | | | | | | |
| Teacher school | 34 | 22.1 | 48 | 21.0 | 82 | 21.4 |
| University teacher | 1 | 0.6 | 0 | – | 1 | 0.3 |
| Doctor | 1 | 0.6 | 4 | 1.7 | 5 | 1.3 |
| Other government job | 4 | 2.6 | 3 | 1.3 | 7 | 1.8 |
| Lawyer | 2 | 1.3 | 3 | 1.3 | 5 | 1.3 |
| Other work | 1 | 0.6 | 3 | 1.3 | 4 | 1.0 |
| Retired | – | | 1 | 0.4 | 1 | 0.3 |
| Housewife | 110 | 71.4 | 165 | 72.1 | 275 | 71.8 |
| No answer | 1 | 0.6 | 2 | 0.9 | 3 | 0.8 |
| ***No. of earning members at home*** | | | | | | |
| ≤ 2 | 94 | 61.0 | 160 | 69.9 | 254 | 66.3 |
| 3–6 | 54 | 35.1 | 64 | 27.9 | 118 | 30.8 |
| 7+ | 6 | 3.9 | 5 | 2.2 | 11 | 2.9 |

Table 1 **Basic characteristics of respondents (*concluded*)**

| Characteristic | Males (*n* = 154) | | Females (*n* = 229) | | Total (*n* = 383) | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| ***Residential area*** | | | | | | |
| Urban area | 22 | 14.3 | 55 | 24.0 | 77 | 20.1 |
| Suburban area | 106 | 68.8 | 148 | 64.6 | 254 | 66.3 |
| Outside Benghazi | 26 | 16.9 | 25 | 10.9 | 51 | 13.3 |
| ***Type of residence*** | | | | | | |
| Modern villa | 61 | 39.6 | 84 | 36.7 | 145 | 37.9 |
| Apartment | 26 | 16.9 | 55 | 24.0 | 81 | 21.1 |
| Traditional house | 67 | 43.5 | 89 | 38.9 | 156 | 40.7 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |
| ***Type of family*** | | | | | | |
| Nuclear | 92 | 59.7 | 160 | 69.9 | 252 | 65.8 |
| Joint | 62 | 40.3 | 69 | 30.1 | 131 | 34.2 |

selected by random skipping, using the right hand rule.

### Data processing and analysis

Survey monitoring and data quality assurance process had progressed through scrutinizing, field editing and centralized editing. Analyses were carried out through frequencies and cross-tabulations and mean and standard deviation (SD). The chi-squared and Student *t*-tests (independent sample) were used to analyse the significance of differences.

## Results

### Sample profile

The total sample was 383 students: 154 (40.2%) males and 229 (59.8%) females. Adolescents (17–19 years) were 30.5% of the total. A majority of the sample (68.9%) were in the earlier years of university education (years 1–2) (Table 1).

Parental educational status showed that more than half of the fathers were educated up to university level (56.4%) compared with only 33.2% of mothers. Fathers of male students were more educated than fathers of female students (57.1% versus 55.9%). Proportionately a majority of fathers were in government jobs (clerical grade or lower). The major occupation of mothers was teaching in schools.

More of the students resided in suburban areas (66.3%) than urban areas (20.1%) or nearby towns (13.3%). A majority had 3–6 brothers (53.0%) and ≤ 2 sisters (48.0%). Types of residence were villa (37.9%), apartment (21.1%) or house (40.7%). The number of the wage-earning members at home was ≤ 2 for 66.3% of the sample. A nuclear family (one or two generations) was the most common (65.8%) type of family.

### Physical and mental health status

Most students self-rated their general health as excellent (43.9%) or very good (39.4%); fewer rated it as only good (13.8%) or poor (2.3%) (Table 2). More males rated their health as excellent than did females (47.4% versus 41.5%), while fewer females rated their health as poor than did males (1.3% versus 3.9%). However, these sex differences were not statistically significant, even when comparing the combined categories excellent/very good versus good/poor.

Age was significantly associated with self-rated health (categorized as excellent/very good versus good/poor); 92.3% of those aged 17–19 years had excellent/very good health versus 79.9% of those aged 20–24 years ($\chi^2$ = 9.12, $P$ = 0.003).

Of the total sample 17.8% reported having current health complaints, and there was no significant difference between males and females (18.2% versus 17.5%). Among the problems, the most common were digestive problems (19.1%), flu (13.2%) and noncommunicable diseases, e.g. high or low blood pressure and diabetes (13.2%). The major problems among females were digestive problems (22.5%) and influenza (17.5%), while among males it was accidents (21.4%).

There was a significant difference between the sexes in terms of the timing of their last complaint, comparing episodes in the previous 1 month versus more than 1 month and for those who had had an episode of illness in the previous year (Table 2). More females had health problems in the previous month compared with males ($\chi^2$ = 7.6, $P$ = 0.006).

In the assessment of health status today the most commonly reported concern among the 5 domains was anxiety or depression (described as extreme by 12.5% of respondents); this rate was much higher among females (17.0%) than males (5.8%) ($\chi^2$ = 19.3, $P$ < 0.001) (Table 3). Even though few

**Table 2 Health status of students in Benghazi**

| Characteristic | Males (*n* = 154) | | Females *n* = 229) | | Total (*n* = 383) | | $\chi^2$-value | *P*-value |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | |
| ***Self-rating of health*** | | | | | | | | |
| Excellent | 73 | 47.4 | 95 | 41.5 | 168 | 43.9 | 2.087 | 0.149[b] |
| Very good | 50 | 32.5 | 101 | 44.1 | 151 | 39.4 | | |
| Good | 24 | 15.6 | 29 | 12.7 | 53 | 13.8 | | |
| Poor | 6 | 3.9 | 3 | 1.3 | 9 | 2.3 | | |
| No answer | 1 | 0.6 | 1 | 0.4 | 2 | 0.5 | | |
| ***Health complaints at present*** | | | | | | | | |
| Yes | 28 | 18.2 | 40 | 17.5 | 68 | 17.8 | 0.04 | 0.842 |
| No | 124 | 80.5 | 187 | 81.7 | 311 | 81.2 | | |
| No answer | 2 | 1.2 | 2 | 0.9 | 4 | 1.1 | | |
| Total | 154 | 100.0 | 229 | 100.0 | 383 | 100.0 | | |
| ***Diseases at present[a]*** | | | | | | | | |
| Digestive problem | 4 | 14.3 | 9 | 22.5 | 13 | 19.1 | 2.60 | 0.107[c] |
| Influenza | 2 | 7.1 | 7 | 17.5 | 9 | 13.2 | | |
| NCD | 3 | 10.7 | 6 | 15.0 | 9 | 13.2 | | |
| Migraine | 4 | 14.3 | 4 | 10.0 | 8 | 11.8 | | |
| Sensory complaint | 4 | 14.3 | 4 | 10.0 | 8 | 11.8 | | |
| Accident | 6 | 21.4 | 1 | 2.5 | 7 | 10.3 | | |
| Epilepsy | 1 | 3.6 | 2 | 5.0 | 3 | 4.4 | | |
| Depression | 0 | 0.0 | 2 | 5.0 | 2 | 2.9 | | |
| Respiratory problem | 1 | 3.6 | 1 | 2.5 | 2 | 2.9 | | |
| Other | 1 | 3.6 | 0 | 0.0 | 1 | 1.5 | | |
| No answer | 2 | 7.1 | 4 | 10.0 | 6 | 8.9 | | |
| Total | 28 | 100.0 | 40 | 100.0 | 68 | 100.0 | | |
| ***Time of last complaint*** | | | | | | | | |
| Previous month | 36 | 34.6 | 81 | 51.9 | 117 | 45.0 | 7.6 | 0.006 |
| Other | 68 | 65.4 | 75 | 48.1 | 143 | 55.0 | | |
| Total | 104 | 100.0 | 156 | 100.0 | 260 | 100.0 | | |

*[a]Percentages were calculated out of total diseases reported. [b]Excellent/very good vs good/poor; [c]Digestive problem/influenza vs all others.*
*NCD = noncommunicable disease, e.g. blood pressure, diabetes.*

students reported having extreme pain or discomfort, a large proportion reported moderate pain/discomfort (47.3%) and this was significantly higher among females (53.7%) than males (37.7%) ($\chi^2 = 9.59$, $P = 0.008$).

The total mean score for perceived health status today was 72.8 (SD 19.6) (Table 4). Males had significantly better health status than females (75.3 versus 71.2) ($t = 2.0$, $P = 0.042$). Younger students (aged 17–19 years) had better health status than those aged 20–24 years (75.3 versus 71.8), but the difference was not significant. Health status varied across the faculties. Students in the education faculty scored significantly lower than those in the faculties of pharmacy ($t = 2.8$, $P = 0.009$), engineering ($t = 2.1$, $P = 0.043$), economics ($t = 2.3$, $P = 0.023$), arts ($t = 2.0$, $P = 0.052$) and law ($t = 2.4$, $P = 0.022$). Paternal education positively affected health status; with an increase in educational level there was an increase in health status ($t = -2.4$, $P = 0.017$) (Table 4). Mothers' education did not show any significant effect. Similarly, children of professionally employed parents (doctors, engineers, schoolteachers, police etc.), both fathers and mothers, had better health status. Those who resided in the city were found to have a lower health status (70.0) than those in suburban areas (73.1) or outside the city (75.6), although this difference was not significant. Family type did not affect health status score.

## Emotional health status

A majority of the sample were in the advanced levels of Dabrowski's theory of emotional functioning (i.e. organized multilevel disintegration), especially the domains of excitation, suggestibility, joy, crying and enthusiasm (more than 30% of students fell

**Table 3** Self-perceived health status today of students in Benghazi

| Characteristic | Males (*n* = 154) | | Females (*n* = 229) | | Total (*n* = 383) | | $\chi^2$-value | *P*-value |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | |
| ***Mobility*** | | | | | | | | |
| No problems | 124 | 80.5 | 171 | 74.7 | 295 | 77.0 | | |
| Some problems | 20 | 13.0 | 29 | 12.7 | 49 | 12.8 | 3.86 | 0.145 |
| Confined to bed | 10 | 6.5 | 29 | 12.7 | 39 | 10.2 | | |
| ***Self-care*** | | | | | | | | |
| No problems | 143 | 92.9 | 216 | 94.3 | 359 | 93.7 | | |
| Some problems | 9 | 5.8 | 13 | 5.7 | 22 | 5.7 | 3.00 | 0.223 |
| Incapable | 2 | 1.3 | 0 | 0.0 | 2 | 0.5 | | |
| ***Usual activities*** | | | | | | | | |
| No problems | 100 | 64.9 | 145 | 63.3 | 245 | 64.0 | | |
| Some problems | 47 | 30.5 | 70 | 30.6 | 117 | 30.5 | 0.45 | 0.798 |
| Unable | 7 | 4.5 | 14 | 6.1 | 21 | 5.5 | | |
| ***Pain or discomfort*** | | | | | | | | |
| None | 88 | 57.1 | 96 | 41.9 | 184 | 48.0 | | |
| Moderate | 58 | 37.7 | 123 | 53.7 | 181 | 47.3 | 9.59 | 0.008 |
| Extreme | 8 | 5.2 | 10 | 4.4 | 18 | 4.7 | | |
| ***Anxiety or depression*** | | | | | | | | |
| None | 75 | 48.7 | 68 | 29.7 | 143 | 37.3 | | |
| Moderate | 70 | 45.5 | 122 | 53.3 | 192 | 50.1 | 19.3 | < 0.001 |
| Extreme | 9 | 5.8 | 39 | 17.0 | 48 | 12.5 | | |

into these domains) and secondary integration, especially the domain of unpleasure (43.3%) (Table 5). Fewer students were in the lower levels of emotional state (i.e. primary integration and unilevel disintegration), although at primary integration level 35.5% were in the domain of suicide and at the unilevel disintegration level 47.8% and 38.4% fell into the domains of attitude to death and affective memory respectively. More than 30% of students were in a moderate or confused state of emotion (i.e. spontaneous multilevel disintegration), in the domains of sadness, solitude and suicide.

In emotional–cognitive functioning (Table 5), the primary integration, unilevel disintegration and spontaneous multilevel disintegration levels predominated. More than 30% of the sample were in the domains of morality and criticism at the primary integration level whereas more than 30% were in the domains of religious attitude and uncertainty in the unilevel disintegration level. More than 30% of students were in the reality and success domains at the spontaneous multilevel disintegration level.

The mean total score was 77.8 (SD 7.3) on emotional status, suggesting that the sample in general remained at the spontaneous multilevel disintegration level (scores between 53 and 78), reflecting a period of transition from lower to higher levels (Table 6). There was no significant difference in mean scores by sex or age. However, there were differences in mean scores among faculties; e.g. medicine students scored higher than law students ($t$ = 1.9, $P$ = 0.057), economics students scored higher than dental ($t$ = 1.8, $P$ = 0.080), IT ($t$ = 1.8, $P$ = 0.079) and law students ($t$ = 2.7, $P$ = 0.009); arts students scored higher than law students ($t$ = 1.8; $P$ = 0.082); education students scored higher than law students ($t$ = 1.84, $P$ = 0.070). Parental education had no significant effect on emotional development except for those with middle level educated fathers and university educated fathers ($t$ = –1.87; $P$ = 0.063). Students living in the city area had lower scores than those in suburban areas ($t$ = 1.75; $P$ = 0.082).

## Social health status

### *Physical activities*

Physical activity was reported by only 34.7% of the sample, significantly more among males (48.1%) than females (25.8%) ($\chi^2$ = 19.9, $P$ < 0.001) (Table 7). Physical activities included playing football or any other games (47.3%), regular walking or jogging (36.8%), weight lifting (7.5%), swimming (6.7%), kung fu or karate (5.2%), horse riding (4.5%) and dancing (3.0%).

### *Eating habits*

A majority of the sample ate the typical Libyan meal pattern of 3 main meals per day (59.0%) rather than only 2 per day (25.3%); a few students consumed 4 or more meals (Table 7). A 3-meal system was more prevalent among males, whereas a 2-meal system was

**Table 4 Mean scores on self-perceived health status today index of students in Benghazi (*n* = 383)**

| Characteristic | No. | Mean score (SD) |
|---|---|---|
| ***Sex*** | | |
| Male | 154 | 75.3 (18.1) |
| Female | 229 | 71.2 (20.4) |
| ***Age (years)*** | | |
| 17–19 | 117 | 75.3 (17.7) |
| 20–24 | 266 | 71.8 (20.3) |
| ***Year of study*** | | |
| 1–2 | 264 | 73.5 (19.6) |
| 3+ | 118 | 71.4 (19.7) |
| No answer | 1 | 70.0 (19.6) |
| ***Faculty*** | | |
| Medicine | 40 | 72.0 (18.8) |
| Dentistry | 16 | 75.5 (15.3) |
| Pharmacy | 15 | 82.3 (13.3) |
| Public health | 10 | 77.0 (14.9) |
| Nursing | 3 | 43.3 (45.0) |
| Engineering | 41 | 74.6 (18.1) |
| Science | 63 | 70.6 (21.1) |
| Economics | 88 | 74.5 (18.6) |
| Arts | 59 | 72.7 (16.8) |
| Education | 18 | 62.7 (24.4) |
| Law | 22 | 78.4 (16.7) |
| IT | 8 | 58.7 (34.8) |
| ***Father's education*** | | |
| Primary | 21 | 69.7 (20.8) |
| Middle | 53 | 71.7 (17.4) |
| Intermediate | 93 | 69.1 (21.5) |
| University | 216 | 75.0 (18.9) |
| ***Mother's education*** | | |
| Primary | 64 | 70.0 (23.2) |
| Middle | 68 | 72.2 (20.0) |
| Intermediate | 123 | 73.5 (18.4) |
| University | 127 | 73.8 (18.7) |
| No answer | 1 | 80.0 (–) |
| ***Father's occupation*** | | |
| Teacher in school | 20 | 74.5 (19.5) |
| University teacher | 5 | 70.0 (23.4) |
| Engineer | 27 | 76.4 (18.1) |
| Physician | 13 | 80.7 (11.1) |
| Police | 24 | 77.2 (13.9) |
| Other government job | 132 | 69.7 (21.1) |
| Lawyer | 4 | 62.5 (22.1) |
| Business | 95 | 74.3 (20.1) |
| Other work | 9 | 71.1 (16.1) |
| Retired | 43 | 71.7 (20.3) |
| Unemployed | 8 | 78.7 (13.5) |
| No answer | 3 | 76.0 (7.0) |
| ***Mother's occupation*** | | |
| School teacher | 82 | 74.8 (17.8) |
| University teacher | 1 | 50.0 (–) |
| Doctor | 5 | 81.0 (11.4) |
| Other government job | 7 | 65.7 (13.9) |
| Lawyer | 5 | 86.0 (11.4) |
| Other work | 4 | 65.0 (17.3) |
| Retired | 1 | 50.0 (–) |
| Unemployed | 275 | 72.4 (20.3) |
| No answer | 3 | 65.0 (7.0) |
| ***Place of residence*** | | |
| City area | 77 | 70.0 (19.4) |
| Suburban area | 254 | 73.1 (19.7) |
| Outside Benghazi | 51 | 75.6 (19.0) |
| No answer | 1 | 70.0 (–) |
| Total | 383 | 72.8 (19.6) |
| ***Type of family*** | | |
| Nuclear | 252 | 72.5 (20.5) |
| Joint | 131 | 73.4 (17.9) |
| ***Total*** | 383 | 72.8 (19.6) |

*SD = standard deviation.*

more prevalent among females. Eating out in restaurants was a common practice among the sample (63.2%). Fresh juice was the preferred drink, followed by soft drinks and coffee.

### *Social activities*

Visiting relatives was the main social activity among 77.8% of students, more commonly among females (81.2%) than males (72.7%) (Table 7). Of the males 11.7% had no social activities and 11.0% reported just wandering around as their main activity.

### *Substance use*

More than one-third of the males in the sample reported that they smoked (36.4%) compared with 4.4% of the females. A few students admitted to alcohol (5.0%) and narcotic drug use (4.2%).

## Discussion

The current study explored the physical, social and mental health status of a sample of students aged 17–24 years which was drawn from 2 universities located in the city of Benghazi. Attempts were made to link some of the independent variables with health status variables.

**Table 5** Emotional health of students in Benghazi according to levels of Dabrowski's theory of emotional functioning ($n$ = 383)

| Indicator | Primary integration | | Unilevel disintegration | | Spontaneous multilevel disintegration | | Organized multilevel disintegration | | Secondary integration | | No answer | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| ***Emotional functions*** | | | | | | | | | | | | |
| Excitation | 64 | 16.7 | 54 | 14.1 | 39 | 10.2 | 127 | 33.2 | 99 | 25.8 | 1 | 0.3 |
| Suggestibility | 94 | 4.5 | 58 | 15.1 | 57 | 14.9 | 138 | 36.0 | 36 | 9.4 | 1 | 0.3 |
| Unpleasure | 31 | 8.1 | 45 | 11.7 | 49 | 12.8 | 91 | 23.8 | 166 | 43.3 | 2 | 0.5 |
| Joy | 49 | 12.8 | 55 | 14.4 | 84 | 21.9 | 123 | 32.1 | 71 | 18.5 | 2 | 0.5 |
| Sadness | 34 | 8.9 | 93 | 24.3 | 192 | 50.1 | 37 | 9.7 | 25 | 6.5 | 1 | 0.3 |
| Crying | 57 | 14.9 | 28 | 7.3 | 57 | 14.9 | 152 | 39.7 | 87 | 22.7 | 1 | 0.3 |
| Anger | 77 | 20.1 | 97 | 25.3 | 14 | 3.7 | 104 | 27.2 | 90 | 23.5 | 1 | 0.3 |
| Fear/anxious | 81 | 21.1 | 30 | 7.8 | 105 | 27.4 | 109 | 28.5 | 58 | 15.1 | 1 | 0.3 |
| Enthusiasm | 98 | 25.6 | 40 | 10.4 | 45 | 11.7 | 164 | 42.8 | 36 | 9.4 | 1 | 0.3 |
| Affective memory | 73 | 19.1 | 147 | 38.4 | 48 | 12.5 | 47 | 12.3 | 68 | 17.8 | 1 | 0.3 |
| Frustration | 86 | 22.5 | 96 | 25.1 | 55 | 14.4 | 62 | 16.2 | 84 | 21.9 | 1 | 0.3 |
| Emotional ties | 70 | 18.3 | 82 | 21.4 | 43 | 11.2 | 98 | 25.6 | 89 | 23.2 | 1 | 0.3 |
| Solitude | 80 | 20.9 | 18 | 4.7 | 126 | 32.9 | 113 | 29.5 | 46 | 12.0 | 0 | – |
| Attitude to death | 38 | 9.9 | 183 | 47.8 | 30 | 7.8 | 95 | 24.8 | 36 | 9.4 | 1 | 0.3 |
| Suicide | 136 | 35.5 | 56 | 14.6 | 133 | 34.7 | 4 | 1.0 | 53 | 13.8 | 0 | – |
| ***Emotional cognitive functions*** | | | | | | | | | | | | |
| Reality | 75 | 19.6 | 66 | 17.2 | 131 | 34.2 | 59 | 15.4 | 52 | 13.6 | 0 | – |
| Success | 45 | 11.7 | 78 | 20.4 | 136 | 35.5 | 52 | 13.6 | 72 | 18.8 | 0 | – |
| Justice | 36 | 9.4 | 114 | 29.8 | 100 | 26.1 | 30 | 7.8 | 103 | 26.9 | 0 | – |
| Immorality | 119 | 31.1 | 42 | 11.0 | 64 | 16.7 | 75 | 19.6 | 82 | 21.4 | 0 | – |
| Religious attitude | 107 | 27.9 | 130 | 33.9 | 28 | 7.3 | 58 | 15.1 | 59 | 15.4 | 0 | – |
| Aesthetic attitude | 91 | 23.8 | 50 | 13.1 | 60 | 15.7 | 57 | 14.9 | 124 | 32.4 | 0 | – |
| Cognition | 47 | 12.3 | 72 | 18.8 | 87 | 22.7 | 88 | 23.0 | 89 | 23.2 | 0 | – |
| Intuition | 107 | 27.9 | 96 | 25.1 | 59 | 15.4 | 71 | 18.5 | 49 | 12.8 | 0 | – |
| Criticism | 150 | 39.2 | 59 | 15.4 | 36 | 9.4 | 84 | 21.9 | 54 | 14.1 | 0 | – |
| Uncertainty | 45 | 11.7 | 143 | 37.3 | 58 | 15.1 | 80 | 20.9 | 57 | 14.9 | 0 | – |
| Awareness | 78 | 20.4 | 68 | 17.8 | 67 | 17.5 | 132 | 34.5 | 37 | 9.0 | 0 | – |

**Table 6 Means score on emotional development index of students in Benghazi (*n* = 383)**

| Variable | No. | Mean score (SD) |
|---|---|---|
| ***Sex*** | | |
| Male | 154 | 77.7 (7.2) |
| Female | 229 | 77. 8 (7.3) |
| ***Age (years)*** | | |
| 17–19 | 117 | 77.3 (7.3) |
| 20–24 | 266 | 78.0 (7.3) |
| ***Year of study*** | | |
| 1–2 | 264 | 77.7 (7.4) |
| 3+ | 118 | 77.9 (7.0) |
| No answer | 1 | 78.0 (–) |
| ***Faculty*** | | |
| Medicine | 40 | 78.1 (5.9) |
| Dentistry | 16 | 75.8 (7.5) |
| Pharmacy | 15 | 76.2 (7.2) |
| Public health | 10 | 77.5 (8.0) |
| Nursing | 3 | 77.0 (14.4) |
| Engineering | 41 | 78.1 (8.2) |
| Science | 63 | 77.5 (7.7) |
| Economics | 88 | 79.1 (6.8) |
| Arts | 59 | 77.7 (6.5) |
| Education | 18 | 79.3 (7.8) |
| Law | 22 | 74.6 (8.2) |
| IT | 8 | 74.6 (7.6) |
| ***Place of residence*** | | |
| City area | 77 | 76.4 (7.5) |
| Suburban area | 254 | 78.1 (7.2) |
| Outside Benghazi | 51 | 77.9 (7.1) |
| No answer | 1 | 92.0 (–) |
| ***Father's occupation*** | | |
| School teacher | 20 | 79.4 (8.2) |
| University teacher | 5 | 76.8 (8.0) |
| Engineer | 27 | 78.0 (5.8) |
| Physician | 13 | 72.5 (3.9) |
| Police | 95 | 79.0 (7.5) |
| Other government job | 24 | 78.7 (8.1) |
| Lawyer | 132 | 77.6 (7.6) |
| Business | 43 | 75.8 (6.3) |
| Other work | 8 | 73.9 (7.4) |
| Retired | 4 | 77.2 (6.7) |
| Unemployed | 9 | 79.2 (4.7) |
| No answer | 3 | 84.0 (1.4) |
| ***Mother's occupation*** | | |
| School teacher | 82 | 77.6 (7.3) |
| University teacher | 1 | 73.0 (–) |
| Physician | 5 | 72.0 (7.3) |
| Other government job | 7 | 79.4 (6.5) |
| Lawyer | 1 | 77.0 (–) |
| Other work | 275 | 77.8 (7.3) |
| Retired | 5 | 78.8 (8.6) |
| Unemployed | 4 | 80.0 (8.4) |
| No answer | 3 | 80.5 (7.8) |
| ***Type of family*** | | |
| Nuclear | 252 | 77.3 (7.3) |
| Joint | 131 | 78.6 (7.2) |
| ***Total*** | 383 | 77.8 (7.3) |

*SD = standard deviation.*

## Profile of sample

Proportionate sampling meant that there were more females than males in the sample. This was not only proportional to the existing sex composition at these universities but also of medical universities in nearby Arab countries [13,14]. Parental profile showed that a large majority were from the upper middle class group with highly educated fathers and mothers in addition to higher parental occupational levels. The higher socioeconomic status of university level students has been demonstrated elsewhere in the Eastern Mediterranean region [13,14]. More students resided in suburban areas, which might be because of the emergence of new residential areas as a result of increasing urbanization in Benghazi [8]. They were mostly from moderate family backgrounds in terms of family size, type of housing and type of family and this agrees with the profile of students of other countries [6,7,13].

## General health status

Health as a "state of complete physical, mental and social well being and not merely the absence of disease or infirmity" [15] was examined in this study from 3 dimensions. Physically and mentally, this group had moderately high rating of their own health. Self-rating of health and self-reports of present complaints/diseases did not vary significantly by sex or by age. Similarities in health complaints between males and females and between adolescents and youths have been shown before [1,16]. Although the types of illnesses did not vary between the sexes the frequency of illness episodes, however, had an association with sex. Among females, a higher proportion had health problems in the previous month compared with males. Sex differences in physical functioning among adolescents have been shown before [17].

Variables developed to assess health status today brought similar results for males and females in terms of mobility,

**Table 7** Lifestyle variables of students in Benghazi

| Variable | Males (*n* = 154) | | Females (*n* = 229) | | Total (*n* = 383) | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| ***Physical activity*** | | | | | | |
| Yes | 74 | 48.1 | 59 | 25.8 | 133 | 34.7 |
| No | 80 | 51.9 | 169 | 73.8 | 249 | 65.0 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |
| ***No. of primary meals/day*** | | | | | | |
| 1 | 4 | 2.6 | 12 | 5.2 | 16 | 4.2 |
| 2 | 33 | 21.4 | 64 | 27.9 | 97 | 25.3 |
| 3 | 100 | 64.9 | 126 | 55.0 | 226 | 59.0 |
| 4+ | 17 | 11.0 | 27 | 11.7 | 44 | 11.5 |
| ***Meals from restaurants/day*** | | | | | | |
| 0 | 57 | 37.0 | 84 | 36.7 | 141 | 36.8 |
| 1 | 77 | 50.0 | 122 | 53.3 | 199 | 52.0 |
| 2 | 18 | 11.7 | 17 | 7.4 | 35 | 9.1 |
| 3+ | 2 | 1.3 | 6 | 2.6 | 8 | 2.0 |
| ***Usual drinks*** | | | | | | |
| Coffee | 45 | 29.2 | 56 | 24.5 | 101 | 26.4 |
| Tea | 14 | 9.1 | 13 | 5.7 | 27 | 7.0 |
| Soft drinks | 45 | 29.2 | 58 | 25.3 | 103 | 26.9 |
| Fresh juice | 50 | 32.5 | 100 | 43.7 | 150 | 39.2 |
| No answer | 0 | – | 2 | 0.9 | 2 | 0.5 |
| ***Usual social activities*** | | | | | | |
| None | 18 | 11.7 | 4 | 1.7 | 22 | 5.7 |
| Wandering around | 17 | 11.0 | 17 | 7.4 | 34 | 8.9 |
| Charity work | 0 | – | 3 | 1.3 | 3 | 0.8 |
| Visiting relatives | 112 | 72.7 | 186 | 81.2 | 298 | 77.8 |
| No answer | 7 | 4.5 | 19 | 8.3 | 26 | 6.8 |
| ***Smoking*** | | | | | | |
| Yes | 56 | 36.4 | 10 | 4.4 | 66 | 17.2 |
| No | 98 | 63.6 | 219 | 95.6 | 317 | 82.8 |
| ***Alcohol use*** | | | | | | |
| Yes | 18 | 11.7 | 1 | 0.4 | 19 | 5.0 |
| No | 136 | 88.3 | 227 | 99.1 | 363 | 94.8 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |
| ***Narcotic drug use***[a] | | | | | | |
| Yes | 2 | 7.8 | 4 | 1.7 | 16 | 4.2 |
| No | 142 | 92.2 | 224 | 97.8 | 366 | 95.6 |
| No answer | 0 | – | 1 | 0.4 | 1 | 0.3 |

[a] *Includes chewing drugs (marijuana, khat, hashish) and injecting drugs.*

self-care and usual activities, with a large majority having no inabilities or problems. In the areas of pain/discomfort and anxiety/depression, however, there was a significant difference between the sexes, with females reporting these more frequently. This imbalance against females is an area for further investigation and intervention [16,18,19]. At higher ages there was higher self-reported disability on both the variables of mobility and pain/discomfort. Age differentials in perceived health have been shown previously [10] and studies have found depression among school children [18].

The mean scores for health status today also revealed that the population as a whole had good perceived health

and that males had better self-perceived health than females. While age or university or year of study did not show much variation there were differences in perceived health score across faculty. It might be assumed that the faculty to which students belong represents social class differences. Parental education influenced the students' perceived health. Children of fathers of intermediate and university level had significantly better perceived health status but mothers' education did not produce any significant difference. These findings contradict the popular notion that maternal education is more important in family health [10,16,20]. There were no differentials in perceived health levels between rural and urban residence or nuclear versus joint family, again contradicting other findings [10,16].

Emotional health, as measured according to Dabrowski's emotional development theory, showed that the students were going through a transitional stage from the primary to secondary levels. A majority of the group were going through the transitional stage of spontaneous multilevel disintegration in terms of both emotional functions and emotional–cognitive functions. Both males and females followed similar patterns of emotional development, which was in agreement with other research hypotheses [10,11]. Neither sex nor age group made a significant difference to overall emotional levels. Faculty of study was a distinguishing variable in terms of emotional health, perhaps because faculties represent varying levels of socioeconomic status. This draws attention to the need to consider adolescents' and youth's issues separately by considering their heterogeneity [20,21], offering space for achievement of emotional independence, attaining economic independence, coming in terms with sexuality and achievement of ego identity [22]. Parental education had no significant effect on emotional development, except for students with middle level educated fathers and university educated fathers. Students living in the city area differed significantly from those from suburban areas.

Social health, explored through a number of variables such as physical activities, eating habits, social engagements and substance abuse, revealed inactivity by a large proportion of students, over-eating by some, no social engagements by a few and substance use by very few. More females than males were physically inactive. Libyan society has close family ties and for more than three-fifths of students family visits were the major social activity. One-fifth of males had no social activities and or reported "wandering around" as an activity. Cigarettes are widely available and smoking is socially acceptable in Libyan society, especially for males. There was an early age at onset of smoking habit. Alcohol is not socially sanctioned and only 5.0% of students (all except 1 were males) reported drinking and slightly fewer were narcotic drug users.

There were some limitations of the current study. It was carried out in only 2 universities in Benghazi, which limits the results to a certain social strata. The study used tools that were developed in other cultural contexts, which is also a limitation.

## Conclusions

The study highlights some concerns about physical health status in terms of mobility, self-care, inability to conduct usual activities and mental health in terms of depression and anxiety, especially among women. Emotional health was at a transitional stage. Lifestyle variables showed that smoking and low levels of physical activity, especially among women, need to be addressed. Education programmes are needed for young people at university level in Libya on balanced nutrition and lifestyle modifications. Counselling programmes may be useful to equip students with better life coping skills to deal with stressful situations.

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## Correction

**E. Alkhasawneh, L. Ismayilova, H. Olimat and N. El-Bassel. Social and behavioural HIV/AIDS research in Jordan: a systematic review. *Eastern Mediterranean Health Journal*, 2012, 18(5):487–494.** The name of the author H. Olimat in Arabic should read: عليمات وليس غليمات.

# Health-care-seeking behaviour among university students in Lebanon

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**سلوك اِلْتِماس الرعاية الصحية بين طلبة الجامعة في لبنان**

هلا القاعي، غريس أبي رزق، سني حليس، سليم أديب

**الخلاصة:** هَدَفَتْ هذه الدراسة المستعرضة إلى تقييم سلوك اِلْتِماس الرعاية الصحية، والعقبات أمام الحصول على الرعاية، والعوامل المرتبطة بذلك في عينة من الطلبة اللبنانيين قِوامُها 543 طالباً من طلبة جامعة القديس يوسف. وجمع الباحثون المعطيات حول سلوك اِلْتِماس الرعاية الصحية لعدد من المشاكل الصحية في الأشهر الاثنَيْ عشر السابقة باستخدام استبيان لا يُدرج فيه اسم المشارك. وتم تصنيف سلوك اِلْتِماس الرعاية الصحية إلى الفئات التالية: طلب الرعاية الرسمية (اِلْتِماس المساعدة المهنية)؛ اِلْتِماس الرعاية غير الرسمية (طلب المساعدة من الأصدقاء أو الأسرة)؛ اِلْتِماس الرعاية غير الرسمية عن طريق شخصي (المساعدة الذاتية). أما المشاكل الصحية التي تم استكشافها فهي: المشاكل البدنية، والنفسية، والاجتماعية، والعلائقية، والجنسية، والمخدرات، والكحول، والتدخين. ولوحظ أنه عند مواجهة مشكلة ذات صلة بالصحة، يميل الطلبة إلى اِلْتِماس الرعاية الصحية غير الرسمية. أما سلوك اِلْتِماس الرعاية الصحية الرسمية للمشاكل النفسية فضئيل (3.3٪)، وكذا المشاكل الاجتماعية ومشاكل العلاقات (1.8٪)، والمشاكل المتعلقة بتعاطي مواد الإدمان (5.1٪). ويمكن تقسيم العقبات أمام اِلْتِماس الرعاية الصحية الرسمية إلى مجموعتين: الإتاحة والعلاقات. فمن أجل تشجيع الشباب على الوصول إلى الرعاية الصحية الرسمية، يجب تقديم الخدمات الصحية النوعية لهم مع التأكيد لهم على ضمان السرية وتفهُّم حالاتهم.

ABSTRACT This cross-sectional study assessed the health-care-seeking behaviour, barriers to accessing care and associated factors among a sample of 543 Lebanese students at Saint-Joseph University. Data were collected on health-care-seeking behaviour for health issues in the previous 12 months using an anonymous questionnaire. Health-care-seeking behaviour was categorized as: formal (professional help sought); informal relational (help sought from friends/family); informal personal (self-help). The health issues examined were: physical, psychological, social and relational, sexual, drug, alcohol and smoking. When facing health-related issues, the students tended to seek informal health care. Formal health-care-seeking behaviour was almost non-existent for psychological issues (3.3%), relational and social issues (1.8%), and issues related to substance use (5.1%). The barriers to seeking formal health care fell into 2 categories: accessibility and relational. To encourage young people to access formal health care, specific health services should be provided for them where they are assured of confidentiality and understanding.

**Comportement en matière de recherche de soins des étudiants d'une université au Liban**

RÉSUMÉ La présente étude transversale a évalué le comportement de recherche de soins de santé d'un échantillon de 543 étudiants libanais inscrits à l'Université Saint-Joseph, les obstacles à l'accès aux soins et les facteurs associés en la matière. Les données ont été recueillies sur le comportement de recherche de soins pour des problèmes de santé dans les 12 mois précédents au moyen d'un questionnaire anonyme. Les comportements de recherche de soins ont été catégorisés comme suit : formel (recherche d'une aide professionnelle) ; relationnel informel (recherche d'une aide auprès d'amis/de la famille) ; personnel informel (recherche individuelle). Les problèmes de santé étudiés étaient d'ordre physique, psychologique, social/relationnel, sexuel, toxicologique, alcoolique et tabagique. Face à des problèmes de santé, les étudiants avaient tendance à rechercher des soins de santé informels. Le comportement de recherche de soins formel était presqu'inexistant pour les problèmes d'ordre psychologique (3,3 %), relationnel et social (1,8 %), ainsi que pour les questions liées à l'usage de substances psychoactives (5,1 %). Deux types d'obstacles à une recherche de soins de santé formelle sont apparus : l'accessibilité et les relations. Pour encourager les jeunes à accéder aux soins de santé formels, des services de santé dédiés devraient leur être offerts. afin qu'ils soient assurés du caractère confidentiel de la consultation et de la compréhension des professionnels.

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Received: 20/09/10; accepted: 31/03/11

## Introduction

The "youth" constitutes a population subgroup with lower rates of mortality, morbidity and medical use. Nevertheless, they tend to have significant health concerns that are often hidden and/or under-diagnosed, and these may relate to risky behaviours such as drug and alcohol abuse, unsafe sexual behaviours, smoking, and mental health issues such as depression and suicidal thoughts and attempts [1–4].

Young people tend to find it difficult to ask for help especially when it comes to health issues; the major barriers to accessing health services include concerns about confidentiality, embarrassment in disclosing health issues [5–8], absence of medical insurance or limited financial accessibility [5,7–10], low knowledge of existing services and lack of trust in health professionals [7,8]. Thus, whenever young people face health concerns, they often seek health care informally; in other words, they do not refer to health professionals or to formal health services first. Instead, they are more likely to seek help from people close to them: parents, friends or others they trust [6,7,11]. Furthermore, the need for autonomy that defines youth generates self-help practices based on Internet browsing [12] or self-medication [13]. Health-care-seeking behaviour among young people is also partially affected by their socioeconomic status and the cost of health services [11], urban or rural origins [9,10,14,15] as well as gender, young women are more likely to seek help from health providers than young men. [5,7,9,10,14–17].

In Lebanon, studies have also shown that Lebanese youth may also participate in risky behaviour, such as drug and alcohol use [18], and have suicidal thoughts [19]. Despite this, health interventions targeting young adults are not a priority for health policies in Lebanon [20], hence services specifically provided for young adults and their needs are very rare and may be limited to university-based health services. As in other countries, young people in Lebanon tend to engage in informal health-care-seeking behaviour rather than resort to formal health structures [21]. Young people aged between 10 and 20 years have the lowest use of ambulatory care and of routine consultations [22].

This study attempts to explain the health-care-seeking behaviour among adolescents entering university and the barriers to formal care-seeking. This in turn may suggest ways to improve the outreach to young people and increase their use of formal health services.

## Methods

### Design and target population

A cross-sectional survey targeted students of Saint-Joseph University (USJ) undergoing their mandatory preventive medical visit at the University Center of Family and Community Health (UCFCH). UCFCH organizes yearly preventive health visits intended for all first-year students from the Beirut, Tripoli, Saida and Zahle campuses. These visits take place during the first and second semester of each academic year.

Our sample comprised all the students aged 17 to 21 years undergoing their preventive medical visit in UCFCH during the second semester of the academic year 2007–2008 (between 1 January 2008 and 31 May 2008).

### Survey questionnaire

A questionnaire partially based on similar studies found in the medical literature [7–9,11,12], was pilot-tested with about 50 students and modified accordingly. Questionnaires were anonymous and designed to be self-completed in approximately 10 minutes. They were given by hand to the students by the nurses of the Center before the preventive medical visit. The students completed them on the spot and returned them to the nurses. The purpose of the study was explained in the introduction to the questionnaire and nurses were available for further clarification.

### Definition of variables

Two dependent variables were measured: health-care-seeking behaviour and barriers to formal care

*Health-care-seeking behaviour* was defined as: formal, when professional help was sought from health care services and/or health care providers (physicians, psychologists); informal relational, when help was sought from members of the student's social network (parents, friends, teachers, trusted persons); informal personal, when young people resorted to self-medication or browsed the Internet or read self-help books.

The type of health-care-seeking behaviour recorded for each student was that most frequently reported when faced by various categories of health issues in the previous 12 months. These health issues were divided into 5 categories and listed in the questionnaire as follows:

- Physical issues, acute or chronic, such as headaches, stomach aches, cough, acne, obesity, diabetes, asthma
- Psychological issues, such as anxiety, stress, low mood, depression
- Social and relational issues, such as conflicts with parents, difficulties making friends, difficulties in studies
- Sexual issues, such as sexually transmitted diseases, contraception
- Drug, alcohol and smoking issues.

When a participant indicated both formal and informal behaviour equally regarding any one category of problem, he/she was classified as engaging in formal behaviour. A category of "no care-seeking behaviour" was subsequently created for those who reported health problems yet declared not taking any remediation steps.

*Barriers to formal care* was assessed according to 8 possible barriers to using

formal care, measured on 3-point Likert scales. Later, principal component analysis of those 8 items found 2 categories of barriers: accessibility and relational barriers.

The independent variables considered in this analysis were:

- Age, categorized as 17–18 or 19–21 years
- Sex
- Household crowding index (HCI), defined as the total number of residents per household divided by the total number of rooms, excluding the kitchen and bathrooms. HCI is a correlate of socioeconomic status as demonstrated by the study of Melki et al. [23]. It is a continuous variable that decreases as we move from low to high socioeconomic status.
- Father's and mother's levels of education, categorized as lower than university or university and above
- Place of residence as reported by the student, categorized as rural, urban or suburban (in between urban and rural, e.g. small towns).

### Ethical considerations

The objectives and procedures of the study were submitted to the Ethical Committee of Saint-Joseph University. It was made clear that the study would be anonymous, that the consent of the students would be sought to participate, and that non-participation would not be penalized. Ethical approval was subsequently granted.

### Statistical analysis

Categorical variables were tabulated as frequencies and percentages and continuous variables as means, medians and standard deviation (SD). The associations between dependent and independent variables were tested using: chi-squared test, *t*-test and ANOVA. Independent variables with significant bivariate association with the dependent variables were subsequently entered in a multivariate logistic regression analysis to determine their joint effects on the outcomes and the odds ratio (OR ) and 95% confidence intervals (95% CI) were determined. Differences were considered statistically significant for $P \leq 0.05$. Data were analysed using *SPSS*, version 13.0 for Windows and *STATA* 7.

## Results

### Sociodemographic characteristics

Table 1 shows the sociodemographic characteristics of the students. In total 543 students were invited to participate, 22 (4%) of whom declined to take part. Of the 521 students who completed a questionnaire, 315 (60%) were women and 206 (40%) men. The mean age was 18.5 (SD 0.8) years. The majority of the participants were either urban or suburban residents, only 12.1% were rural residents. The parents' level of education was relatively high: 60% of fathers and 52% of mothers had university degree or above. The socioeconomic status of the students as measured by the HCI, was predominantly middle class, as indicated by a mean index of 1 person/room.

### Health status

Table 2 shows the reported health status of the students. Only 57 students (10.9%) said they had had no health problem in the 12 months prior to the survey, significantly more in men than women ($P < 0.001$). The health problems most frequently mentioned in the previous 12 months were physical issues (71.6%), psychological issues (57.2%). Significantly more women reported physical and psychological issues than men ($P < 0.004$), while more men reported drug, alcohol and smoking issues ($P < 0.001$).

### Health-care-seeking behaviour

For the students who reported having faced physical issues, 61.9% sought

**Table 1 Sociodemographic characteristics of surveyed university students**

| Variable | No. (%) (*n* = 521) |
|---|---|
| ***Sex*** | |
| Male | 206 (39.5) |
| Female | 315 (60.5) |
| ***Age (years)*** | |
| 17–18 | 280 (53.8) |
| 19–21 | 241 (46.2) |
| Mean (SD); Median (range) (years) | 18.6 (0.8); 20 (17–21) |
| ***Father's education*** | |
| Less than university | 208 (40.0) |
| University and higher | 312 (60.0) |
| ***Mother's education*** | |
| Less than university | 249 (47.9) |
| University and higher | 271 (52.1) |
| ***Region of residence*** | |
| Urban | 255 (48.9) |
| Suburban | 203 (39.0) |
| Rural (small town or village) | 63 (12.1) |
| ***Crowding index (number of persons/room)*** | |
| Mean (SD); Median (range) | 1.0 (0.4), 0.9 (0.2–2.5) |

*SD = standard deviation.*

**Table 2 Frequency of health issues in the last 12 months reported by the university students according to sex**

| Health issue | Females (*n* = 315) No. (%) | Males (*n* = 206) No. (%) | Total (*n* = 521) No. (%) | *P*-value |
|---|---|---|---|---|
| Physical | 244 (77.5) | 129 (62.6) | 373 (71.6) | < 0.001 |
| Psychological | 196 (62.2) | 102 (49.5) | 298 (57.2) | 0.004 |
| Social & relational | 60 (19.0) | 49 (23.8) | 109 (20.9) | 0.194 |
| Sexual | 60 (19.0) | 29 (14.1) | 89 (17.1) | 0.141 |
| Drugs, alcohol & smoking | 21 (6.7) | 38 (18.4) | 59 (11.3) | < 0.001 |
| Other issues | 6 (1.9) | 6 (2.9) | 12 (2.3) | 0.454 |
| No issues | 22 (7.0) | 35 (17.0) | 57 (10.9) | < 0.001 |

informal help from a family member or friend (informal relational health-care-seeking behaviour), while only 35.7% sought formal health care from a physician or a health facility. As regards psychological issues, and in spite of the high prevalence (57.2%), only 3.3% consulted a health provider or a health facility, while 21.1% did not seek any help with these issues; the majority of the students (76%) sought informal help from a family member or friend, mostly friends.

These results were similar in relation to social and relational issues: only 1.8% sought formal health care, 32.1% sought no health care and 64.2% informally talked to a relation or friend, again mostly friends (Table 3). With regard to drug, alcohol and smoking issues, here again seeking formal health care was very rare (5.1%), the absence of health-care-seeking behaviour was relatively high (22.0%) and informal relational behaviour was predominant (68%), mostly friends. As for sexual health related issues, while 57.3% showed informal relational health-care-seeking behaviour, informal personal behaviour was relatively more frequent than elsewhere (15.7%), mostly self-research, as was formal recourse to health providers or health facilities (32.6%).

Table 4 shows the health-care-seeking behaviour related to physical issues and sexual health issues according to the sociodemographic characteristics of the students. With regard to sexual health issues, more women showed formal behaviour than men ($P < 0.01$) and more students from suburban areas than those from urban areas ($P = 0.05$). These results remained unaltered in the multivariate linear regression model: OR 0.087, 95% CI: 0.018–0.422 for sex and OR 3.408, 95% CI: 1.211–9.595 for residence.

For other health issues (psychological, social and relational, problems related to drugs, alcohol and smoking), most students exhibited informal health-care-seeking behaviour, and comparisons by the independent variables was therefore uninformative.

## Barriers to accessing formal health-care-seeking behaviour

Table 5 shows the barriers to accessing formal health-care-seeking behaviour reported by the university students according to importance. For the 8 barriers to seeking formal health care enquired about in the questionnaire, all but one (other barriers) were considered a barrier by a large majority of the students. However, most regarded them as low importance. Table 6 shows the results of the principal component analysis of barriers to formal health-care-seeking behaviour. Of the 8 possible barriers, principal component analysis found 2 wide categories:

**Table 3 Health-care-seeking behaviour in the last 12 months by type of health issue**

| Health issue | Informal | | Formal[c] | None | Total[d] |
|---|---|---|---|---|---|
| | Relational[a] | Personal[b] | | | |
| | No. (%) | No. (%) | No. (%) | No. (%) | No. |
| Physical | 231 (61.9) | 37 (9.9) | 133 (35.7) | 41 (11.0) | 373 |
| Psychological | 226 (75.9) | 18 (6.0) | 10 (3.3) | 63 (21.1) | 298 |
| Social & relational | 70 (64.2) | 6 (5.5) | 2 (1.8) | 35 (32.1) | 109 |
| Sexual | 51 (57.3) | 14 (15.7) | 29 (32.6) | 10 (11.2) | 89 |
| Drugs, alcohol & smoking | 40 (67.8) | 5 (8.4) | 3 (5.1) | 13 (22.0) | 59 |

[a] *Includes recourse to parents and/or friends and/or another person of trust.*
[b] *Includes recourse to self-medication and/or self-research.*
[c] *Includes recourse to professional health care providers and/or health facilities.*
[d] *More than one care-seeking behaviour was possible for each group of health issues.*

**Table 4 Sociodemographic variables associated with health-care-seeking behaviour with regard to physical health issues and sexual health issues of the surveyed university students (*n* = 521)**

| Variable | Physical health issues | | | | Sexual health issues | | | |
|---|---|---|---|---|---|---|---|---|
| | Informal behaviour[a] | Formal behaviour[b] | Total | *P*-value | Informal behaviour[a] | Formal behaviour[b] | Total | *P*-value |
| | No. (%) | No. (%) | No. | | No. (%) | No. (%) | No. | |
| ***Total*** | 201 (60.2) | 133 (39.8) | 334 | | 52 (64.2) | 29 (35.8) | 81 | – |
| ***Sex*** | | | | 0.3 | | | | |
| Male | 73 (64.4) | 41 (35.6) | 114 | | 22 (91.7) | 2 (8.3) | 24 | < 0.01 |
| Female | 128 (58.2) | 92 (41.8) | 220 | | 30 (52.6) | 27 (47.4) | 57 | |
| ***Age (years)*** | | | | 0.99 | | | | 0.52 |
| 17–18 | 109 (60.2) | 72 (39.8) | 181 | | 23 (60.5) | 15 (39.5) | 38 | |
| 19–21 | 92 (60.1) | 61 (39.9) | 153 | | 29 (67.4) | 14 (32.6) | 43 | |
| ***Father's education*** | | | | 0.36 | | | | 0.18 |
| Less than university | 81 (63.3) | 47 (36.7) | 128 | | 19 (55.9) | 15 (44.1) | 34 | |
| University and higher | 120 (58.3) | 86 (41.7) | 206 | | 33 (70.2) | 14 (29.8) | 47 | |
| ***Mother's education*** | | | | 0.22 | | | | 0.27 |
| Less than university | 100 (63.7) | 57 (36.3) | 157 | | 22 (57.9) | 16 (42.1) | 38 | |
| University and higher | 101 (57.1) | 76 (42.9) | 177 | | 30 (69.8) | 13 (30.2) | 43 | |
| ***Residence*** | | | | 0.44 | | | | 0.05 |
| Urban | 99 (59.6) | 67 (40.4) | 166 | | 31 (75.6) | 10 (24.4) | 41 | |
| Suburban | 84 (63.2) | 49 (36.8) | 133 | | 19 (55.9) | 15 (44.1) | 34 | |
| Rural | 18 (51.4) | 17 (48.6) | 35 | | 2 (33.3) | 4 (66.7) | 6 | |
| | **Mean (SD)** | **Mean (SD)** | | | **Mean (SD)** | **Mean (SD)** | | |
| ***Crowding index*** | 1.0 (0.4) | 0.9 (0.4) | 1.0 | 0.28 | 0.9 (0.3) | 0.9 (0.4) | 0.9 | 0.51 |

[a]*Informal health-care-seeking behaviour: informal relational health-care-seeking behaviour and/or informal personal health-care-seeking behaviour.*
[b]*When a participant indicated both formal and informal behaviour equally for any one category of problem, the behaviour was classified as formal.*
*SD = standard deviation.*

**Table 5 Barriers to accessing formal health-care-seeking behaviour in the last 12 months by surveyed university students**

| Barrier | Importance of the barrier | | | Total |
|---|---|---|---|---|
| | Low | Medium | High | |
| | No. (%) | No. (%) | No. (%) | No. |
| Knowledge of services | 275 (60.3) | 108 (23.7) | 73 (16.0) | 456 |
| Inadequate transportation means | 304 (69.4) | 98 (22.4) | 36 (8.2) | 438 |
| Concerns about confidentiality towards parents | 269 (63.6) | 99 (23.4) | 55 (13.0) | 450 |
| Difficulties of contact | 291 (69.1) | 89 (21.1) | 41 (9.7) | 421 |
| Cost | 252 (57.7) | 101 (23.1) | 84 (19.2) | 437 |
| Embarrassment in disclosing health concerns | 223 (51.6) | 106 (24.5) | 103 (23.8) | 432 |
| General concerns about confidentiality | 270 (62.4) | 80 (18.5) | 83 (19.2) | 433 |
| Doubt on the ability of professionals to help | 227 (55.1) | 104 (25.2) | 81 (19.7) | 412 |
| Others barriers | 16 (66.7) | 7 (29.2) | 1 (4.2) | 24 |

- Relational barriers: these were general concerns about confidentiality, concerns about confidentiality towards the parents, embarrassment in disclosing health concerns, and doubt about the ability of professionals to help. These barriers explained 29% of the variability with an Eigen-value of 2.30.
- Accessibility barriers: these were lack of knowledge of services, inadequate means of transportation, difficulties in making contact and cost. These barriers explained 23% of the variability with an Eigen-value of 1.86.

The potential effects of the independent variables on these 2 categories of barriers were analysed. Table 7 shows the sociodemographic characteristics of the students associated with the relational and accessibility barriers to formal health-care-seeking behaviour. Accessibility obstacles were not affected by any of the independent variables in the study. On the other hand, perceived relational barriers increased significantly with age ($P < 0.009$) and with urban residence ($P < 0.017$). These results remained unaltered in the multivariate linear regression model of sociodemographic variables associated with relational barriers to formal health-care-seeking behaviour: coefficient for age = 0.270 ($P = 0.013$) and coefficient for residence = –0.343 ($P = 0.007$).

## Discussion

Although adolescents are past the care of paediatricians, they have several types of health needs and concerns that cannot be fully met within the adult-oriented care system. While the 17–21-year-old students interviewed were in good health as would be expected, 71.6% had had some physical concerns in the past year, over a half reported psychological concerns and nearly a quarter had relational concerns. As for sexual

**Table 6 Principal component analysis of barriers to formal health-care-seeking behaviour**

| Barrier | Loading of each barrier on both factors | |
|---|---|---|
| | Factor 1 | Factor 2 |
| Knowledge of services | 0.056 | 0.596 |
| Inadequate means of transportation | 0.059 | 0.770 |
| Concerns about confidentiality towards parents | 0.635 | 0.337 |
| Difficulties of contact | 0.358 | 0.468 |
| Cost | 0.412 | 0.648 |
| Embarrassment in disclosing health concerns | 0.746 | 0.263 |
| General concerns about confidentiality | 0.732 | 0.282 |
| Doubt about the ability of professionals to help | 0.710 | –0.112 |
| | Factor 1: relational barriers[a] | Factor 2: accessibility barriers[b] |
| Eigen value | 2.304 | 1.863 |
| Variance (%) | 28.796 | 23.284 |

[a] *General concerns about confidentiality, concerns about confidentiality towards the parents, embarrassment in disclosing health concerns, and doubt about the ability of professionals to help.*
[b] *Knowledge of services, inadequate transport, difficulty of contact and cost.*

**Table 7 Sociodemographic characteristics of the students associated with relational and accessibility barriers to formal health-care-seeking behaviour**

| Variable | Relational barriers[a] | | | Accessibility barriers[b] | | |
|---|---|---|---|---|---|---|
| | Mean (SD) | Linear regression coefficient | *P*-value | Mean (SD) | Linear regression coefficient | *P*-value |
| ***Sex*** | | | 0.476 | | | 0.827 |
| Male | 6.2 (2.1) | | | 5.8 (1.7) | | |
| Female | 6.4 (2.0) | | | 5.8 (1.6) | | |
| ***Age (years)*** | | 0.115 | 0.009 | | 0.020 | 0.651 |
| ***Father's levels of education*** | | | 0.264 | | | 0.999 |
| Less than university | 6.2 (2.0) | | | 5.8 (1.7) | | |
| University and higher | 6.4 (2.0) | | | 5.8 (1.6) | | |
| ***Mother's levels of education*** | | | 0.559 | | | 0.999 |
| Less than university | 6.4 (1.9) | | | 5.8 (1.7) | | |
| University and higher | 6.3 (2.0) | | | 5.8 (1.6) | | |
| ***Residence*** | | | 0.017 | | | 0.075 |
| Urban | 6.5 (2.1) | | | 5.9 (1.6) | | |
| Suburban[c] | 6.2 (2.0) | | | 5.4 (1.2) | | |
| Rural | 5.8 (1.6) | | | 5.8 (1.8) | | |
| ***Crowding index (mean persons/room)*** | | −0.006 | 0.886 | | 0.083 | 0.060 |

[a] *General concerns about confidentiality, concerns about confidentiality towards the parents, embarrassment in disclosing health concerns, and doubt on the ability of professionals to help.*
[b] *Knowledge of services, inadequate transport, difficulty of contact and cost.*
[c] *Small town or village.*
*SD = standard deviation.*

and addictive substances concerns, which are traditionally associated with adolescence, they were less frequently reported. A similar low frequency of sexual and addictive substances concerns was found in a study conducted among Chinese school students [17]. This is lower than reported in North American and western European countries [1,3] and may in part be explained by the different cultural construct in Lebanon, or in China, with regard to such sensitive issues. Topics relating to sexuality and addictive substances are considered taboo in Lebanon and are thus less openly discussed. Additionally, adolescents may ignore or underestimate the health risks associated with such substances, especially tobacco and alcohol, and with risky sexual practices. Therefore they do not consider them real health threats but rather normal behaviour and hence they do not require any intervention.

Faced with different sorts of health concerns, the young people surveyed tended to avoid seeking help from formal health-care providers and turned instead primarily to their peers and other sources of informal help. This was also shown in other studies conducted elsewhere, although the populations studied were younger [6,7,11]. Our participants particularly showed informal health-care-seeking behaviour when it came to psychological, relational and addictive substances issues. Furthermore, they were more likely to forego care for these categories of problems, a tendency that has also been found elsewhere [5].

While informal health-care-seeking behaviour was also predominant among our students for physical and sexual health issues, they were more likely to have recourse to a formal and professional source for these issues. The health-care-seeking behaviour resemblance between these 2 issues may indicate that, in the minds of these Lebanese adolescents, the organic/reproductive dimensions of sexuality prevail over the relational/emotional ones. On another level, regarding sexual health issues, young people were more likely to resort to informal personal health-care-seeking behaviour than for the other issues, meaning that they looked for information by Internet browsing or by reading books and magazines.

It is also worth noting that when young people sought informal relational help, the choice of the person approached depended on the nature of the health concern. Young people went to their parents when the problems were of a bodily nature, physical and sexual problems, which may ultimately require formal medical care. They were more likely to go to friends for emotional or behavioural problems. These observations are similar to results found elsewhere. In Chili, for example, with physical problems, 1 out of 3 teenagers asked their parents for help, 1 out of 10 asked a health professional

and very few asked friends for help. For personal problems, 1 teenager in 3 asked for friends' help and less than 1 in 100 asked for a doctor's help [24]. In Switzerland, recourse to family was first in terms of physical problems and to friends for psychological problems [25]. In France, teenagers preferred to talk to their mothers when it came to general health problems, while they preferred to talk to their friends for emotional or relational problems [11].

Gender differences were noted in our study and these should be taken into consideration when dealing with the youth in Lebanon. Female students had more physical and psychological issues, while male students reported more issues related to addictive substances. In previous studies conducted in the United States [5,9,10,14,16], Australia [7,15] and China [17], girls expressed a greater willingness than boys to access a service. In our study, however, gender differences were only evident for sexual health issues, with females showing more formal behaviour than males. This could be explained by the fact that young women, naturally preoccupied by reproductive health issues such as contraception and menstruation, tend to seek professional help more frequently than men, for whom these issues tend to be of lower importance. Furthermore, a culture of self-reliance related to males may make them reluctant to seek formal care.

While in general, youth in rural communities tend to forego formal care more frequently than in urban settings [9,10,14,15], the only rural–urban differences we found also concerned sexual health issues: young people from a rural or semi-rural residence reported more formal health-care-seeking behaviour than those from an urban residence. This might be because the students from rural areas consider their parents and friends poorly informed about sexual issues and hence unqualified to help them. It might also reflect the relational closeness in rural social networks so that a young person is reluctant to share "embarrassing" information with friends or relatives, fearing its rapid disclosure to the entire network. Professional health practitioners are thus perceived as non-judgemental and more discreet sources to turn to for advice and help.

The common barriers to care reported by our students are similar to those reported elsewhere [5,7–10], suggesting that these are universal and transcend geographical differences. The majority cited both accessibility and relational barriers. The survey did not elicit whether these concerns were based on previous unsatisfactory experiences or whether they were just unfounded beliefs. At any rate, this finding indicates the need to reassure young adults coming in contact with formal care and to provide more intimacy and certainty of confidentiality than usually provided to adult patients.

Although many studies have shown that adolescents from rural areas have more difficulty in accessing health care [9,10,14,15], we did not find any rural–urban differences concerning accessibility. As for relational barriers, such as concerns about confidentiality and embarrassment, they tended to increase with age and within urban areas. It may be that with age or when from an urban area, young people become more reserved about their relations, want more intimacy and confidentiality, and have higher expectations from health providers.

Informal care-seeking behaviour is a reality that health professionals concerned with youth health cannot ignore. Health professionals should be aware of these trends and reach out to adolescents. First, they should provide young people with specific services, which are multidisciplinary, adapted to their needs/expectations and affordable, and ensure that they know about them by, for example, using the Internet as a means to reach out to them. Second, health professionals need to work on establishing a solid partnership of trust with adolescents and make them feel more comfortable with disclosing intimate concerns and assured of confidentiality. Third, care does not always have to be given by formal health-care providers; informal providers are also a good means to deliver proper care to youth. Nevertheless, informal care is not always appropriate and health professionals need to support and educate parents, peers and other support networks so that they can have a better impact on youth health. More research, including qualitative studies, should be encouraged to further understand the contextual triggers that may push young people to consult (or not) their physician or psychologist. These may be more amenable to modification than unalterable factors such as gender or area of residence.

## Acknowledgements

This study was funded by the Saint Joseph University Research Council.

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# Suicide in the Islamic Republic of Iran: an integrated analysis from 1981 to 2007

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**الانتحار في جمهورية إيران الإسلامية: تحليل تَكَامُلي من عام 1981 حتى 2007**

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**الخلاصة:** على الرغم من أن معدّل الانتحار منخفض في البلدان الإسلامية، فإن ثَـمَّةَ بيِّنات على أنه آخذ في الازدياد. وقد أُجري تحليل تَكَامُلي لمعطيات محاولات الانتحار (المميتة وغير المميتة) من الدراسات التي تمَّت في جمهورية إيران الإسلامية من عام 1981 حتى 2007. ومن بين أربع وخمسين دراسة منشورة تتعلق بالانتحار، كانت ثمان وأربعون دراسة منها مؤهَّلةً لمعايير الإدراج في الدراسة (التي غَطَّتْ 26 768 محاولة للانتحار). وكان المتوسط الـمُوَزَّن لمعدّل محاولات الانتحار هو 26.5 بكل مئة ألف، ووسطي معدّل الوفيات بالانتحار 6.7 بكل مئة ألف. ومتوسط عمر الذين حاولوا الانتحار 25 سنة؛ وكان منهم في المتوسط 41.8٪ من الذكور، و50.5٪ عازبين، وكان 70.0٪ من سُكّان المدن. ولم تنجح غالبية محاولات الانتحار: وقد أَقْدَمَ عليها في المتوسط 54.2٪ من ربَّات البيوت المتزوجات، و25.5٪ من الطلبة، و21.0٪ من الرجال العاطلين عن العمل. وأظهرت السوابق الطبية أن 16.2٪ من الذين حاولوا الانتحار كان لديهم سوابق عجز، وأن 42.0٪ منهم كان لديهم سوابق إصابة بالاضطرابات النفسية. وقد قورنت هذه المعدّلات مع دراسات على مجموعات من الأمم ومن الأديان الأخرى.

ABSTRACT Although the rate of suicide is low in Muslim countries, there is evidence that it is increasing. An integrated analysis was made of data on suicide attempts (nonfatal and fatal) from studies carried out in the Islamic Republic of Iran from 1981 to 2007. Of 54 published studies concerning suicide, 48 (covering 26 768 cases of attempted suicide) satisfied the inclusion criteria. The weighted mean rate of suicide attempts was 26.5 per 100 000 and the average rate of death by suicide was 6.7 per 100 000. The mean age of suicide attempters was 25 years; on average 41.8% were male, 50.5% single and 70.0% from urban areas. Most suicide attempters were not working: 54.2% on average were housewives, 24.5% students and 21.0% unemployed men. Medical history showed that 16.2% of suicide attempters had a history of disability and 42.0% had a history of psychological disorders. The rates were compared with studies from other nations/religious groups.

**Suicides en République islamique d'Iran : une analyse intégrée de 1981 à 2007**

RÉSUMÉ Même si le taux de suicide est faible dans les pays musulmans, des données indiquent que celui-ci est en hausse. Une analyse intégrée a été menée sur des données de tentatives de suicide (mortelles ou non) extraites d'études menées en République islamique d'Iran entre 1981 et 2007. Sur 54 études publiées sur le sujet, 48 d'entre elles, couvrant 26 768 cas de tentatives de suicide, correspondaient aux critères d'inclusion. Le taux moyen pondéré de tentatives de suicide était de 26,5 pour 100 000 et le taux moyen de décès par suicide était de 6,7 pour 100 000. L'âge moyen des personnes ayant fait une tentative de suicide était de 25 ans ; 41,8 % de ces personnes en moyenne étaient de sexe masculin ; 50,5 % étaient célibataires et 70,0 % vivaient en milieu urbain. La majorité d'entre elles ne travaillaient pas : parmi elles, 54,2 % en moyenne étaient des femmes au foyer, 24,5 % des étudiants et 21,0 % des hommes sans emploi. Les dossiers médicaux ont permis de révéler que 16,2 % des personnes ayant tenté de se suicider avaient des antécédents d'incapacité et 42,0 % des antécédents de troubles psychologiques. Les taux ont été comparés aux résultats d'études d'autres pays ou de différents groupes religieux.

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Received: 23/03/10; accepted: 11/10/10

## Introduction

Suicide is a growing problem worldwide [1,2]. According to World Health Organization estimates, approximately 850 000 suicides leading to death occurred throughout the world in the year 2000 [3]. It has been estimated than in 2020 about 1 530 000 people will attempt suicide [3,4]. Although the rate of suicide is low in most Muslim countries [3,5], there is evidence that it is increasing [6].

Suicide and attempted suicide have been occurring throughout human history and studies of suicide epidemiology have an important role in assessing the psychological health of a society [7]. According to a report by the American Psychiatric Society suicide is the second most common cause of death among students, the third cause of death of young people between the ages 15–24 years and the sixth cause of death of children below 15 years of age. Among these younger age groups of the population, suicide is the second cause of death after accidents [8–10]. Methods of attempting suicide vary across different countries, perhaps reflecting different lifestyles, cultures and religions [1]. The objective of this study was to integrate and analyse the data on suicide attempts from all studies carried out in the Islamic Republic of Iran from 1981 to 2007.

## Methods

An integrated-analysis method was used. This technique combines information from various studies so that the number of people investigated increases and thus the power of the analysis and the precision of estimates will increase [11].

All published studies in English or Farsi languages concerning suicide attempts (nonfatal and fatal) in the Islamic Republic of Iran from 1981 to 2007 were considered. The main Internet search engines and resources used to find studies were: SID (the Iranian Scientific Information Database), IranMedex (index of articles published in Iranian biomedical journals), MagIran (the Scientific Magazines Bank of Iran), PubMed (database of United States National Library of Medicine) and databases of the World Health Organization Regional Office for the Eastern Mediterranean Region. The scientific research journals of the Iranian medical universities of were also searched. The research keywords used were suicide, self-burning, self-beating and poisoning.

The criterion for selection for this analysis was that the study had sufficient reliability in data collection methods and sources and methods of analysis. The scientific reliability of the articles was assessed by a third person who had good knowledge of the subject but was blind to the names of the authors and the journal. Out of 54 available studies, 48 were selected, which included data on 26 768 cases of attempted suicide [12–59].

The data presented in these studies were extracted, recorded in a table which was prepared for this purpose and analysed using *SPSS*, version 17, and *Excel*, version 2003, software. The summary indices were calculated as weighted average of indices in each study based on the number of suicide attempt cases in each study using the fixed effects model.

## Results

### Aggregated rates of suicide and suicide attempt

As Table 1 shows, for the 7 studies in which data were available, the weighted mean rate of suicide attempts was 26.5 per 100 000 population and the average rate of death by suicide was 6.7 per 100 000.

### Demographic characteristics

The demographic characteristics of the people attempting suicide are given in Table 2. Data on age, sex and marital status were available in 30 out of the 48 studies. The aggregated mean age (standard deviation) of suicide attempters was 25 (SD 3.6) years. The weighted mean proportion of males was 41.8%. On average 50.5% of suicide attempters were single (never married).

Data on residence, employment, education and economic status were available in fewer studies (Table 2). On average, 70.0% of suicide attempts took place in an urban area. The rate of suicide attempts among those with educational level up to 12 years was 30.3% and this rate was higher than among those who had were illiterate (17.2%) and or had 12 or more years of education (10.8%). Most suicide attempters were not working: employment status showed that 54.0% were housewives, 24.5% were students and 21.5% were unemployed men. Economic status, reported in 12 studies, showed that suicide attempts were more common

**Table 1 Rate of attempted suicide (nonfatal and fatal) based on an integrated analysis of studies carried out in the Islamic Republic of Iran**

| Attempted suicide | No. of studies analysed | No. of cases | Rate per 100 000 population | | | |
|---|---|---|---|---|---|---|
| | | | Weighted mean (SD) | 95% CI | Min. | Max. |
| Nonfatal | 7 | 6575 | 26.5 (2.7) | 21.1–32.2 | 0 | 35 |
| Fatal | 7 | 6575 | 6.7 (1.9) | 3.4–8.6 | 1 | 12 |

*SD = standard deviation; CI = confidence interval.*

**Table 2 Demographic characteristics of suicide attempters based on an integrated analysis of studies carried out in the Islamic Republic of Iran**

| Characteristic | No. of studies analysed | No. of cases | Weighted mean (SD) | 95% CI | Min. | Max. | Median |
|---|---|---|---|---|---|---|---|
| ***Age (mean years)*** | 14 | 85 231 | 25.0 (3.6) | 17.5–32.3 | 18 | 37 | 25 |
| ***Sex (% of cases)*** | 30 | 18 956 | | | | | |
| Male | | | 41.8 (3.2) | 35.4–48.2 | 12 | 61 | 39.5 |
| Female | | | 58.2 (5.4) | 47.4–60.0 | 29 | 68 | 59.5 |
| ***Marital status (%)*** | 30 | 18 956 | | | | | |
| Single[a] | | | 50.5 (4.1) | 47.6–58.9 | 17 | 77 | 51 |
| Married | | | 45.6 (5.2) | 35.4–55.6 | 12 | 69 | 47 |
| Divorced | | | 3.9 (0.8) | 2.2–5.5 | 0.3 | 14 | 3.5 |
| ***Residence (%)*** | 13 | 7 543 | | | | | |
| Urban | | | 70.0 (6.4) | 63.5–82.8 | 10 | 90.1 | – |
| Rural | | | 30.0 (3.4) | 23.5–36.8 | 47 | 48 | 29 |
| ***Education (%)*** | 22 | 16 543 | | | | | |
| Illiterate | | | 17.2 (2.8) | 22.9–14.8 | 2 | 33 | 19.5 |
| High school (< 12 years) | | | 30.3 (3.7) | 22.6–37.7 | 0 | 45 | 30.4 |
| University (≥ 12 years) | | | 10.8 (2.3) | 6.3–14.6 | 0 | 21 | 11 |
| ***Economic status (%)*** | 12 | 67 553 | | | | | |
| Low | | | 62.0 (4.9) | 51.8–72.1 | 3.7 | 86 | 65 |
| Moderate | | | 10.0 (3.1) | 3.6–16.2 | 3.4 | 25 | 9.4 |
| High | | | 28.0 (3.5) | 21.4–35.6 | 23 | 44 | 27 |
| ***Occupation (%)*** | | | | | | | |
| Housewife | 12 | 85 431 | 54.0 (4.7) | 43.8–63.5 | 2 | 79 | 55 |
| Unemployed | 18 | 17 361 | 21.5 (2.1) | 16.7–25.6 | 15.7 | 39 | 20 |
| Student | 18 | 17 361 | 24.5 (3.3) | 18.1–31.3 | 5.2 | 43 | 25 |

[a]*Never married.*
*SD = standard deviation; CI = confidence interval.*

in those with low income (62.0%) than those with high (28.0%) or moderate (10.0%) levels of income.

### Medical history and reasons for suicide attempts

Medical history, when available in the studies, showed that 16.2% of suicide attempters had a history of physical disorder and 42.0% had a history of mental disorder (32.6% had a history of depression and 23.8% had a history of addiction) (Table 3).

On average, 24.8% of cases had made one or more previous suicide attempt. One-third of suicide attempters (32.0%) had warned about their action beforehand. The most prevalent reasons for suicide attempt were family difficulties (49.5%), emotional/relationship problems (17.5%) and employment/education problems (14.5%).

The rate of suicide attempts was higher in summer (35.2%) than other seasons.

### Suicide methods

Drugs were the most common method of attempting suicide (65.0%). Self-burning and poisoning were the second and third most common methods (15.0% and 12.0% respectively) (Table 3). The rate of hanging was 9.1% and of suicide with firearms was 6.0%.

## Discussion

In this integrated analysis of 24 256 attempted suicide cases in 48 studies the aggregated suicide rate in the Islamic Republic of Iran (6.7 per 100 000) was lower than in India (9.6 per 100 000), Christian-majority countries (11.2 per 100 000) and Buddhist countries (17.9 per 100 000) [1]. It was higher than in Muslim-majority countries (1 per 100 000) [1] but lower than Turkey (7.8 per 100 000) [5]. The stigma of suicide in the religious context of Iranian society and the risk of subsequent legal problems for their family (e.g. burying the deceased) may mean that suicide is under-reported in the Islamic Republic of Iran.

The present analysis found that Iranian women attempted suicide 1.39 times more than men. This also agrees with studies in other countries; in European countries, for example,

**Table 3 Reasons and methods of attempted suicide and medical history of suicide attempters based on an integrated analysis of studies carried out in the Islamic Republic of Iran**

| Variable | No. of studies analysed | No. of cases | % of cases | | | | |
|---|---|---|---|---|---|---|---|
| | | | Weighted mean (SD) | 95% CI | Min. | Max. | Median |
| ***Suicide history*** | | | | | | | |
| Warning before attempting suicide | 10 | 5 834 | 32.0 (2.5) | 27.1–37.1 | 20.7 | 40 | 29.7 |
| Previous suicide attempt | 17 | 19 876 | 24.8 (2.3) | 13.8–29.7 | 3 | 37 | 20 |
| ***Method*** | | | | | | | |
| Drugs | 21 | 15 783 | 65.0 (2.6) | 55.3–60.5 | 41 | 88.5 | 67 |
| Poisoning | 17 | 12 346 | 12.0 (3.1) | 5.1–18.8 | 6 | 30 | 13 |
| Self-burning | 10 | 9 783 | 15.0 (4.6) | 6.2–24.3 | 2.5 | 32 | 12 |
| Hanging | 10 | 7 673 | 9.1 (2.3) | 4.7–13.4 | 0.5 | 18 | 8 |
| Gunshot | 6 | 4 782 | 6.0 (2.9) | 0.2–11.4 | 0.5 | 10 | 10 |
| Other | 4 | 2 158 | 1.3 (1.9 | 0–4.5 | – | – | – |
| ***Reason*** | | | | | | | |
| Family difficulties | 21 | 19 431 | 49.5 (2.8) | 43.2–45.4 | 30 | 76 | 52 |
| Relationship/emotional problems | 17 | 12 371 | 17.5 (2.1) | 12.2–21.7 | 5 | 29.2 | 16.5 |
| Employment/education problems | 17 | 16 731 | 14.5 (2.1) | 10.1–18.9 | 0.5 | 27 | 13 |
| Other | 17 | 5 423 | 2.1 (18.5) | 14.1–22.9 | – | – | – |
| ***Medical history*** | | | | | | | |
| Mental disorder | 22 | 21 789 | 42.0 (2.5) | 36.8–47.4 | 9.6 | 52 | 39.6 |
| Physical disorder | 22 | 19 789 | 16.2 (1.3) | 13.7–18.9 | 1 | 38 | 16 |
| Substance dependence | 12 | 9 187 | 23.8 (2.4) | 19.0–29.6 | 7.2 | 35 | 23.2 |
| Depression | 17 | 18 731 | 32.6 (3.4) | 28.3–39.4 | 9 | 47 | 27 |
| ***Season*** | 10 | 8 567 | | | | | |
| Spring | | | 22.7 (3.2) | 13.9–29.1 | 19.3 | 26 | – |
| Summer | | | 35.2 (2.0) | 31.2–40.4 | 28.6 | 54 | – |
| Autumn | | | 21.5 (1.5) | 18.6–24.9 | 20 | 33 | – |
| Winter | | | 20.5 (2.3) | 15.2–25.7 | 19.1 | 24.7 | – |

*SD = standard deviation; CI = confidence interval.*

women attempt suicide 1.5 times more than men [9]. In our analysis, there similar rates of suicide attempts among single and married people (50.5% and 45.6%), although other studies have found marriage to be a preventive factor in attempted suicide [1–5,9,10,60]. The most common age of suicide in Islamic Republic of Iran was among youth, as the average age was 25 years. This is similar to reports from most other countries [1–11,60]. Pritchard and Amanulah in an analysis of suicide in 17 predominantly Islamic countries contrasted with the UK concluded that suicide rates were higher for males than females, and older (65+ years) than younger (15–34 years) ages in every country reviewed [61]. The rate for males in the Middle East was 0–36 per million, South Asia 0–12 per million, Europe 53–177 per million and former USSR 30–506 per million, with 3 countries exceeding the UK rate of 116 per million. Suicide rates in Islamic varied widely and the authors concluded that the high rates of "other violent deaths" (ICD-9 category), especially in Middle Eastern countries, may be a repository for hiding culturally unacceptable suicides [61].

The rate of suicide attempts in this analysis was higher among those with high school education than those with no education and those with university level education. As for occupation, the highest rate of suicide attempts was among unemployed men and housewives. Of course, unemployment is linked to other social factors such as low literacy and financial problems. In New Zealand, unemployed men are 2 or 3 times at greater risk of attempting suicide than employed men [1,4,60]. Most suicide attempters in the Islamic Republic of Iran had low income, while in developed countries, suicide

was more common in upper socioeconomic groups of society [2,4]. Qin et al. in a study of Denmark concluded that unemployment and low income had stronger effects on suicide in male subjects; living in an urban area was associated with higher suicide risk in female subjects and a lower risk in male subjects; and a family history of suicide raised suicide risk slightly more in female than in male subjects [62].

The most common reasons for attempting suicide were family difficulties, relationship/emotional and employment/education problems. This agrees with data from developing countries [1,4,5]. Considering the psychological and social stresses of youth and their perceived inability to solve their emotional problems and deal with life stressors, there is an important role for better life skills training and psychological support at home, school and university [4,8].

The highest suicide rate in the Islamic Republic of Iran was in summer (35.2%), nearly 13% higher than the other seasons, although these results do not agree with the findings from other countries [1]. A study in Finland found a strong seasonal effect on suicide occurrence, with the risk of suicide being greatest in spring [63]. The seasonal effect was most pronounced when the number of suicides was relatively low.

Suicide attempts in urban areas in the Islamic Republic of Iran were higher than in rural areas, which may be due to the greater stress imposed by urban lifestyles. This finding is similar to data reported from other countries [1,8]. More research is needed into reasons for higher rates of suicide in specific areas in order to plan interventions. For example, studies from Ilam province, near the border with Iraq, showed that it had the highest rate of suicide in Islamic Republic of Iran [53,59] and suggests that this region needs more attention on suicide prevention than other regions of the country .

As reported elsewhere [4], drugs were the most common method of suicide attempts in the Islamic Republic of Iran, which may be due to the ease of use and accessibility of drugs. The second most common suicide method was self-burning. This method is rarely used in developed countries [2,7,8,60]. Cultural differences in attitudes to self-immolation, storage of flammable fluids at home and the use of flammable materials such as kerosene for cooking may explain this difference.

About half of the people who attempted suicide had a history of mental disorders and approximately one-third of them had been diagnosed with depression. These results agree with studies in other countries [1–10,60]. Brent et al. in the United States found that the most significant psychiatric risk factors associated with adolescent suicide were major depression (OR = 27.0), bipolar mixed state (OR = 9.0), substance abuse (OR = 8.5), and conduct disorder (OR = 6.0) [64]. In our survey on average, about one-third of people who attempted suicide had a history of attempted suicide. Brent et al. also found that previous suicide attempts, suicidal ideation and homicidal ideation were associated with suicide among adolescents [64]. According to WHO, instigating mental health services after a person has attempted suicide is effective in reducing the risk of further attempts [3].

Suffering from a chronic physical disease will also increase the risk of suicide [9]. In our analysis, an average of 16.2% of people who attempted suicide had a history of physical disorders. In a study in Denmark 52% of suicide attempters interviewed were found to suffer from a somatic disease, and 21% were on analgesics for pain [65]. Physicians need to be aware of the need not only for physical treatment but also for psychological support for patients with chronic diseases. This advice is reinforced by WHO [3] and is followed in many developed countries.

More targeted support, for example training about life skills, is needed for those at greater risk of suicide, especially young people, to help them to cope with family and emotional difficulties and employment and economic problems. Mental health services need to be aware of the higher risk of suicide among people with depression and those with previous suicide attempts but also people suffering from chronic physical health problems.

## Acknowledgements

The present study was conducted with the support of the Social Determinants of Health Research Centre of Yasuj University of Medical Sciences. We thank the research committee of the University and all colleagues and students who helped us.

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# Vitamin D receptor gene polymorphisms in type 1 diabetes mellitus: a new pattern from Khorasan province, Islamic Republic of Iran

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**تعدد أشكال جين مستقبِلَة الفيتامين "د" في النمط الأول من السكري: نموذج جديد من منطقة خراسان في جمهورية إيران الإسلامية**

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**الخلاصة:** تختلف الترابُطات المسجَّلة بين تعدد أشكال مستقبلات الفيتامين "د" (VDR) والنمط الأول من السكري في ما بين المجموعات العرقية. وقد درس الباحثون العلاقة بين النمط الأول من السكري وبين أربعة أشكال متعددة لجِين مُستقبلات الفيتامين "د" (وهي: *Bb*، *Ff*، *Aa*، *Tt*) لدى الإيرانيين. وضمَّت الدراسة مجموعة مكونة من 69 مريضاً بالنمط الأول من السكري، و 45 شخصاً غير مريض بالسكري. وجرى تحليل معدّل انتشار تعدد أشكال مستقبِلات الفيتامين "د" في 4 مواقع لاقتطاع الشدف بما في ذلك تحليل *Bsm*I، *Fok*I، *Apa*I، *Taq*I في مجموعتَيْ المرضى والشواهد. وكان تكرار ثلاثة أنماط جينية هي (*Aa*، *FF*، *Bb*) أعلى بدرجة يُعْتَدُّ بها إحصائياً في مجموعة المرضى. ولم تُشاهَدْ علاقة يُعْتَدُّ بها إحصائياً بين تعدد أشكال جين مستقبل الفيتامين "د" وبين نماذج بدء السكري. كما لم تشاهد فَوَارق يُعتدّ بها إحصائياً بين تكرار النمط الجيني وبين المضاعفات المزمنة للسكري، في حين شوهدَتْ علاقة يُعْتَدُّ بها إحصائياً بين النمط الجيني *Ff* وبين الحماض الكيتوني. وقد تبيَّن أن نتائج هؤلاء الباحثين تختلف عن الدراسات السابقة لتعدد الأشكال في مناطق أخرى.

ABSTRACT Reported associations between vitamin D receptor (VDR) polymorphism and type 1 diabetes mellitus vary across ethnic groups. We studied the association between type 1 diabetes and 4 VDR gene polymorphisms (*Bb, Ff, Aa* and *Tt*) in an Iranian population. A group of 69 patients with type 1 diabetes mellitus and 45 unrelated healthy subjects were recruited. The prevalence of VDR polymorphisms in 4 restriction fragment length polymorphism sites including *Bsm*I, *Fok*I, *Apa*I and *Taq*I were analysed in patients and controls. The frequencies of 3 genotypes (*Aa, FF* and *Bb*) were significantly higher in the patient group. The relationship between VDR gene polymorphisms and onset pattern of diabetes was not significant. There were no significant difference between the genotype frequencies and chronic complications of diabetes, but the relationship between the *Ff* genotype and ketoacidosis was significant. Our results differ from previous polymorphism studies in other regions.

**Polymorphismes du gène du récepteur de la vitamine D et diabète de type 1 : un nouveau modèle dans la province de Khorasan (République islamique d'Iran)**

RÉSUMÉ Les associations observées entre le polymorphisme du récepteur de la vitamine D et le diabète de type 1 varie en fonction des groupes ethniques. Nous avons étudié l'association entre le diabète de type 1 et quatre polymorphismes du gène du récepteur de la vitamine D (génotypes *Bb*, *Ff*, *Aa* et *Tt*) dans une population iranienne. Un groupe de 69 patients atteints de diabète de type 1 et 45 témoins en bonne santé sans lien entre eux ont été recrutés pour cette étude. La prévalence des polymorphismes de ce gène sur quatre sites de polymorphisme de la longueur des fragments de restriction (notamment *Bsm*I, *Fok*I, *Apa*I et *Taq*I) a été analysée dans les deux groupes. La fréquence de trois génotypes (*Aa*, *FF* et *Bb*) était nettement supérieure dans le groupe des patients. Le lien entre les polymorphismes géniques du récepteur de la vitamine D et l'apparition d'un diabète n'était pas significatif. Aucune différence importante n'a été observée entre la fréquence des génotypes et les complications chroniques du diabète. Toutefois, le lien entre le génotype *Ff* et l'acidocétose était fort. Nos résultats diffèrent des études antérieures sur le polymorphisme dans d'autres régions.

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Received: 25/01/10; accepted: 21/12/10

## Introduction

Type 1 diabetes mellitus (DM) is a common autoimmune endocrinopathy that results from an interaction of environmental and genetic factors. This interaction is believed to lead to immune destruction of insulin-producing beta cells by T-cell infiltration of the pancreatic islets [1]. In addition to its calciotropic effect, vitamin D has potent non-calcaemic effects and is involved in the modulation and regulation of immune systems [2–6]. Vitamin D deficiency has been shown to accelerate the onset of type 1 DM [7]. Moreover, vitamin D deficiency leads to impaired insulin secretion, which is reversible by 1,25-dihydroxyvitamin D administration [8]. Other studies suggest that the active metabolite of vitamin D decreases the incidence and development of autoimmune diseases such as type 1 DM and also acts as an immunosuppressant agent [9,10]. The biological effect of vitamin D is thought to occur by binding to the vitamin D receptor (VDR) which belongs to the steroid receptor superfamily and is widely expressed in many cell types including lymphocytes (activated T lymphocytes, B cells), antigen-presenting cells (including monocytes, macrophages, dendritic cells) and pancreatic islet cells [11–13].

Although many polymorphisms exist in the VDR gene, their effect on VDR protein function and signalling is unknown [14]. Based on the effect of the VDR ligand on immune function, an association between type 1 DM and VDR polymorphisms is likely. The effect of VDR polymorphisms on insulin secretion has been reported before [15]. Four major polymorphic sites have been described within the VDR gene. A polymorphic *Fok*I site in exon-2 results in an alternative transcription initiation site, leading to a protein variant with 3 additional amino acids at the amino terminus [4]. Polymorphic *Bsm*I and *Apa*I sites are present in intron-8, and a silent T to C substitution creates a *Taq*I polymorphic site in exon-9 [16].

An association between VDR polymorphism and type 1 DM has been reported in some studies; however, it appears to vary across ethnic groups [17–23]. The aim of this study was to investigate the relationship of VDR gene polymorphism to the risk of type 1 DM and its association with the onset pattern of diabetes (acute or slow onset) in an Iranian population in Khorasan province.

## Methods

### Sample collection

The study was carried out in Mashhad, Islamic Republic of Iran, during 2006–07. Patients were drawn from the Parsian diabetes clinic, which is a referral centre for diabetic patients and cares for more than 500 patients with type 1 DM. Blood samples were obtained from 69 Iranian type 1 DM patients (41 females/28 males) diagnosed with type 1 DM according to World Health Organization criteria (pancreatic beta-cell destruction as the primary cause of diabetes, and tendency to ketoacidosis), under age 35 years and C-peptide-negative. Another group of 45 unrelated healthy volunteers (26 females/19 males) with a socioeconomic status similar to that of the patients, were also recruited from classmates or friends of the patients.

Demographic and basic clinical variables were collected such as age, sex, time of onset of diabetes, time of starting insulin treatment and history of ketoacidosis and complications such as hypertension, retinopathy, nephropathy, dyslipidaemia, concomitant autoimmune disorders. The patients were divided into 2 groups: acute onset (< 6 months from onset of diabetes to start of insulin treatment); and slow onset (> 12 months from diabetes onset to insulin treatment).

All patients gave informed voluntary consent to participate in the study according to the protocol approved by the local ethics committee of Mashhad University of Medical Sciences and in accordance with the ethical standards of the Helsinki Declaration.

### DNA isolation and PCR experiments

Blood samples were collected in EDTA tubes and genomic DNA was extracted using the salting out method. The *Bsm*I, *Fok*I, *Apa*I and *Taq*I polymorphic sites were considered. Polymerase chain reaction (PCR) amplification was performed using 3 sets of primers—VDR1 (for *Bsm*I), VDR2 (for *Fok*I), and VDR3 (for both *Apa*I and *Taq*I)—as described previously [17,22], using the Techgene thermocycler (Techne). After initial denaturation for 5 min. at 95 °C, samples were subjected to 30 cycles of amplification, 25 s at 94 °C, 20 s at the relevant primer pair annealing temperature (Table 1) and 20 s at 72 °C. The final step was a 5 min. hold at 72 °C. Amplified DNA was digested overnight with suitable amounts of reference restriction enzymes (Fermentas) in the restriction protocol at 37 °C or 4 h at 55 °C according to the manufacturer's instructions (Table 1). Digestion products were electrophoresed on 3% agarose gel containing 0.4 mg/L ethidium bromide. The polymorphism was documented by photographing under UV illumination.

### Polymorphism analysis

All data concerning the 4 restriction enzymes and their restriction patterns are summarized in Table 1. Aliquots of 0.1 U of *Bsm*I, *Fok*I and *Apa*I and 3U of *Taq*I restriction enzymes (Fermentas, Lithuania) and 2 µL buffer were added to 4 µL of the VDR PCR products. The alleles were designated as *B* (650 bp and 175 bp fragments) and *b* (825 bp fragment) for *Bsm*I, *F* (196 bp and 69 bp fragments) and *f* (265 bp) for *Fok*I

**Table 1** Characteristic features of the 4 studied polymorphisms in the vitamin D receptor (VDR) gene

| Polymorphism | Location in VDR gene | Restriction site | Digested alleles | Primer sequence | Annealing temperature (ºC) | Digestion protocol | Amplicon length (bp) | Restricted fragments (bp) |
|---|---|---|---|---|---|---|---|---|
| *Bsm*I | Intron-8 | GAATGC(1/-1)↓ | B, b | Forward: 5'-CAA CCA AGA CTA CAA GTA CCG CGT CAG TGA-3'<br>Reverse: 5'-AAC CAG CGG GAA GAG GTC AAG GG-3' | 63 | 37 ºC overnight | 825 | 650, 175 |
| *Fok*I | Exon-2 | GGATG(9/13)↓ | *F, f* | Forward: 5'-AGC TGG CCC TGG CAC TGA CTC TGC TCT-3'<br>Reverse: 5'-ATG GAA ACA CCT TGC TTC TTC TCC CTC-3' | 68 | 37 ºC overnight | 265 | 196, 69 |
| *Apa*I | Intron-8 | GGGCC↓C | *A, a* | Forward: 5'-CAG AGC ATG GAC AGG GAG CAA-3'<br>Reverse: 5'-GCA ACT CCT CAT GGC TGA GGT CTC-3' | 62 | 37 ºC overnight | 740 | 530, 210 |
| *Taq*I | Exon-9 | T↓CGA | *T, t* | Forward: 5'-CAG AGC ATG GAC AGG GAG CAA-3'<br>Reverse: 5'-GCA ACT CCT CAT GGC TGA GGT CTC-3' | 62 | 55 ºC 4 h | 740 | PS+: 290, 245, 205<br>PS–: 495, 245 |

*PS+ = restriction pattern when the polymorphic site is present; PS– = restriction pattern without polymorphic site.*

and *A* (530 bp and 210 bp) and *a* (740 bp) for *Apa*I. *Taq*I has 2 binding sites on the PCR product, one product a 495 bp and a 245 bp fragment (*t*) and the other at the single nucleotide polymorphism site in the presence of which the 495 bp fragment will be cut into a smaller 290 bp piece and a 205 bp piece (*T*).

### Statistical analysis

Data were analysed using *SPSS*, version 11.5 statistical software. Comparisons of genotype frequencies between groups were performed using the t-test. The chi-squared test was used for analysis of the difference between the 2 groups. *P*-value < 0.05 was considered significant.

## Results

The patients were 28 males (40.6%) and 41 females (59.4%). The mean age of patients was 22.2 (SD 8.7) years and the mean age onset of diabetes was 13.4 (SD 6.1) years. Family history of DM was positive for 26 patients (37.7%). The frequency of complications of diabetes, including history of ketoacidosis, hypertension, retinopathy, nephropathy and dyslipidaemia, are shown in Table 2. There were 50 patients (72.5%) with acute onset of diabetes and 19 patients (27.5%) with chronic onset. The control group consisted of 19 (42.2%) men and 26 (57.8%) women with a mean age of 19.7 (SD 6.2) years.

The distributions of VDR gene polymorphism in patients and control groups are shown in Table 3. The genotype frequencies were higher in the patients than the controls for the *bb* genotype (42.6% versus 40.0%, *P* = 0.14) and the *TT* genotype (49.3% versus 44.4%, *P* = 0.057) although the differences were not significant. However, the frequencies of genotypes were significantly higher in the patient group versus controls for the *Aa* genotype (75.4% versus 40.0%, *P* = 0.003), *FF* genotype (55.1% versus 40.0%, *P* = 0.008) and *Bb* genotype (37.7% versus 24.4%, *P* = 0.014).

We stratified type 1 DM patients based on their onset pattern of disease and assessed the relationship to the types of VDR gene polymorphisms (Table 4). The relationship between VDR gene polymorphisms and onset pattern of diabetes was not significant in any of restriction sites. The age of onset of disease did not affect the distribution of genotype frequencies in type 1 DM patients. Moreover, there was no significant difference between the distribution of genotype frequencies (*Bsm*I, *Apa*I, *Fok*I and *Taq*I) and chronic complications of diabetes, but the relation between the *Ff* genotype and history of ketoacidosis was significant (*P* = 0.04).

The electrophoresis pattern of the 4 restriction enzymes is illustrated in Figure 1.

## Discussion

The molecular mechanisms of pathogenesis of type 1 DM remain to be elucidated. Several studies have recently reported an association

**Table 2 Frequencies of complications in patients with type 1 diabetes mellitus (*n* = 69)**

| Complication | Positive | | Negative | |
|---|---|---|---|---|
| | No. | % | No. | % |
| History of ketoacidosis | 39 | 56.5 | 30 | 43.5 |
| Hypertension | 2 | 2.9 | 67 | 97.1 |
| Retinopathy | 8 | 11.6 | 61 | 88.4 |
| Nephropathy | 6 | 8.7 | 63 | 91.3 |
| Dyslipidaemia | 14 | 20.3 | 55 | 79.7 |
| Concomitant autoimmune disorders | 6 | 8.7 | 63 | 91.3 |

between type 1 DM and VDR gene polymorphisms. This study demonstrated a significantly higher frequency of *Aa*, *FF* and *Bb* genotypes in the VDR receptor in type 1 DM patients in an Iranian population. The frequency of *bb* and *TT* genotypes were also higher in patients compared with the control group, but the differences were not statistically significant.

Several populations with different genetic background have been studied for the association of type 1 DM and VDR gene polymorphisms, and contradictory results have been shown. The results of the first published study in southern India showed that the *b* allele of *Bsm*I in VDR was more prevalent in type 1 DM patients than healthy controls [18]. Chinese investigators showed in their Han population that the frequency of the *B* allele of *Bsm*I site gene was significantly higher in type 1 DM [19]. In a Taiwanese population type 1 DM was also associated with the *B* allele [20]. In Barcelona, Spain, the frequencies of *bb*, and especially combined *bb/FF* genotypes, were higher in type 1 DM patients than in controls [21]. However, in a Finnish population VDR polymorphisms had no association with type 1 DM [24], and a study in Santiago on children with type 1 DM demonstrated that the frequency of the *b* allele and *bb* genotype was significantly lower compared with the control group [22]. Surprisingly, a meta-analysis in 2006 also showed that there was no association between VDR gene polymorphisms and type 1 DM risk in case–control and family transmission studies [25].

**Table 3 Distribution of vitamin D receptor (VDR) gene polymorphisms in patients with type 1 diabetes mellitus and non-diabetic controls**

| VDR polymorphism | Cases (*n* = 69) | | Controls (*n* = 45) | | *P*-value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| ***BsmI*** | | | | | |
| bb | 29 | 42.0 | 18 | 40.0 | 0.109 |
| BB | 14 | 20.3 | 16 | 35.6 | 0.715 |
| Bb | 26 | 37.7 | 11 | 24.4 | 0.014 |
| ***FokI*** | | | | | |
| ff | 6 | 8.7 | 7 | 15.6 | 0.782 |
| FF | 38 | 55.1 | 18 | 40.0 | 0.008 |
| Ff | 25 | 36.2 | 20 | 44.4 | 0.456 |
| ***ApaI*** | | | | | |
| aa | 4 | 5.8 | 1 | 2.2 | 0.180 |
| AA | 13 | 18.8 | 18 | 40.0 | 0.369 |
| Aa | 52 | 75.4 | 26 | 40.0 | 0.003 |
| ***TaqI*** | | | | | |
| tt | 7 | 10.1 | 8 | 17.8 | 0.796 |
| TT | 34 | 49.3 | 20 | 44.4 | 0.057 |
| Tt | 28 | 40.6 | 17 | 37.8 | 0.101 |

In our study no significant relationship was found between VDR polymorphisms and the onset pattern of diabetes (acute or chronic). Motohashi et al. in a study of 203 type 1 DM patients compared with healthy controls found that there was a significant difference in the frequency of the *B* allele in the *Bsm*I site between acute-onset diabetes and control groups. However, the difference between the slow-onset type 1 DM group and controls was not significant and they concluded that assessment of this VDR gene polymorphism may contribute to prediction of the onset pattern in individuals with a high-risk component of type 1 DM [23].

No significant association was found between VDR gene polymorphisms and chronic complications of diabetes (including nephropathy, retinopathy, dyslipidaemia and hypertension). Taverna et al. in Paris observed 200 patients with type 1 DM and found that the *Tt* genotype was associated with severe retinopathy. In that study, patients with *TT* genotype were low risk for severe diabetic retinopathy [26]. We found no association between VDR gene polymorphisms and diabetic retinopathy. It seems that vitamin D functions may play a role in the pathogenesis of hypertension as a negative endocrine regulator of renin biosynthesis [27] and have a favourable effect on cardiovascular disease [28,29]. Other researchers have also reported an association between the *bb* genotype and severe coronary stenosis [30].

We found a significant relationship between the *Ff* genotype and a history of ketoacidosis among our patients. To

**Table 4 Distribution of vitamin D receptor (VDR) gene polymorphisms in patients with type 1 diabetes mellitus according to history of ketoacidosis and onset of diabetes**

| VDR polymorphism | With history of ketoacidosis (*n* = 39) | | Without history of ketoacidosis (*n* = 30) | | *P*-value | Acute onset (*n* = 50) | | Chronic onset (*n* = 19) | | *P*-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | No. | % | No. | % | |
| ***BsmI*** | | | | | | | | | | |
| bb | 17 | 43.6 | 12 | 40.0 | 0.36 | 31 | 64.0 | 10 | 52.6 | 0.44 |
| BB | 6 | 15.4 | 8 | 26.7 | | 5 | 10.0 | 5 | 26.3 | |
| Bb | 16 | 41.0 | 10 | 33.3 | | 14 | 26.0 | 4 | 21.1 | |
| ***FokI*** | | | | | | | | | | |
| ff | 2 | 5.1 | 5 | 16.7 | | 2 | 4.0 | 2 | 10.6 | |
| FF | 20 | 51.3 | 18 | 60.0 | 0.04 | 32 | 64.0 | 14 | 73.6 | 0.48 |
| Ff | 17 | 43.6 | 7 | 23.3 | | 16 | 32.0 | 3 | 15.8 | |
| ***ApaI*** | | | | | | | | | | |
| aa | 2 | 5.1 | 2 | 6.7 | | 2 | 4.0 | 0 | 0.0 | |
| AA | 6 | 15.4 | 6 | 20.0 | 0.86 | 4 | 8.0 | 5 | 26.3 | 0.21 |
| Aa | 31 | 79.5 | 22 | 73.3 | | 44 | 88.0 | 14 | 73.7 | |
| ***TaqI*** | | | | | | | | | | |
| tt | 2 | 5.1 | 4 | 13.3 | 0.50 | 0 | 0.0 | 1 | 5.3 | 0.27 |
| TT | 20 | 51.3 | 12 | 40.0 | | 35 | 70.0 | 13 | 68.4 | |
| Tt | 17 | 43.6 | 14 | 46.7 | | 15 | 30.0 | 5 | 26.3 | |

our knowledge this is first report of this association. In a study performed on 134 unrelated patients, investigators found that the *ff* genotype frequency was significantly higher in type 1 DM patients than controls, although the relationship between type 1 DM and chronic complications of diabetes was not analysed [31]. In a Chinese population, the *F* allele of the *FF* genotype showed a higher prevalence in patients compared with controls. The *FF* genotype was suggested as a marker for type 1 DM in this population. However, the authors did not analyse the relation of this genotype with type 1 DM associated complications.

This is the first report comparing the frequencies of all 4 known sites of the VDR gene in healthy and type 1 DM Iranian population. It seems that environmental factors that influence levels of active vitamin D in humans are complex and a significant difference exists between vitamin D functions and VDR polymorphisms. It further confirms that the association between VDR polymorphisms and type 1 DM varies across different ethnic groups.

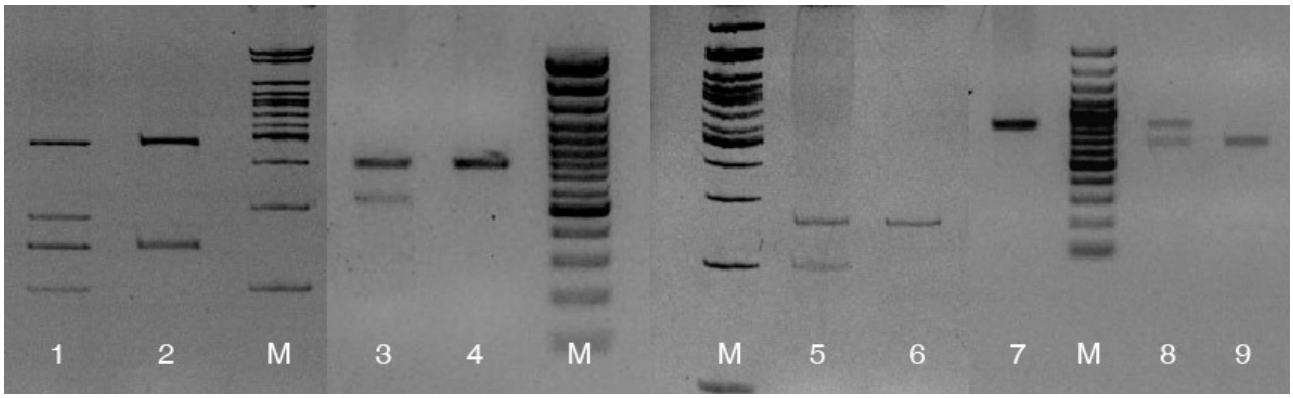


**Figure 1 Digestion results of the 4 polymorphism sites. *TaqI* digestion: *Tt* (lane 1), *tt* (lane 2); *Apa*I digestion: *Aa* (lane 3), *aa* (lane 4); *Fok*I digestion: *Ff* (lane 5), *ff* (lane 6); *Bsm*I digestion: *bb* (lane 7), *Bb* (lane 8), *BB* (lane 9). M: 100 bp DNA ladder (Fermentas)**

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# La néphropathie non diabétique chez les patients diabétiques de type 2 à l'hôpital militaire Mohammed V de Rabat (Maroc)

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**الاعتلال الكلوي غير السكري في المرضى السكّريين من النمط الثاني في مستشفى محمد الخامس العسكري في الرباط في المغرب**

ياسر زاجاري، محمد بن يحيى، دينا منتصر إبراهيم، جلال قسوتي، عمر موجود، فيصل جندوز، زهير واليم

**الخلاصة:** ليس التمييز بين آفات اعتلال الكلية السكري بين الآفات الكلوية اللاسكرّية واضحاً على الدوام، ولذلك يعتمد التشخيص على الخزعة الكلوية. وقد قيَّمَت هذه الدراسة معدّلات انتشار مرض الكلية غير السكري والـمُنْبئات به لدى المرضى السكّريين من النمط الثاني. وقد أجريَت الدراسة بين شهري كانون الثاني/ يناير 2008 وتشرين الأول/ أكتوبر 2010 في قسم طب الكُلَى في المستشفى العسكري في الرباط. وضمَّت الدراسة ستة عشر مريضاً بالنمط الثاني من السكّري ممّن استدعت بعض الدواعي إجراء خزعة من الكلية فيهم. وقد وُجد في ستة من المرضى (37.5٪) مرض كلوي غير سكري؛ وكان اعتلال الكلية بالفلوبولين المناعي A Ig هو الأكثر تواتُراً في أمراض الكلية غير السكرية (نصف الأمراض الكلوية غير السكرية). وكان فرط ضغط الدم أقل تواتُراً في فئة المرض الكلوي اللاسكّري (16.7٪ مقابل 80.0٪) ($P = 0.024$)، وكانت مدة السكري أقصر (4.5 سنة مقابل 15.5 سنة ($P = 0.022$)، وكان اعتلال الشبكية السكري غير موجود 100.0٪ في اعتلال الكلية اللاسكري مقابل 40٪ في اعتلال الكلية السكري، ($P = 0.026$). لم يشاهد اختلاف يُعْتَدُّ به إحصائياً بين الفئتين في ما يتعلق بالعمر، والجنس، ومستوى الكرياتينين، والبيلة البروتينية لمدة 24 ساعة، والمتلازمة الكُلاَئية، والبيلة الدموية المجهرية.

RÉSUMÉ La distinction entre les lésions de néphropathie diabétique et les lésions de néphropathie non diabétique n'est pas toujours évidente ; elle est basée souvent sur la ponction-biopsie rénale. Cette étude a évalué la prévalence et les facteurs prédictifs de la néphropathie non diabétique chez le diabétique de type 2. L'étude, réalisée entre janvier 2008 et octobre 2010 au service de néphrologie de l'hôpital militaire de Rabat, incluait 16 diabétiques de type 2 ayant bénéficié d'une ponction-biopsie rénale. La néphropathie non diabétique a été observée chez 6 patients (37,5 %) ; la néphropathie à IgA était la plus fréquente (50 % des néphropathies non diabétiques). L'hypertension artérielle était significativement moins fréquente dans le groupe de la néphropathie non diabétique que dans le groupe de la néphropathie diabétique (16,7 % contre 80,0 % ; $p = 0,024$), la durée du diabète était plus courte (4,5 contre 15,5 ans ; $p = 0,022$) et la rétinopathie diabétique absente (100 % contre 40 % ; $p = 0,026$). Il n'y avait pas de différence statistiquement significative entre les deux groupes en ce qui concerne l'âge, le sexe, la créatininémie, la protéinurie des 24 h, le syndrome néphrotique et l'hématurie microscopique.

**Non-diabetic renal disease in type II diabetes mellitus patients in Mohammed V military hospital, Rabat, Morocco**

ABSTRACT The distinction between diabetic nephropathy lesions and non-diabetic renal lesions is not always obvious and is often based on renal biopsy. This study evaluated the prevalence and predictors of non-diabetic renal disease in people with type 2 diabetes. The study was conducted between January 2008 and October 2010 in the nephrology department of the military hospital in Rabat. The study included 16 patients with type 2 diabetes in whom renal biopsy was indicated. Non-diabetic renal disease was found in 6 of the patients (37.5%); IgA nephropathy was the most frequent non-diabetic renal disease (half of non-diabetic renal diseases). Hypertension was significantly less frequent in the non-diabetic renal disease group than the diabetic nephropathy group (16.7% versus 80.0%, $P = 0024$), duration of diabetes was a shorter (4.5 versus 15.5 years, $P = 0.022$) and diabetic retinopathy was absent (100% versus 40%, $P = 0.026$). There were no statistically significant differences between the 2 groups in relation to age, sex, creatinine level, 24-hour proteinuria, nephrotic syndrome and microscopic haematuria.

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Reçu : 18/12/11 ; accepté : 26/01/12

## Introduction

La néphropathie diabétique (ND) est la première cause d'insuffisance rénale chronique terminale dans le monde [1] ; elle complique le diabète dans 40 % des cas avec une ancienneté de diabète de plus de 20 ans [2,3]. Généralement, le diagnostic de la ND est aisé si le diabète est ancien, en présence de complications dégénératives et lorsque l'évolution est marquée par une protéinurie précédant l'insuffisance rénale.

Si cette démarche est validée chez le diabétique de type 1, elle est discutée chez le diabétique de type 2 [4]. L'absence de neuropathie et de rétinopathie diabétique (RD) en présence de signes de néphropathie doit faire suspecter une néphropathie non diabétique (NND) [5], de même qu'une détérioration rapide de la fonction rénale ainsi que la présence d'une hématurie macro- ou microscopique [6]. La ponction-biopsie rénale (PBR) n'est habituellement indiquée chez le diabétique de type 2 que si une NND est suspectée. Le but de l'étude était d'évaluer la prévalence de la NND et les facteurs associés chez le diabétique de type 2.

## Méthodes

Il s'agit d'une étude rétrospective réalisée entre janvier 2008 et octobre 2010 au service de néphrologie de l'hôpital militaire de Rabat, incluant les PBR effectuées chez les patients ayant un diabète de type 2, selon la définition de l'Organisation mondiale de la Santé, chez lesquels le diagnostic de NND était suspecté.

La PBR était réalisée par voie percutanée après consentement éclairé des patients, en utilisant un dispositif semi-automatique armé par une aiguille à usage unique (16 Gauge). L'étude histologique était réalisée par microscopie optique et par immunofluorescence aux antisérums IgG, IgA, IgM, C3, C4, C1q et fibrinogène, et dans certains cas aux antisérums des chaînes légères Kappa et Lambda par le même anatomo-pathologiste. Nous avons recueilli des paramètres démographiques, cliniques et biologiques.

L'étude statistique a été réalisée par un logiciel SPSS 13.0. Les variables quantitatives étaient exprimées en médianes et les variables qualitatives en pourcentages. La comparaison des variables quantitatives était réalisée par le test non paramétrique de Mann-Whitney et la comparaison des variables qualitatives était réalisée par le test exact de Fischer. Une valeur de $p < 0,05$ était retenue comme statistiquement significative.

## Résultats

Durant la période d'étude, 16 PBR ont été réalisées chez 15 patients par voie percutanée et dans un cas sur pièce de néphrectomie pour tumeur rénale ; 81,3 % étaient des patients de sexe masculin ayant un diabète de type 2, évoluant depuis plus de 6,5 ans chez la moitié. La médiane d'âge était de 60 ans (extrêmes 47-79 ans). Neuf patients (56,3 %) étaient hypertendus, 10 patients (62,5 %) n'avaient pas de RD. La médiane de la protéinurie de 24 heures était de 4,75 g/j (extrêmes 0,7-13 g/j). Onze patients (68,8 %) étaient néphrotiques et 10 (62,5 %) avaient une hématurie microscopique. La médiane de créatininémie était de 45 mg/L (Tableau 1).

Les indications de la PBR étaient un syndrome néphrotique associé à un diabète récent (durée de moins de cinq ans) chez quatre patients, une insuffisance rénale rapidement progressive associée à une hématurie microscopique chez trois patients, une insuffisance rénale aiguë associée à des signes extrarénaux (cutanés, digestifs et articulaires) chez deux patients, une insuffisance rénale associée à des anomalies biologiques chez six patients (quatre cas de dysglobulinémies, un cas d'hépatite virale chronique B, un cas d'hypocomplémentémie C3), et une insuffisance rénale associée à un oncocytome rénal chez un seul patient.

Sur les 16 patients diabétiques biopsiés, six patients présentaient des lésions de NND. Il s'agissait de trois cas de néphropathie à IgA (deux cas de purpura rhumatoïde et un cas de maladie de Berger), d'un cas de néphropathie à lésions glomérulaires minimes (LGM), d'un cas de glomérulopathie extramembraneuse (GEM) et d'un cas de tubulopathie myélomateuse.

**Tableau 1 Paramètres démographiques, cliniques et biologiques des patients**

| Variable | Valeur |
|---|---|
| Âge (ans) [médiane (quartile)] | 60 (47-79) |
| Sexe | |
| Masculin [Nbre (%)] | 13 (81,3) |
| Féminin [Nbre (%)] | 3 (18,7) |
| Hypertension artérielle [Nbre (%)] | 9 (56,3) |
| Absence de rétinopathie diabétique [Nbre (%)] | 10 (62,5) |
| Ancienneté du diabète (ans) [médiane (quartile)] | 6,5 (1-39) |
| Créatininémie (mg/L) [médiane (quartile)] | 45,25 (7-112) |
| Syndrome néphrotique [Nbre (%)] | 11 (68,8) |
| Protéinurie (g/j) [médiane (quartile)] | 4,75 (0,7-13) |
| Hématurie [Nbre (%)] | 10 (62,5) |

L'ancienneté du diabète était plus marquée dans le groupe ND en comparaison avec le groupe NND (15,5 contre 4,5 ans ; $p$ = 0,022). L'hypertension artérielle était moins fréquente dans le groupe NND (16,7 % contre 80,0 % ; $p$ = 0,024). La RD était absente chez tous les patients du groupe NND et chez 40 % des patients du groupe ND ($p$ = 0,026). Il n'y avait pas de différence significative entre les deux groupes concernant l'âge, le sexe, la créatininémie, la protéinurie de 24 heures, le syndrome néphrotique et l'hématurie microscopique (Tableau 2).

## Discussion

Dans ce travail, la PBR était réalisée chez 16 patients diabétiques de type 2, dans un contexte de suspicion de NND expliquant en partie le faible échantillon de notre série. Les critères de suspicion de NND chez le diabétique de type 1 sont : l'hématurie microscopique, l'absence de RD, l'insuffisance rénale d'évolution rapide ou la présence d'anomalies immunologiques. Cependant ces critères ne sont pas validés chez le diabétique de type 2 [3].

Dans les séries de biopsies rénales chez le diabétique de type 2, la prévalence de la NND varie de 10 à 85 % [4,7-10] ; cette différence dépend des critères d'indication de la PBR et de la population étudiée [11]. Dans notre étude, la prévalence de la NND était de 37,5 %. Les néphropathies à IgA étaient les étiologies les plus fréquentes des NND (50 % des cas). Dans la série de Zhou et al., la néphropathie à IgA (34 %) et les GEM (22 %) étaient les étiologies les plus fréquentes de NND [12].

La ND est une complication chronique du diabète ; elle se manifeste cliniquement 5 à 10 ans après la découverte du diabète. Ainsi, une courte durée d'évolution du diabète en présence d'anomalies rénales oriente vers une NND [12]. Dans la série de Choi, les NND étaient associées à une courte durée du diabète [4]. Dans notre série, le diabète était d'ancienneté plus courte dans le groupe NND avec une médiane de 4,5 ans contre 15,5 ans dans le groupe ND ($p$ = 0,022).

La RD est une complication microvasculaire du diabète de pathogénie similaire à la ND [12]. Chez le diabétique de type 1, elles coexistent habituellement selon plusieurs auteurs [13,14]. Selon Parving, tous les diabétiques de type 2 ayant une protéinurie avec une RD ont une ND ; cependant, en l'absence de RD avec une protéinurie, 50 % des patients avaient une ND [15]. Dans la série de Zhou et al., 90 % des diabétiques de type 2 avec RD avaient une ND et 76 % des diabétiques de type 2 sans RD avaient une NND, ce qui suggère que la présence de la RD est un marqueur de ND et que son absence est un facteur prédictif de NND [12]. Dans notre série, tous les patients ayant une RD avaient une ND et 60 % des patients sans RD avaient une NND.

L'hypertension artérielle est une expression fréquente des néphropathies ; cependant, elle est plus fréquente chez le diabétique. Cela s'explique par la rétention hydrosodée, l'activation du système rénine angiotensine, la stimulation du système sympathique et le dysfonctionnement endothélial plus fréquent chez cette population [12]. Dans la série de Zhou et al., l'hypertension artérielle était plus fréquente et plus sévère dans le groupe ND [12] ; dans notre série, le groupe NND avait moins d'hypertension artérielle (16,7 % contre 80 % ; $p$ = 0024).

L'hématurie est une manifestation inhabituelle de la ND. Elle est l'expression de plusieurs NND, notamment les néphropathies à IgA. Dans l'étude de Wong, l'association de la protéinurie ou de l'hématurie à l'absence de RD orientait vers une NND avec une valeur prédictive positive de 94 % [16]. Dans notre série, l'hématurie était présente chez 83,3 % des patients du groupe NND et 50 %

**Tableau 2 Comparaison du groupe ND et groupe NND**

| Caractéristiques | Groupe ND | Groupe NND | *p* |
|---|---|---|---|
| Âge (ans) [Médianes (quartiles)] | 60 (56,25 ; 63) | 56,5 (50,75 ; 62) | 0,229 |
| Sexe masculin [Nbre (%)] | 8 (80) | 5 (83,8) | 0,696 |
| Hypertension artérielle [Nbre (%)] | 2 (80) | 5 (16,7) | 0,024* |
| Absence de rétinopathie diabétique [Nbre (%)] | 4 (40) | 6 (100,0) | 0,026* |
| Ancienneté du diabète (ans) [Médianes (quartiles)] | 15,5 (5,75 ; 20,25) | 4,5 (1 ; 6,25) | 0,022* |
| Créatininémie (mg/L) [Médianes (quartiles)] | 56,5 (32,25 ; 83,25) | 27,5 (7 ; 58,75) | 0,142 |
| Protéinurie (g/j) [Médianes (quartiles)] | 4,65 (3,42 ; 8,12) | 5,1 (2,87 ; 11,2) | 0,828 |
| Hématurie [Nbre (%)] | 5 (50) | 5 (83,3) | 0,215 |

**Significatif à p < 0,05.*
*ND : néphropathie diabétique ; NND : néphropathie non diabétique.*

des patients du groupe ND. Cependant, il n'y avait pas de différence statistiquement significative ($p$ = 0,215). Cela peut être expliqué en partie par le faible échantillon de notre série en l'absence d'indication systématique de PBR chez le diabétique de type 2.

## Conclusion

Bien que de nombreux indicateurs puissent orienter vers le diagnostic de NND chez le diabétique de type 2, l'étude histologique du parenchyme rénal reste le moyen diagnostique le plus sûr pour la prise en charge et le pronostic de ces patients. Toutefois, le risque de complications hémorragiques encourus lors de la PBR doit limiter ces indications systématiques. L'échantillon faible de notre série rend nécessaire des études plus larges.

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# Prevalence of hepatitis B and C infections and associated factors among blood donors in Aden city, Yemen

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**معدّل انتشار عدوى التهاب الكبد "بي" و"سي" والعوامل المرتبطة بها بين المتبرعين بالدم في مدينة عدن في اليمن**

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**الخلاصة:** وقد حددت هذه الدراسة معدّل انتشار كلٍّ من فيروس التهاب الكبد "بي" وفيروس التهاب الكبد "سي" وعوامل الاختطار المرتبطة بهما بين المتبرعين بالدم في مدينة عدن في اليمن. وقد اختار الباحثان عينة منهجية مكونة من 469 ذكراً من المتبرعين بالدم الذين راجعوا خدمات بنك الدم الوطني في عدن في ما بين شهري حزيران/ يونيو وتشرين الأول/ أكتوبر 2007. وجمع الباحثون المعطيات بواسطة استبيان وعينات دموية. ومن بين المشاركين الـ 469، كان 24 منهم (5.1٪) إيجابيين للمستضد السطحي لالتهاب الكبد "بي"، و6 منهم (1.3٪) إيجابيين لمضاد فيروس التهاب الكبد "سي". ووجد الباحثون بالتحليل المتعدد المتغيرات، تبيَّن أن السوابق الآتية: نقل الدم (OR = 22.8)، وعلاج الأسنان (OR = 3.6)، الحجامة (OR = 3.9)، والعدوى بالملاريا (OR = 6.8) هذه السوابق كانت متـرابطة على نحو يُعْتَدُّ به بالإيجابية للمستضد السطحي لالتهاب الكبد "بي". على أن من كان لهم سوابق تبرع بالدم كانوا أقل احتمالاً بكونهم إيجابيين لأضداد فيروس التهاب الكبد "سي" (OR = 0.05)، في حين أن من تَلَقَّوا نقل دم سابقاً كانوا أكثر احتمالاً بكونهم إيجابيين (OR = 6.65 ). وقد دلّت هذه النتائج على أن معدَّل انتشار التهاب الكبد بالفيروس "بي" والتهاب الكبد بالفيروس "سي" مازال مرتفعاً بين المتبرعين بالدم في اليمن مقارنة بالبلدان الأخرى.

ABSTRACT This study determined the prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV ) and associated risk factors among blood donors in Aden city, Yemen. A systematic sample of 469 male blood donors was selected from those attending the national blood bank service in Aden between June and October 2007. Data were collected by questionnaire and blood samples collected. Of the 469 participants, 24 (5.1%) were positive for HBsAg and 6 (1.3%) for anti-HCV. In multivariate analysis, history of: blood transfusion (OR = 22.8), dental treatment (OR = 3.6), cupping (OR = 3.9) and malaria infection (OR = 6.8) were significantly associated with being positive for HBsAg. Those with history of blood donation were less likely to be positive for HBsAg (OR = 0.17). Those with a history of blood donation were significantly less likely to be positive for anti-HCV positivity (OR = 0.05), while those with history of blood transfusion were more likely to test positive (OR = 65.6). The prevalence of HBV and HCV among blood donors in Yemen is still high compared to many other countries.

**Prévalence des infections par les virus de l'hépatite B et C et facteurs associés chez des donneurs de sang dans la ville d'Aden (Yémen)**

RÉSUMÉ La présente étude a déterminé la prévalence des infections à hépatite B et C et les facteurs de risque associés chez des donneurs de sang dans la ville d'Aden (Yémen). Un échantillon systématique de 469 donneurs de sang de sexe masculin a été sélectionné à partir de donneurs fréquentant le service national de la banque de sang dans la ville d'Aden entre juin et octobre 2007. Des données ont été recueillies par questionnaire et des échantillons de sang ont été prélevés. Parmi les 469 participants, 24 étaient positifs pour les antigènes de surface du virus de l'hépatite B (5,1 %) et 6 pour les anticorps contre le virus de l'hépatite C (1,3 %). Dans une analyse multivariée, les antécédents de transfusion sanguine (O.R. = 22,8), de traitement dentaire (O.R. = 3,6), d'application de ventouses (O.R. = 3,9) et de paludisme (O.R. = 6,8) étaient fortement associés à la positivité aux antigènes de surface du virus de l'hépatite B. Les personnes ayant déjà fait don de leur sang avaient moins de risque d'être positives pour les antigènes de surface du virus de l'hépatite B (O.R. = 0,17). Ces dernières avaient aussi beaucoup moins de risque d'être positives pour les anticorps contre le virus de l'hépatite C (O.R. = 0,05), contrairement aux personnes ayant reçu des transfusions sanguines (O.R. = 65,6). Par rapport à de nombreux autres pays, la prévalence de l'infection par les virus de l'hépatite B et C chez les donneurs de sang reste élevée au Yémen

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Received: 24/07/11; accepted: 12/12/11

## Introduction

Infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) causes considerable morbidity and mortality worldwide [1,2]. In Yemen, chronic hepatitis is an important cause of cirrhosis and liver cancer but studies on the prevalence of these viruses in the general population are scarce [3]. Among Middle Eastern countries, Bahrain, Islamic Republic of Iran and Kuwait have low HBV endemicity; Cyprus, Iraq and United Arab Emirates have intermediate endemicity; while Egypt, Jordan, Oman, Palestine, Yemen and Saudi Arabia have high endemicity [4]. In 1988 a sero-epidemiological survey of hepatitis A, B and D was performed in the Yemen [5]. The prevalence of hepatitis B surface antigen (HBsAg) was 12.7%. Using multivariate analysis, age, past history of jaundice, and combined history of blood transfusion and surgery were independent predictors of hepatitis B infection [5].

The prevalence rates of HBsAg among volunteer blood donors in developing countries are much higher than that reported in developed countries [6]. This reflects the efficacy of blood donor selection policies, effective screening and very low HBV prevalence in the general population in these countries. Volunteer blood donors are generally regarded as a healthier segment of any community, as blood banks usually have strict selection criteria. [7]. The proportion of donors with hepatitis and the risk factors associated with the disease among these healthy individuals may reflect the magnitude of chronic HBV and HCV infection in the general population.

The awareness of the importance of blood safety for controlling the transmission of HBV and HCV has helped to decrease the spread of these viruses. Public health interventions and strategies have been shown to be effective method of preventing such infection. Any strategy to prevent these infections must therefore be based on accurate data, including information about prevalence and risk factors of these infections. Therefore, this study was conducted to determine the prevalence of HBV and HCV and their associated factors among blood donors at Aden city, Yemen. Such information may raise awareness regarding the need for urgent action to prevent HBV and HCV transmission in Yemen.

## Methods

### Study population

This study was conducted among all blood donors who attended the national blood bank service in Aden in Yemen between June and October 2007. Blood donation operates on an exchange basis in which relatives and friends of patients are requested to donate blood for their clinical management. A systematic sample was obtained by selecting all blood donors attending the national blood bank every other day. For cultural reasons, only males who consider themselves healthy donate blood. The staff at the national blood bank informed donors about their infectious status and those who were found to be infected were counselled and referred to seek medical attention.

### Data collection

A structured self-administered questionnaire was used to collect data. The questionnaire was filled through face-to-face interview by a trained public health specialist (first author) for those who could not read and write. The questionnaire sought information about personal characteristics such as age, gender, level of education, marital status, number of wives, number of children, residency, occupational history, previous blood donation, and history of: blood transfusion, haemodialysis, cupping, travel outside the country, malaria, hepatitis B vaccination, surgical procedures and dental treatment. History of malaria infection was determined by asking the participants whether they had ever had physician-diagnosed malaria.

### Laboratory testing

Blood samples were routinely collected from blood donors at the national blood bank. Testing of specimens was performed at the laboratories of virology unit of the national blood bank. Blood was screened for HBsAg using a hepatitis B antigen detection kit/enzyme immunoassay (PRC, Germany). Hepatitis C infection was measured with IMx HCV version 3.0 (Abott, Germany). Manufacturer's instructions were followed.

### Ethical considerations

Written consent was obtained from the respondents who agreed to participate in this study. The respondents were assured about the confidentiality of the information and that the laboratory results would not be disclosed to any other persons.

### Statistical analysis

Data are presented as frequency distributions for categorical variables. Differences in the prevalence of hepatitis between patients according to the variables examined were tested with the Pearson chi-squared test. Multivariate analysis using binary logistic regression was used to identify factors associated with HBsAg and anti-HCV. Data were analysed using *SPSS*, version 11.5. A *P*-value of less than 0.05 was considered statistically significant.

## Results

### Participant's characteristics

A total of 495 male blood donors who attended the national blood bank service of Yemen (Aden) between June and October, 2007 were approached

and invited to participate in this study. Of those, 469 (94.7%) agreed to participate in this study. Of the 469 participants, 27 (5.8%) were interviewed face to face because there were illiterate. The age of participants ranged between 18 and 59 years with a mean of 29.3 years. Their sociodemographic, clinical, and relevant characteristics are shown in Table 1. More than half of the participants (56.3%) had less than high school education. About 76% were living in Aden and 24.1% were living in other governorates. About two-thirds (64%) were donating blood for the first time.

### Prevalence of HBV and HCV

Of the 469 Yemeni blood donors, 24 (5.1%) were positive for HBsAg and 6 (1.3%) where positive for anti-HCV. The prevalence of positive HBsAg and positive anti-HCV according to sociodemographic and relevant characteristics is shown in Table 2. There was no difference in the prevalence of hepatitis B and hepatitis C in donors according to their sociodemographic status. The prevalence of hepatitis B and hepatitis C was significantly lower among those with history of blood donations ($P$ = 0.01) and higher among those with a history of blood transfusion ($P$ = 0.01), dental treatment ($P$ = 0.01), cupping ($P$ = 0.04) and malaria infection ($P$ = 0.04).

### Multivariate analysis

In the multivariate analysis (Table 3), after adjustment for all other variables, history of blood transfusion (OR = 22.8), dental treatment (OR = 3.6), cupping (OR=3.9) and malaria infection (OR = 6.8) remained significantly associated with increased odds of being positive for HBsAg. Those with history of blood donation were significantly less likely to be positive for HBsAg.

The odds of having positive anti-HCV differed significantly between participants according to the history of blood donation and history of blood transfusion. Frequent blood donors were less likely to test positive for Anti-HCV whereas those with history of blood transfusion were more likely to test positive for anti-HCV.

## Discussion

The prevalence of hepatitis B among blood donors at the national blood bank service in Aden Governorate, Yemen found in this study was 5.1%. Much higher rates (7.1%, 9.8%, 15% and 6.7 %) have previously been reported among Yemeni blood donors [8–10]. These differences in the prevalence rates might be explained by the geographical differences in the availability of services and programmes or might reflect a true reduction in prevalence over time. The prevalence of HBsAg in the general population seems to be relatively high in Yemen. In a seroepidemiological survey of hepatitis in Yemen in 1988, Scott et al. reported a prevalence of HBsAg of 12.7% [5]. Although it is difficult to compare the prevalence rates reported in our study (among blood donors) with that reported by Scott et al. (among the general population), it seems that the rate of HBsAg has decreased dramatically. Introducing hepatitis B vaccine within the national immunization programmes, improvement of the people's knowledge about hepatitis risk factors through educational programmes, and the availability of measures to diagnose hepatitis in health centres and blood banks might

**Table 1 Sociodemographic characteristics of male blood donors in Aden and their relevant history**

| Variable | No. | % ($n$ = 469) |
|---|---|---|
| ***Age (year)*** | | |
| < 25 | 132 | 28.1 |
| 25–30 | 143 | 30.5 |
| > 30 | 194 | 41.4 |
| ***Marital status*** | | |
| Single | 194 | 41.4 |
| Married | 275 | 58.6 |
| ***Occupation*** | | |
| Health worker | 31 | 6.6 |
| Military | 99 | 21.1 |
| Other | 339 | 72.3 |
| ***Education*** | | |
| < High school | 264 | 56.3 |
| ≥ High school | 205 | 43.7 |
| ***Residence*** | | |
| Aden | 356 | 75.9 |
| Other governorates | 113 | 24.1 |
| ***History of:*** | | |
| Travel outside the country | 98 | 20.9 |
| Previous blood donations | 301 | 64.2 |
| Chronic disease | 36 | 7.7 |
| Blood transfusion | 41 | 8.7 |
| Dental treatment | 167 | 35.6 |
| Cupping | 88 | 18.8 |
| Surgical procedures | 24 | 5.1 |
| Malaria infection | 90 | 19.2 |

**Table 2 Prevalence of hepatitis B and C among 469 male blood donors in Aden according to sociodemographic characteristics and relevant history**

| Variable | Hepatitis B | | *P*-value | Hepatitis C | | *P*-value |
|---|---|---|---|---|---|---|
| | No | Yes | | No | Yes | |
| | No. (%) | No. (%) | | No. (%) | No. (%) | |
| ***Age group (years)*** | | | 0.42 | | | 0.80 |
| < 25 | 127 (96.9) | 4 (3.1) | | 127 (99.2) | 1 (0.8) | |
| 25–30 | 133 (94.3) | 8 (5.7) | | 133 (98.5) | 2 (1.5) | |
| ≥ 30 | 179 (93.7) | 12 (6.3) | | 179 (98.4) | 3 (1.6) | |
| ***Marital status*** | | | 0.68 | | | 0.68 |
| Single | 183 (95.3) | 9 (4.7) | | 183 (98.9) | 2 (1.1) | |
| Married | 256 (94.5) | 15 (5.5) | | 256 (98.5) | 4 (1.5) | |
| ***Occupation*** | | | 0.41 | | | 0.77 |
| Health worker | 28 (90.3) | 3 (9.7) | | 28 (100.0) | 0 (0.0) | |
| Military | 92 (93.9) | 6 (6.1) | | 92 (98.9) | 1 (1.1) | |
| Other | 319 (95.5) | 15 (4.5) | | 319 (98.5) | 5 (1.5) | |
| ***Education*** | | | 0.53 | | | 0.77 |
| < High school | 246 (94.3) | 15 (5.7) | | 246 (98.8) | 3 (1.2) | |
| ≥ High school | 193 (95.5) | 9 (4.5) | | 193 (98.5) | 3 (1.5) | |
| ***Residence*** | | | 0.27 | | | 0.57 |
| Aden | 336 (95.5) | 16 (4.5) | | 336 (98.8) | 4 (1.2) | |
| Other | 103 (92.8) | 8 (7.2) | | 103 (98.1) | 2 (1.9) | |
| ***History of:*** | | | | | | |
| Previous blood donation | | | 0.02 | | | 0.01 |
| No | 149 (91.4) | 14 (8.6) | | 149 (96.8) | 5 (3.2) | |
| Yes | 290 (96.7) | 10 (3.3) | | 290 (99.7) | 1 (0.3) | |
| Chronic disease | | | 0.35 | | | 0.38 |
| No | 407 (95.1) | 21 (4.9) | | 407 (98.8) | 5 (1.2) | |
| Yes | 32 (91.4) | 3 (8.6) | | 32 (97.0) | 1 (3.0) | |
| Blood transfusion | | | 0.01 | | | 0.01 |
| No | 415 (97.4) | 11 (2.6) | | 415 (99.5) | 2 (0.5) | |
| Yes | 24 (64.9) | 13 (35.1) | | 24 (85.7) | 4 (14.3) | |
| Dental treatment | | | 0.01 | | | 0.01 |
| No | 294 (97.7) | 7 (2.3) | | 294 (99.7) | 1 (0.3) | |
| Yes | 145 (89.5) | 17 (10.5) | | 145 (96.7) | 5 (3.3) | |
| Cupping | | | 0.01 | | | 0.04 |
| No | 364 (96.3) | 14 (3.7) | | 364 (99.2) | 3 (0.8) | |
| Yes | 75 (88.2) | 10 (11.8) | | 75 (96.2) | 3 (3.8) | |
| Surgical procedures | | | 0.82 | | | 0.56 |
| No | 416 (94.8) | 23 (5.2) | | 416 (98.6) | 6 (1.4) | |
| Yes | 23 (95.8) | 1 (4.2) | | 23 (100.0) | 0 (0.0) | |
| Travel outside the country | | | 0.13 | | | 0.83 |
| No | 350 (95.6) | 16 (4.4) | | 350 (98.6) | 5 (1.4) | |
| Yes | 89 (91.8) | 8 (8.2) | | 89 (98.9) | 1 (1.1) | |
| Malaria infection | | | 0.01 | | | 0.04 |
| No | 363 (96.5) | 13 (3.5) | | 363 (99.2) | 3 (0.8) | |
| Yes | 76 (87.4) | 11 (12.6) | | 76 (96.2) | 3 (3.8) | |

**Table 3 Multivariate analysis of factors associated with hepatitis B and C infection among male blood donors in Aden**

| Variable | Hepatitis B | | Hepatitis C | |
|---|---|---|---|---|
| | OR (95% CI) | *P*-value | OR (95% CI) | *P*-value |
| ***History of:*** | | | | |
| Blood donation | 0.17 (0.06–0.50) | 0.01 | 0.05 (0.005–0.517) | 0.01 |
| Blood transfusion | 22.80 (7.20–72.30) | 0.01 | 65.60 (9.40–459.80) | 0.01 |
| Dental treatment | 3.60 (1.20–10.40) | 0.02 | | |
| Cupping | 3.90 (1.30–11.30) | 0.01 | | |
| Malaria infection | 6.80 (2.30–20.50) | 0.01 | | |

*OR = odds ratio; CI = confidence interval.*

explain this decrease. Many other studies in nearby countries have shown a lower prevalence of hepatitis B among blood donors, including Saudi Arabia (4.0%) [11], Egypt (4.3%) [12] and Pakistan (3.3%) [13]. This may be because there was insufficient protection for patients admitted to hospitals in Yemen. Sterilization, disinfection and general standards of training and proficiency are generally lacking in most hospitals in Yemen.

Our study demonstrated that no previous blood donation, history of blood transfusion, history of dental procedures, history of cupping and previous infection with malaria were associated with increased odds of hepatitis B infection. The significant association between HBsAg positivity and history of blood transfusion, cupping and dental treatment is consistent with the findings of other studies [14,15]. The association between previous infection with malaria and HBsAg positivity (OR = 6.8) may relate to impaired clearance of liver parasites in the presence of the reduced level of HLA class I antigen expression on hepatocytes infected by HBV [16]. In a case–control study in Gambia, the prevalence of HBV was significantly increased amongst children with severe *Plasmodium falciparum* malaria compared to matched controls [16]. Barcus et al. found a prevalence of HBV infection of 24% in adult Vietnamese patients admitted with severe *P. falciparum* malaria, which was higher than the estimated 10% prevalence of HBV in that area [17].Previous studies have shown that the prevalence rates of malaria in Yemen ranged between 12.8% and 18.6% [18–20] and males are more infected [20]. The association between HBV positivity and malaria may relate to impaired clearance of the liver-stage malaria parasites, as a result of HBV infection of the hepatocytes. Also, protein levels in the body may reflect the immunity status of an individual; hence, any adverse influence may increase the vulnerability to hepatitis B infection.

We found that 1.3% of the blood donors were positive for anti-HCV. A similar study among blood donors in Yemen reported that about 1.1% of the donors in Hajja Governorate were infected with hepatitis C [10]. Sallam et al. reported a prevalence of hepatitis C in 2003 of 0.2 % in Sana'a and 0.6 % in Aden [9]. The prevalence of hepatitis C among blood donors is higher than that reported from the neighbouring countries including Oman (0.5%) and Saudi Arabia (1.0% ) [21,22]. Such small differences in prevalence rates may be explained by methodological differences between studies.

Only history of blood donation and blood transfusion were significantly associated with HCV infection in our study. First-time blood donors were 20 times more likely to have HCV infection compared with frequent donors. This association is plausible since first-time blood donors have never been screened. The lack of an associations between HCV infection and other variables, including malaria, may be explained by the fact that only 6 people were positive for anti-HCV.

The seroprevalence rates of hepatitis B and hepatitis C are high in Yemen and nationwide efforts are required to identify infected individuals. Transmission of hepatitis B and C through unscreened blood transfusion, reuse of unsterilized syringes and medical equipment is well documented in the pertinent literature. Moreover, people having cupping, history of dental treatment, circumcision and shaving by barbers are also at increased risk due to reuse of equipment. Efforts should be made for the promotion of behaviour changes among the public and health care workers to use sterilized medical instruments and screened blood.

In conclusion, the prevalence of hepatitis B and C among blood donors in Yemen is still high compared to many other countries. Given the lack of information on the prevalence of hepatitis B and C in the general population in Yemen, we recommend a population-based study for the assessment of hepatitis B and C prevalence as a first step to implement control measures. Increased coverage of hepatitis B vaccination would further reduce that rate.

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# عيارات أضداد المستضد السطحي لفيروس التهاب الكبد البائي لدى بعض الطلاب الملقحين، كلية طب الأسنان، جامعة دمشق

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**Anti-hepatitis B surface antigen titres in vaccinated dentistry students at Damascus University**

ABSTRACT Dental practice carries considerable danger for acquiring bloodborne pathogens such as hepatitis B virus (HBV). Vaccination against this virus is an important approach to reducing the infection. Post-vaccination test to confirm the seroconversion is important also. Over the period 1 March–31 May 2010, we assessed the efficacy of HBV vaccination among 91 fourth-year dental students at Damascus University, who were vaccinated under the mandatory Faculty of Dentistry programme. Anti-HBsAg antibody titres were determined in the blood samples using an enzyme immunoassay to measure; ≥ 10 IU/mm was considered an adequate response titer. Seven of the 91 dentistry students (7.7%) had anti-HBs antibody titre < 10 mIU/mL. The frequency of unresponsiveness was significantly higher with smoking ($P = 0.012$) and alcohol consumption ($P = 0.014$). Anti-HBs test should be included in routine immunization services of the School of Dentistry at Damascus University.

**الخلاصة:** تحمل ممارسة طب الأسنان خطراً كبيراً لاكتساب عوامل مُسببة للأمراض منقولة بالدم، مثل فيروس التهاب الكبد بي. ويعد التلقيح المضاد لهذا الفيروس من الأساليب الهامة المتبعة لتقليص العدوى. كما يعد إجراء اختبار تالٍ للتلقيح للتحقق من الانقلاب المصلي هاماً أيضاً. وقد أجرى الباحثون تقييماً لكفاءة التلقيح ضد فيروس التهاب الكبد بي في المدة من الأول من آذار/ مارس وحتى 31 أيار/ مايو 2010؛ وشملت الدراسة 91 طالباً في السنة الرابعة لطب الأسنان في جامعة دمشق، ممن تلقوا التلقيح وفق البرنامج الإلزامي لكلية طب الأسنان؛ فقاس الباحثون عيارات أضداد المستضد السطحي لالتهاب الكبد بي في الدم بالمقايسة المناعية الإنزيمية، مع اعتبار العيارات التي تساوي أو تزيد عن 10 وحدات دولية/ ميلي متر مكعب استجابة كافية، ووجد الباحثون أن سبعة طلاب من بين 91 طالباً (7.7٪) لديهم عيار أضداد المستضد السطحي لالتهاب الكبد أقل من 10 وحدات دولية/ ميلي متر مكعب. ووجد الباحثون أن معدل تكرار عدم الاستجابة يكون أعلى مع التدخين (قوة الاحتمال $P = 0.012$)، ومع تعاطي الكحول (قوة الاحتمال $P = 0.014$). إن قياس عيار أضداد المستضد السطحي لالتهاب الكبد بي ينبغي أن يكون روتينياً ضمن خدمات التمنيع لكلية طب الأسنان في جامعة دمشق.

**Titres des anticorps contre les antigènes de surface du virus de l'hépatite B chez des étudiants vaccinés en faculté dentaire de l'Université de Damas**

RÉSUMÉ La pratique des soins dentaires comporte un risque important d'infection par des agents pathogènes à transmission hématologique comme le virus de l'hépatite B. La vaccination contre ce virus représente un outil majeur pour réduire le nombre d'infections. Le test post-vaccinal pour confirmer la séroconversion est également important. Pendant la période du 1er mars au 31 mai 2010, nous avons évalué l'efficacité de la vaccination contre le virus de l'hépatite B chez 91 étudiants en quatrième année de la faculté dentaire de l'Université de Damas qui avaient été vaccinés dans le cadre du programme de vaccination obligatoire de l'établissement. La méthode immunoenzymatique a été utilisée pour déterminer les titres d'anticorps contre l'antigène de surface du virus de l'hépatite B dans les échantillons de sang ; un résultat supérieur ou égal à 10 IU/mm a été considéré comme une réponse adéquate des anticorps. Sept étudiants sur 91 (7,7 %) ont présenté des titres d'anticorps contre les antigènes de surface du virus de l'hépatite B inférieurs à 10 mIU/ml. La fréquence de non-réponse était nettement supérieure chez les étudiants consommant du tabac (P = 0,012) et de l'alcool (P = 0,014). Le test des anticorps devrait être inclus dans les services de vaccination systématique de la faculté dentaire de l'Université de Damas.

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الاستلام: 10/10/26، القبول: 10/12/21

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## المقدمة

تعتبر العدوى بفيروس التهاب الكبد البائي واحداً من أهم عشرة أمراض مسببة للوفاة حول العالم [1]، وتشير التقديرات إلى أن أكثر من 378 مليون شخص (6٪ من سكان العالم) يحملون عدوى مزمنة بفيروس التهاب الكبد البائي [2].

وقد أثبتت الدراسات الوبائية في السبعينيات من القرن الماضي أن انتشار التهاب الكبد البائي ضمن العاملين في مجال الرعاية الصحية أعلى بعشر مرات من انتشاره بين أفراد المجتمع، الأمر الذي أدى لبدء حملات التمنيع واتباع الاحتياطات القياسية لتجنب التعرض للدم وسوائل الجسم الأخرى منذ بداية الثمانينيات [2].

وفي هذا السياق يعتبر اللقاح ضد فيروس التهاب الكبد البائي وسيلة فعالة واقتصادية في كبح العدوى [3, 4]، وتستعمل أغلب بلدان العالم اللقاح الحاوي على المستضد السطحي لفيروس التهاب الكبد البائي المأشوب والذي أصبح متاحاً في عام 1986 [2, 5]. وفي عام 1992 أوصت منظمة الصحة العالمية بتبني هذا اللقاح في جميع أنحاء العالم ، بهدف استئصال هذه العدوى [5]، وفي سوريا يعطى ثلاث جرعات من اللقاح (0.5 مل) ضمن برنامج التلقيح الوطني: الأولى عند الولادة والثانية في بداية الشهر الثالث والثالثة في بداية الشهر السابع [6]، على أن هذا البرنامج لم يشمل عينة هذه الدراسة، ويصنف عدد من الباحثين هذا اللقاح على أنه أول لقاح ضد أحد أكبر السرطانات البشرية شيوعاً وهو السرطان الكبدي، حيث أنه لا يقي من السرطان فقط وإنما من الالتهاب الكبدي الصاعق الناجم عن فيروس التهاب الكبد البائي [2, 3].

تتمثل الاستجابة للقاح المعطى بتشكيل أضداد المستضد السطحي لفيروس التهاب الكبد البائي و التي تلاحظ في 90٪–95٪ من الحالات بعد شهر واحد من إتمام جدول التلقيح [2]، وعلى الرغم من أن هذا اللقاح آمن وفعال بنسبة 90٪–95٪، إلا أن بعض المشكلات يمكن أن تحدث، حيث أن نسبة مهمة من الأشخاص لم يستجيبوا أبداً أو بشكل كاف لعملية التلقيح [3]، لذلك كان من الضروري توثيق الاستجابة المناعية بعد اللقاح، وخاصة عند الفئة عالية الخطورة كالعاملين في مجال طب الأسنان [7]، كما تشير الدراسات أن هنالك فقداناً مهماً في الأضداد يحدث بعد 10–15 سنة من اللقاح، والقليل من الملقحين قد حافظ على كمية أضداد أكثر من 100 وحدة دولية/ لتر ومع ذلك فإن هذا الفقد لم يؤدِ لحالات عدوى بالفيروس [8]، حيث ينجح الأشخاص الذين فقدوا هذه الأضداد مع الوقت، في الحصول على استجابة مناعية إدكارية سريعة عندما يقدم لهم جرعة إضافية داعمة من اللقاح بعد عدة سنوات من تلقيهم للقاح حسب جدول التلقيح الأولي، أو عندما يتعرضون لفيروس التهاب الكبد البائي، و هذا يعني أن الذاكرة المناعية تجاه المستضد السطحي لفيروس التهاب الكبد البائي تحتفظ بأضداد له لفترة طويلة من الزمن [9] لذلك لا يوصى بإعطاء جرعات داعمة للأشخاص الذين تلقوا جدول التلقيح الأولي بنجاح [8]، واستناداً لذلك تقرر حديثاً أن فعالية اللقاح تدوم مدى الحياة [10].

وفي نفس السياق: يعتبر فحص أضداد المستضد السطحي لفيروس التهاب الكبد البائي إجراءً هاماً عند العاملين في مجال الرعاية الصحية ، حيث يُجرى الفحص بعد شهر إلى ستة أشهر من إتمام برنامج التلقيح [11]. ولا يمكن الجزم بحدوث حماية كافية تقي أطباء الأسنان من العدوى بفيروس التهاب الكبد البائي ما لم يتم توثيق الانقلاب المصلي الفعال [12]، وقد قدمت كلية طب الأسنان في جامعة دمشق لقاح Engerix-B (وهو من أول اللقاحات المرخصة) لطلابها بشكل موثق وفق برنامج إلزامي لأول جرعتين من اللقاح فقط، بدءاً من عام 2007 وفي ظل غياب إجراء فحص أضداد المستضد السطحي لفيروس التهاب الكبد البائي للتثبت من نجاح عملية التلقيح لدى الطلاب المتلقين لهذا اللقاح كانت دراستنا.

## المواد والطرق

جرى العمل في عيادة قسم طب الفم في كلية طب الأسنان بجامعة دمشق، بعد أن تم توقيع موافقة مستنيرة (informed consent) من قبل 91 متبرع من طلاب الصف الرابع في كلية طب الأسنان بجامعة دمشق، المتلقين لجدول التلقيح الكامل والمنتظم من الكلية ذاتها (تمثل هذه العينة حوالي 30٪ من مجموع طلاب الصف الرابع) تم أخذ عينات دم وريدي (4 مل تقريباً من الوريد المرفقي) بواسطة أدوات عقيمة وتستعمل لمرة، ثم تم تثفيل هذه العينات بسرعة 5500 دورة بالدقيقة بدرجة حرارة 25 درجة مئوية ولمدة عشرة دقائق، بعد ذلك تم قياس أضداد المستضد السطحي لفيروس التهاب الكبد البائئ مباشرة (anti-HBs antibody) بواسطة تقنية المقايسة المناعية الأنزيمية microparticle enzyme immunoassay، مع اعتبار الشخص الذي يملك عيار أضداد أقل من 10 مل وحدة دولية/ مل (nonreactive) غير حاصل على مناعة ضد العدوى بفيروس التهاب الكبد البائي، أما الشخص الذي يملك عيار أضداد أعلى أو يساوي 10 ملتر وحدة دولية/ مل فهو (reactive) أي شخص استجاب مناعياً، وذلك حسب تعليمات الشركة المنتجة .

## الدراسة الإحصائية

تألفت عينة البحث من 91 طالباً (55 ذكر و36 أنثى) تراوحت أعمارهم بين 20 و29 عاماً وسطياً 22.7 ± 2.0 عام (23.3 ± 2.2 للذكور، 21.8 ± 1.2 للإناث)، المتوسط الحسابي لمؤشر كتلة الجسم (BMI body mass index) لعموم العينة 22.98 ± 3.28 (24.09 ± 3.13 ذكور ، 21.29 ± 2.77 إناث)، النسبة المئوية للمدخنين 29.7٪ (100٪ ذكور) وتناول الكحول 20.9٪ (100٪ ذكور) وكان المتوسط الحسابي لمدة اخر جرعة بالأشهر هي 11.64 ± 5.15 شهر.

تمت معالجة البيانات وفق برنامج (SPSS version 13) وتم إجراء التحليل الإحصائي لبيان العلاقة بين الاستجابة المناعية للتلقيح وكل من الجنس وعادة التدخين والكحول باستخدام اختبار K2، واستخدم اختبار Student *t* لإيجاد العلاقة بين الاستجابة المناعية للتلقيح ومؤشر كتلة الجسم ومدة آخر جرعة، تعتبر النتائج ذات دلالة إحصائية عندما يكون $P < 0.05$.

## النتائج

أظهرت النتائج الأولية وجود ستة ذكور لم يستجيبوا مناعياً لجدول التمنيع (حصلوا على عيار أضداد أقل من 10 مل وحدة دولية/ مل)، مقابل أنثى واحدة غير مستجيبة، كما كان الطلاب المدخنون والطلاب الذين يتناولون الكحول ذو احتمال أكبر لعدم الاستجابة بالمقارنة مع الطلاب الذين لا يمارسون هذه العادات، وكان العدد الإجمالي من الطلاب الذين لم يستجيبوا مناعياً للتلقيح سبعة طلاب.

يبين الجدول رقم (2) أنه لا تأثير لمتغير الجنس على الاستجابة المناعية للتلقيح ضد فيروس التهاب الكبد البائي، في حين كانت عادة

جدول 1 يبين نتائج الاستجابة المناعية للتلقيح ضدّ التهاب الكبد البائي في عينة البحث وفقاً لكل من جنس الطالب وعادة التدخين وعادة تناول الكحول

| المتغير المدروس | الفئة | عدد الطلاب | | | النسبة المئوية | | |
|---|---|---|---|---|---|---|---|
| | | Nonreactive | Reactive | المجموع | Nonreactive | Reactive | المجموع |
| جنس الطالب | ذكر | 6 | 49 | 55 | 10.9 | 89.1 | 100 |
| | أنثى | 1 | 35 | 36 | 2.8 | 97.2 | 100 |
| عادة التدخين | غير مدخّن | 2 | 62 | 64 | 3.1 | 96.9 | 100 |
| | مدخّن | 5 | 22 | 27 | 18.5 | 81.5 | 100 |
| عادة تناول الكحول | لا يتناول الكحول | 3 | 69 | 72 | 4.2 | 95.8 | 100 |
| | يتناول الكحول | 4 | 15 | 19 | 21.1 | 78.9 | 100 |
| | عينة البحث كاملةً | 7 | 84 | 91 | 7.7 | 92.3 | 100 |

جدول 2 يبين نتائج اختبار كأي مربع لدراسة تأثير كل من جنس المريض وعادة التدخين وعادة تناول الكحول على تكرارات الاستجابة المناعية للتلقيح ضد فيروس التهاب الكبد البائي في عينة البحث

| المتغير التابع = الاستجابة المناعية للتلقيح ضدّ فيروس التهاب الكبد البائي | | | | | |
|---|---|---|---|---|---|
| المتغير المستقل | عدد الطلاب | قيمة كاي مربع | درجات الحرية | قيمة مستوى الدلالة المقدرة | دلالة الفروق |
| جنس الطالب | 91 | 2.026 | 1 | 0.155 | لا توجد فروق دالة |
| عادة التدخين | 91 | 6.337 | 1 | 0.012 | توجد فروق دالة |
| عادة تناول الكحول | 91 | 6.037 | 1 | 0.014 | توجد فروق دالة |

جدول 3 يبين نتائج اختبار **T** ستيودنت للعينات المستقلة لدراسة دلالة الفروق في متوسط كل من العمر والوزن والطول ومشعر كتلة الجسم **BMI** ومدة آخر جرعة بين مجموعة الحالات التي كان فيها التلقيح غير فعّال ومجموعة الحالات التي كان فيها التلقيح فعّالاً في عينة البحث

| المتغير المدروس | نمط الاستجابة المناعية | عدد الطلاب | المتوسط الحسابي | الانحراف المعياري | الفرق بين المتوسطين | قيمة t المحسوبة | قيمة مستوى الدلالة | دلالة الفروق |
|---|---|---|---|---|---|---|---|---|
| العمر (بالسنوات) | nonreactive | 7 | 25.14 | 2.73 | 2.64 | 3.600 | 0.001 | توجد فروق دالة |
| | reactive | 84 | 22.50 | 1.79 | | | | |
| الوزن (بالكغ) | nonreactive | 7 | 78.14 | 13.22 | 10.69 | 1.947 | 0.055 | لا توجد فروق دالة |
| | reactive | 84 | 67.45 | 14.01 | | | | |
| الطول (بالسنتمترات | nonreactive | 7 | 176.29 | 8.58 | 4.99 | 1.333 | 0.186 | لا توجد فروق دالة |
| | reactive | 84 | 171.30 | 9.57 | | | | |
| BMIمشعر كتلة الجسم | nonreactive | 7 | 25.10 | 3.35 | 2.29 | 1.800 | 0.075 | لا توجد فروق دالة |
| | reactive | 84 | 22.81 | 3.23 | | | | |
| مدة آخر جرعة من اللقاح (بالأشهر) | nonreactive | 7 | 14.29 | 6.68 | 2.87 | 1.424 | 0.158 | لا توجد فروق دالة |
| | reactive | 81 | 11.41 | 4.98 | | | | |

التدخين و عادة تناول الكحول ذات علاقة في إنقاص فعالية الاستجابة للتلقيح عند الطلاب الذين يملكون هذه العادات.

يبين الجدول رقم (3) أنه كلما ازداد العمر تنخفض الاستجابة المناعية للتلقيح، كما لم يوجد لباقي المتغيرات المدروسة (الوزن والطول ومؤشر كتلة الجسم ومدة آخر جرعة) علاقة بالاستجابة المناعية للتلقيح ضد التهاب الكبد البائي.

## المناقشة

تتجلى أهمية هذه الدراسة بكونها أول دراسة من نوعها تجرى على طلاب طب الأسنان في جامعة دمشق، وفي كونها تسلط الضوء على أهمية إجراء فحص أضداد المستضد السطحي لفيروس التهاب الكبد البائي، على أنه السبيل الوحيد لتأكيد نجاعة التلقيح، ووضع الهيئة المسؤولة عن تلقيح الطلاب (كلية طب الأسنان) أمام مسؤوليتها عن تبعات عدم إجراء هذا الفحص، التي تكمن بعدم اكتشاف الطلاب الذين لم تحوِ مصولهم على أضداد المستضد السطحي لفيروس التهاب الكبد البائي رغم تلقيهم للقاح، وبالتالي هم معرضين بدرجة كبيرة للعدوى بفيروس التهاب الكبد البائي، في ظل التأكيد على استمرار اعتبار التهاب الكبد البائي مشكلة صحية في سوريا، مع نسبة انتشار (5.62٪) [13]، وفي ظل شيوع حوادث التعرض المهني وبخاصة إصابات الوخز أثناء الممارسة السنية [14]، ومن الجدير بالذكر أن هذه الدراسة لم تشمل كل الطلاب الملقحين في كلية طب الاسنان–جامعة دمشق، كما تم استثناء ثلاثة طلاب من العينة لم يتلقوا الجرعة الثالثة من اللقاح، الأمر الذي يطرح تحدٍ آخر.

أظهرت الدراسة التي شملت 91 من طلاب طب الأسنان في جامعة دمشق الذين أبلغوا عن تلقيهم اللقاحات حسب جدول تمنيع منتظم (ثلاث جرعات وفق جدول زمني لثلاث جرعات متباعدة 0، 1، 6 شهراً على التوالي)، أن 92.3٪ يملكون عياراً للأضداد ≤ 10مل وحدة دولية/مل

(مستجيبين مناعياً للتلقيح) بينما 7.7٪ كانوا يملكون أضداد < 10 مل وحدة دولية/ ل ( غير مستجيبين)، وهذا يتفق مع دراسة إيرانية حديثة تناولت الاستجابة المناعية للقاح التهاب الكبد البائي لدى طلاب طب الأسنان في جامعة همدان حيث كانت نسبة عدم الاستجابة للطلاب المتلقين لثلاث جرعات 7٪ [11] مع العلم أن عدد من الباحثين أكدوا أن نسبة حدوث الاستجابة المناعية الكافية للتلقيح هي من 90 –95٪ [2, 3, 11]، ويعزى السبب لعيب في الاستجابة المناعية لقبط المستضد والذي يمكن أن ينتج عن ضعف استجابة النمط الثاني من الخلايا التائية المساعدة التي تحرض الخلايا المناعية البائية على إنتاج أضداد المستضد السطحي لفيروس التهاب الكبد البائي [15]، كما وجدت دراسة أخرى زيادة مهمة في معقد التوافق النسيجي الكبير (major histocompatibility complex) لدى الأشخاص غير المستجيبين للتلقيح والذي يلعب دور مهم في التعرف المناعي على المستضد، نقلاً عن [16] كما وجدت زيادة معتبرة لدى غير المستجيبين أيضاً في مستضدات الكريات البيض البشرية HLA human leukocyte antigens [17]، كما وقد يعود سبب عدم الاستجابة لانخفاض في تنشيط الخلايا القاتلة الطبيعية (natural killer) والخلايا التائية القاتلة الطبيعية (natural killer T cells) عند الأشخاص غير المستجيبين للتلقيح، حيث تلعب هذه الخلايا دور هام أيضاً في الاستجابة المناعية للقاح ضد فيروس التهاب الكبد البائي [18].

وبالنسبة لغير المستجيبين للتلقيح فإن 47٪ منهم سوف تتطور لديهم استجابة بعد جرعة إضافية ثانية وأن 42٪ من البقية ستتطور لديهم بعد جرعتين داعمتين و69٪ من الذين تبقوا ستتطور لديهم الاستجابة بعد ثلاث جرعات [19].

أظهرت هذه الدراسة أن الاستجابة المناعية للتلقيح عند الإناث هي أفضل من الاستجابة المناعية للتلقيح عند الذكور ولكن بدون وجود علاقة دالة إحصائياً وهذا ما يتفق مع ما جاء في كثير من الدرسات السابقة على أن هذه النتيجة لم تملك تفسير واضح إلى الآن [11, 20, 21] وفي مجتمعنا الشرق أوسطي، قد تلعب شيوع بعض العادات السيئة كتناول التبغ والكحول لدى الذكور أكثر من الإناث دور في انخفاض الاستجابة المناعية لعملية التلقيح لدى الذكور.

حيث أظهرت هذه الدراسة أن غير المدخنين أكثر استجابة للتلقيح من المدخنين وقد يعود ذلك لتناقص نسبة الخلايا المساعدة/ الخلايا الكابتة (الناجم عن زيادة الخلايا اللمفاوية التائية الكابتة) [22]، بالإضافة لتغيرات مناعية تشمل البالعات السنخية وكبح وظيفة الخلايا القاتلة الطبيعية [23]، مع العلم بوجود دراسات حديثة درست العلاقة بين التدخين وفعالية التلقيح، وقد أظهرت أن فعالية التلقيح تكون أفضل عند غير المدخنين، بدون علاقة يعتد بها إحصائياً [11, 20, 21].

كما أظهرت دراستنا أن الطلاب الذين يتناولون الكحول أقل استجابة لبرنامج التلقيح من الطلاب الذين لا يتناولونه، وقد يعود ذلك لتأثير الكحول السلبي المثبت على الوظيفة الكبدية وما يرافقه من ضعف التغذية الأمر الذي ينعكس سلباً على الحالة المناعية [20].

وأظهرت هذه الدراسة أن الاستجابة المناعية للتلقيح أفضل عند الأقل بدانةً من البدينين على الرغم من عدم وجود علاقة دالة إحصائياً وهذا يتفق مع الدراسات السابقة [11, 20] مع العلم أن قيم عمر الطالب (بالسنوات) في مجموعة الحالات التي كان فيها التلقيح غير فعّال كانت أكبر منها في مجموعة الحالات التي كان فيها التلقيح فعّالاً في عينة البحث، وهذا يتفق مع Sangfelt وزملاءه [21]، ويعود ذلك إلى حدوث تبدل في قدرة الخلية البائية على تمييز المستضد بشكل نوعي مع التقدم بالسن، كما وأن هناك دلائل على وجود خلل في انتظام الخلايا التائية عند كبار السن، متضمنة انخفاض الاستجابة التكاثرية وبالتالي تؤثر على مساعدة الخلايا البائية وبالتالي تتبدل عملية انتاج الأضداد [24].

وعلى الرغم من أن هذه الدراسة لم تظهر علاقة دالة إحصائياً بين الزمن المنقضي على تناول الجرعة الأخيرة وإجراء الدراسة من جهة والاستجابة المناعية إثر التلقيح من جهة أخرى، إلا أن الكثير من الدراسات أشارت إلى أن عيار الأضداد ينخفض مع الوقت ، فأظهرت وجود ارتفاع في نسبة الاستجابة المناعية كلما كان زمن المعايرة قريباً من زمن الجرعة الثالثة والأخيرة من اللقاح، حيث كانت الاستجابة خلال السنوات الثلاث الأولى من التلقيح 96.7٪ وانخفضت هذه النسبة بعد السنوات الخمس الأولى من اللقاح لتصل حتى 87.1٪ [11]، و قد يعزى الاختلاف إلى التقارب الكبير بين الفترات الفاصلة بين آخر جرعة و بدء هذه الدراسة لدى عينة البحث في دراستنا، حيث خضع الطلاب في آن واحد تقريباً لبرنامج التلقيح الإلزامي في كلية طب الأسنان بجامعة دمشق.

## الاستنتاجات

يعتبر فحص أضداد المستضد السطحي لفيروس التهاب الكبد البائي ذو أهمية كبيرة للتأكد من حدوث الاستجابة المناعية لدى طلاب طب الأسنان وكفاية هذه الاستجابة وتوثيقها، ولابد من إدخال هذا الفحص ضمن برامج التلقيح الإلزامي لدى كلية طب الأسنان في جامعة دمشق، حيث يعتبر غياب هذا الإجراء عيباً في هذه البرامج، وهو يعرض مجموعة معتبرة من أطباء المستقبل لخطر العدوى بالتهاب الكبد البائي، الأمر الذي إن وقع سيؤدي لتأثيرات نفسية معقدة على طالب طب الأسنان قد تودي بحياته المهنية، في ظل اعتباره مصدر عدوى مرتفع الخطورة لنقل العدوى إلى مرضاه، ونقترح أن يكون هذا الفحص كما اللقاح مجانياً وملزماً لرفع درجة الامتثال له، ونوصي بمزيد من الدراسات حول الدور المحتمل لتعاطي التدخين و الكحول في خفض الاستجابة المناعية للتلقيح ضد فيروس التهاب الكبد البائي.

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# Management of diarrhoea cases by community pharmacies in 3 cities of Pakistan

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**معالجة حالات الإسهال من قِبَل الصيدليات المجتَمَعيَّة في ثلاثة مدن في باكستان**

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**الخلاصة:** تحظى الصيدليات المجتَمَعيَّة بالتقدير نظراً لدورها المحتمل في معالجة الاعتلالات الشائعة. وقد هَدَفَتْ هذه الدراسة المستعرضة إلى توثيق معالجة المجتمع حالات الإسهال من قِبَل الصيدليّات المجتَمعيَّة في ثلاثة مدن باكستانيَّة. وقد أجرى الباحثان 371 زيارة لصيدليات تم اختيارها عشوائياً، وقصدها الباحثان التماساً للمشورة حول حالات مُفْتَرَضَة من الإسهال عند الأطفال. وقد قدَّر الباحثان للمعالجة أحرازاً وفقاً لقائمة تفقُّدية تتضمن أخذ القصّة المرضية، والنصائح، والمعلومات المقدَّمة من قِبَل الصيدليات. ووَجَدَ الباحثان أن من يقدم الخدمة في 97.2٪ من الزيارات هو مندوب المبيعات، في حين يقدِّمها الصيدلي في 2.2٪ من الزيارات، وأن الأدوية تُصْرَف في 77.1٪ من الزيارات، ومن بين الأدوية التي صُرِفت كان 58.7٪ من مضادات الأميبات، و14٪ من المضادات الحيوية، و18.9٪ من مضادات الإسهال، و8.4٪ فقط من أملاح تعويض السوائل عن طريق الفم. ولم يتوافق أيُّ نظام علاجي منها مع الوصفات المعيارية. ولم تكن تقدَّم أيُّ شُرُوحات للزبائن حول نظام الجرعات إلا في 52.6٪ من الحالات. واتضح للباحثين أن الأمور التي ينبغي التَّعاطي معها تشمل سلامة الدواء، والعاملين غير المؤهلين، وعدم أخذ القصّة المرضية، والمعالجة غير الملائمة، والتقصير في تقديم المشورة.

ABSTRACT Community pharmacies are valued for their potential role in the management of common ailments. This cross-sectional study aimed to document the management of diarrhoea by community pharmacies in 3 cities in Pakistan. Visits were performed to 371 randomly selected pharmacies to request advice for a simulated paediatric case of diarrhoea. The pharmacy's management was scored on a checklist including history taking and provision of advice and information. Customers were served by a salesperson in 97.3% of visits and by a pharmacist in only 2.2%. Medication was dispensed in 77.1% of visits. Of the medications dispensed, 58.7% were antiamoebics, 14.0% antibiotics and 18.9% antidiarrhoeals; only 8.4% were oral rehydration salts. None of the regimens matched with a standard prescription. The dosage regimen was explained to the customer in only 52.6% of cases. Drug safety, unqualified personnel, lack of history taking, inappropriate treatment and lack of counselling are concerns to be addressed.

**Prise en charge des cas de diarrhée en pharmacies communautaires dans trois villes du Pakistan**

RÉSUMÉ Les pharmacies communautaires sont précieuses pour leur rôle potentiel dans la prise en charge des affections courantes. La présente étude transversale visait à documenter la prise en charge des cas de diarrhée en pharmacies communautaires dans trois villes du Pakistan. Des visites ont été faites dans 371 pharmacies sélectionnées aléatoirement afin de solliciter des conseils sur un cas simulé de diarrhée chez un enfant. Une liste de vérification incluant l'interrogation sur les antécédents, et les conseils et les informations donnés a été utilisée pour évaluer la prise en charge au sein de l'officine. Les clients ont été servis par un vendeur dans 97,3 % des cas et par un pharmacien dans 2,2 % des cas. Par ailleurs, 77,1 % des visites se sont conclues par la délivrance de médicaments. Parmi ceux-ci, 58,7 % étaient des antiamibiens, 14,0 % des antibiotiques et 18,9 % des antidiarrhéiques ; seuls 8,4 % étaient des sels de réhydratation par voie orale. Aucun des schémas thérapeutiques proposés ne correspondait à une prescription normalisée. La posologie a été expliquée au client dans 52,6 % des cas uniquement. La non-garantie de l'innocuité des médicaments, le personnel non qualifié, l'absence d'interrogation sur les antécédents, un traitement inapproprié et l'absence de conseils sont des lacunes auxquelles il faut s'attaquer.

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Received: 25/10/10; accepted: 20/01/11

## Introduction

Community pharmacies are valued for their potential role in the management of common ailments [1]. In many low-income countries, dispensers provide a variety of drugs, ranging from simple over-the-counter remedies to steroids and antibiotics [2–5], and also give injections to patients in their retail outlets [6]. Management of any ailment, however, requires appropriate history taking and counselling of patients by the dispensers and an understanding of when to refer patients with more serious conditions. Research from developing countries shows that dispensers working in community pharmacies rarely possess the adequate knowledge and skills for effective disease management, even though of necessity they are extensively involved in it [2,7–13].

Evidence about the quality of services provided by community pharmacies in Pakistan is limited. The available literature indicates that the standard of practice is low [14–16]. If pharmacies are to contribute effectively to health care, the barriers to the provision of higher quality care need to be identified, especially the problem of irrational prescribing. It has been reported that antidiarrhoeal drugs (e.g. metronidazole, bismuth subsalicylate) and combinations of antidiarrhoeals and antibiotics (e.g. furazolidone and metronidazole) are recommended and sold by pharmacies without considering therapy with oral rehydration salts [7]. This research was conducted to document and compare the case management of diarrhoea by community pharmacies in 3 major urban areas of Pakistan.

## Methods

The cross-sectional survey was conducted between April and June 2008. Standard visits were performed to collect information on case management of diarrhoea in terms of history taking and provision of advice and information at community pharmacies. The study was approved by the panel of experts at the research and development wing of the Drug Control Organization at the Pakistan Ministry of Health.

### Sampling of pharmacies and respondents

The study population was all community pharmacy outlets selling allopathic medicines, or homeopathic or herbal medicines if sold alongside allopathic medicines. Any shop meeting this definition constituted the sampling unit; the sampling element included the dispenser and patients/customers visiting these pharmacies. Visits to request treatment advice for a patient were made to 371 pharmacies using convenience sampling in the 3 cities: Islamabad ($n$ = 118), Peshawar ($n$ = 120) and Lahore ($n$ = 133).

### Data collection tool

The data collection tool was adopted from the World Health Organization manual *How to investigate drug use in health facilities* [17] and modified according to the objectives of the study. Focus group discussions were carried out with community pharmacists, drug inspectors, academics and members of consumer groups to discuss the content of the tool. Face and content validity were built through a panel of pharmacy research experts, community pharmacists and statisticians and by pilot testing. Cronbach alpha, applied to assess the reliability and internal consistency of the data, was 0.69 [18].

The observation form included 24 items covering: demographic characteristics of the patient, history of the illness, history of medication use, general medical history, outcome of the visit (medication dispensed or referral to physician) and advice regarding the dose, frequency, duration, use and side-effects of any medication dispensed.

Case management was assessed with 2 subscales. The first scored the pharmacy outlet's compliance with 5 items about history taking: patient's age, patient's weight, history of illness, history of medication use and other medical history. The second checklist scored the outlet's compliance with 5 items concerning provision of information about the medication dispensed in terms of: dose, frequency of doses, duration of use, effect of the drug and side-effects/precautions in use. In both scales the scores were computed on the basis of 1 = yes and 2 = no, so the total score was between 5–10 with lower scores indicating better management and better compliance. The 2 subscales were considered as the minimum standard of history taking and provision of medication information. The form included additional information such as provider type, location of pharmacy, type of licence, dispensing time, outcome of the visit (medication dispensed or referral to physician), suggestions of remedy, any additional questions asked by the dispenser and advice given by the dispenser.

### Data collection

Data was collected by trained data collectors after obtaining permission from the relevant drug inspectors. Local leaders of chemist and druggist associations were also contacted and informed about the study. The data collectors were local students in their final year of the Doctor of Pharmacy programme and were trained by the group of experts including the principal investigator who visited all 371 pharmacies. In Islamabad and Lahore data collectors were both male and females; however due to cultural norms in Peshawar only male data collectors were employed.

The data collector presented him/herself as the elder sibling of a 5-year-old male child with a complaint of diarrhoea and stated that he/she wanted to buy drugs for medical treatment. Other than the standard complaint/symptoms (abdominal cramping; watery diarrhoea with no blood present; no history of

fever), no information was presented unless asked for by the dispenser. One visit was made to each selected pharmacy and the data collectors recorded the management of the encounter at the end of each visit using the structured observation form. They documented any questions that the pharmacy attendant/dispenser asked before making a recommendation, including any discussion on the need for medication and on alternative therapy/advice, any explanation given about the product recommended; and any advice, such as how to treat the condition or when to see a doctor. Any product that was finally recommended was purchased in the quantities suggested. The principal investigator ensured that the observation forms of each pharmacy were compiled and labelled with the name and location of the pharmacy. The observation forms were brought back to the principal investigator the following day.

The therapy proposed by dispensers was compared for right drug, right dose, frequency, duration, strength and use with a standard rational prescription by a physician.

### Data analysis

The data were sorted for any missing data and coded and entered in *SPSS*, version 16. Statistical analysis was undertaken to compare case management of diarrhoea by community pharmacies with reference to independent variables such city, area (urban/rural), location of pharmacy (in supermarket, in small market or near hospital) and type of dispenser (salesperson, trained pharmacy assistant or pharmacist). Kruskal–Wallis and Mann–Whitney tests were performed to assess differences at 95% confidence interval.

## Results

### Background characteristics of pharmacies

Of the 371 community pharmacies visited, 118 (31.8%) were located in Islamabad, 120 (32.4%) in Peshawar and 133 (35.8%) in Lahore. Overall 77.4% were located in urban areas and 22.6% in rural areas. The community pharmacies were located near hospitals in 42.9% of cases, supermarkets in 37.0% or small markets in 20.2%. Just over one-quarter of the pharmacies (26.0%) had a type A licence, 50% type B and 18%. type C (6.0% did no display their license); narcotic licenses had been issued to 35.8% of community pharmacies. One-fifth of community pharmacies (20.2%) were doing extemporaneous compounding of medications. The simulated patients were served by a pharmacy salesperson in 97.3% of visits, by a pharmacist in 2.2% and pharmacy assistant in 0.5%.

### History taking

The scores on the history-taking observation checklist showed that patients' age was enquired about in 83.3% of visits to pharmacies and history of current illness in 28.6% of visits. Only rarely did the pharmacy personnel ask about history of medication use, medical history other than the current episode of illness or the patient's weight (i.e. the child in the simulated case) (Table 1).

### Outcome of visit

Medication was dispensed in 77.1% of the visits, while in 15.1% of cases the customer was referred directly to a physician; in a few cases the patient was referred but a remedy was also suggested and in some cases the patient was not referred and no remedy was suggested (Table 1).

### Medications dispensed

Of the visits where drugs were dispensed 58.7% were for antiamoebic drugs (e.g. metronidazole), 14.0% antibiotics (e.g. sulfamethaxazole, nalidixic acid) and 18.9% antidiarrhoeals (bismuth subsalicylate); oral rehydration salts

**Table 1 Management of acute diarrhoea by community pharmacies in 3 cities of Pakistan: history taking and outcome of visit**

| Pharmacy action | Islamabad (*n* = 118) | | Peshawar (*n* = 120) | | Lahore (*n* = 133) | | Total (*n* = 371) | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| History taking | | | | | | | | |
| Patient's age | 88 | 74.6 | 96 | 80.0 | 125 | 94.0 | 309 | 83.3 |
| Patient's weight | 0 | 0.0 | 1 | 0.8 | 3 | 2.3 | 4 | 1.1 |
| Illness history | 36 | 30.5 | 30 | 25.0 | 40 | 30.1 | 106 | 28.6 |
| Medication history | 21 | 17.8 | 1 | 0.8 | 7 | 5.3 | 29 | 7.8 |
| Other medical history | 6 | 5.1 | 2 | 1.7 | 0 | 0.0 | 8 | 2.2 |
| Outcome of visit | | | | | | | | |
| Medication dispensed | 99 | 83.9 | 90 | 75.1 | 97 | 72.9 | 286 | 77.1 |
| Patient referred directly to physician | 15 | 12.7 | 19 | 15.8 | 22 | 16.5 | 56 | 15.1 |
| Patient referred but remedy also suggested | 4 | 3.4 | 1 | 0.8 | 3 | 2.3 | 8 | 2.2 |
| Patient not referred and no remedy suggested | 0 | 0.0 | 10 | 8.3 | 11 | 8.3 | 21 | 5.6 |

*n = number of visits to pharmacies.*

were given in only 8.4% of cases (Table 2). Of the total items prescribed 83.0% were prescription medicines (according to Pakistan's drug sale rules) and 17.0% were "over-the-counter" drugs (e.g. oral rehydration salts, kaolin pectin, attapulgite and bismuth subsalicylate). None of the regimens fully matched the standard prescription and 8.1% were judged to partially match with the standard therapy.

### Information given about medication

The scores on the medication information checklist showed that the appropriate dose of medicine for the treatment of diarrhoea was communicated to the customer in 52.6% of cases, frequency of treatment in 47.6%, duration of regimen in 7.3% and drug actions in 4.7%. Possible side-effects of the drug were communicated in none of the cases (Table 2).

### Management by type of pharmacy

The Kruskal–Wallis test was used to compare disease management by community pharmacies in the different cities (Table 3). History-taking was better performed in Lahore than in Islamabad and Peshawar, while information-giving was better in Islamabad. No significant difference was observed in terms of history-taking and provision of medication information from pharmacies in urban or rural settings in the 3 cities (Mann–Whitney test). No significant difference was observed in the medication information given by pharmacies situated in different locations (Kruskal–Wallis test) or different types of dispensers. However, there was a significant difference in history taking. Pharmacists were more efficient in history taking than other types of dispenser and pharmacies situated in supermarkets were better at performing history taking than were pharmacies in other locations (Kruskal–Wallis test).

## Discussion

The study revealed that the management of requests of advice for simulated patients with acute diarrhoea at community pharmacies in Pakistan was unsatisfactory. Similar findings were reported by other studies showing that many dispensers prescribe ineffective, inappropriate drugs in inadequate doses with little or no counselling to customers [7–9,14].

The customers were served mostly by unqualified dispensers, a high percentage of whom readily prescribed prescription-only medicines. The drugs given for the treatment of diarrhoea in this study did not meet standard

**Table 2 Management of request for advice for a patient with acute diarrhoea by community pharmacies in 3 cities of Pakistan: medication dispensed and medication information provided to customers**

| Pharmacy action | Total number of medicines dispensed | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Islamabad (*n* = 107) | | Peshawar (*n* = 117) | | Lahore (*n* = 131) | | Total in 3 cities (*n* = 355) | |
| | No. | % | No. | % | No. | % | No. | % |
| ***Type of medication dispensed*** | | | | | | | | |
| Antiamoebic | 73 | 68.3 | 78 | 66.6 | 57 | 43.6 | 208 | 58.7 |
| Antibiotic | 4 | 3.7 | 17 | 14.7 | 29 | 22.1 | 50 | 14.0 |
| Antidiarrhoeal | 21 | 19.6 | 7 | 5.9 | 39 | 29.8 | 67 | 18.9 |
| Oral rehydration salts | 9 | 8.4 | 15 | 12.8 | 6 | 4.5 | 30 | 8.4 |
| Total | 107 | 100.0 | 117 | 100.0 | 131 | 100.0 | 355 | 100.0 |
| ***Medication was compliant with standard*** | | | | | | | | |
| Partially compliant | 7 | 7.2 | 12 | 13.3 | 4 | 4.2 | 23 | 8.1 |
| Not compliant | 90 | 92.8 | 78 | 86.7 | 92 | 95.8 | 260 | 91.9 |
| Total cases in which drugs were dispensed | 97 | 100.0 | 90 | 100.0 | 96 | 100.0 | 283 | 100.0 |
| ***Information given on medication dispensed*** | | | | | | | | |
| Dose | 57 | 53.2 | 78 | 66.6 | 52 | 39.6 | 187 | 52.6 |
| Frequency | 62 | 57.9 | 67 | 57.2 | 40 | 30.5 | 169 | 47.6 |
| Duration | 9 | 8.4 | 15 | 12.8 | 2 | 1.5 | 26 | 7.3 |
| Drug action | 9 | 8.4 | 7 | 5.9 | 1 | 0.7 | 17 | 4.7 |
| Side-effects/precautions | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Total | 107 | 100.0 | 117 | 100.0 | 133 | 100.0 | 355 | 100.0 |

*n = total number of medicines dispensed.*

**Table 3 Management of request for advice for a patient with acute diarrhoea: history taking and information given about medication by type of community pharmacy**

| Variable | History taking[a] | | | | Medication information | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of pharmacies visited | Median scale score[a] | *H*-test | *P*-value[b] | No. of pharmacies visited | Median scale score[a] | *H*-test | *P*-value[b] |
| ***City*** | | | 6.43 | 0.04 | | | 30.60 | < 0.001 |
| Islamabad | 118 | 9 | | | 118 | 8 | | |
| Peshawar | 120 | 9 | | | 120 | 8 | | |
| Lahore | 133 | 9 | | | 133 | 10 | | |
| ***Location of pharmacy*** | | | 7.49 | 0.02 | | | 0.035 | 0.982 |
| Near hospital | 159 | 9 | | | 159 | 9 | | |
| Supermarket | 137 | 9 | | | 137 | 9 | | |
| Small market | 75 | 9 | | | 75 | 9 | | |
| ***Type of provider*** | | | 11.87 | 0.002 | | | 1.986 | 0.370 |
| Salesperson | 361 | 9 | | | 361 | 9 | | |
| Pharmacist | 8 | 7 | | | 8 | 9 | | |
| Pharmacy assistant | 2 | 8.5 | | | 2 | 8 | | |

*[a]Range 5–10; [b]Kruskal–Wallis test.*

treatment practice and were most frequently antiamoebics, antibiotics and antidiarrhoeals. Metronidazole and nalidixic acid were the preferred medicines, whereas oral rehydration salts was given in only a few of the cases. A similar poor pattern of case management of diarrhoea has been reported elsewhere [11,19]. Steps should be taken to restrict irrational drug prescribing by pharmacists, e.g. prescribing of antibiotics for diarrhoea or acute respiratory infections [14,19].

A study from Karachi, Pakistan, reported that dispensers working at community pharmacies had fragmentary knowledge but were willing to treat patients with diarrhoea [15]. The overall process of history taking by dispensers before product recommendation was ignored in all 3 cities in both rural and urban settings. The results of our study are in line with studies conducted in Kenya and Indonesia, where the incidence of history taking before making a product recommendation for diarrhoea was low [8].

The results of our study showed that the simulate patient's history was more frequently taken by the pharmacist if he/she was available. The pharmacies situated in supermarkets were relatively better in the process of history taking than those situated near hospitals or in small markets. This can be attributed to the fact that the pharmacist was more commonly present at pharmacies located in supermarkets. The process of history taking was performed comparatively more frequently at community pharmacies in Islamabad than in Lahore and Peshawar. Other studies have reported inappropriate diagnosis and treatment by unqualified and untrained pharmacy attendants, and that pharmacists tended to perform better than other staff [3,20].

Proper advice and information is an important determinant for an effective use of drugs by the patient. The information conveyed should include advice on appropriate use, when to expect symptom relief, potential side-effects, dose and frequency of the drug [21]. The results of our study showed that the overall process of advice and information giving at community pharmacies in the 3 cities was neglected in both rural and urban settings and irrespective of the type of dispenser and location of the pharmacy. The provision of advice for treating the common symptoms of diarrhoea was negligible or was not in accordance with standard therapy, indicating a deficit of qualified and trained personnel at these pharmacies. The observations in our study are in line with other studies showing that the quality of professional services from pharmacies is low and the provision of advice for common symptoms in middle-income countries is limited [22]. The situation in Pakistan is not an exception and similar patterns of counselling were observed in other countries [3,23–25].

## Conclusion

Case management of diarrhoeal disease by community pharmacies in Pakistan was poor. Sales of prescription-only medicines or even antibiotics without a prescription was common. Drug safety issues, unqualified personnel, lack of history taking, inappropriate treatment and lack of counselling were the major concerns to be addressed. Government interventions are needed to improve the quality of services and promote rational drug use through training of dispensers and provision of drug information to the public.

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# Utilization and cost of antibacterial drugs in 2 general surgery units in Palestine measured using anatomical therapeutic chemical classification and defined daily dose methodology

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**قياس استخدام وتكاليف الأدوية المضادة للجراثيم في وحدتَيْ جراحة عامة في فلسطين باستخدام التصنيف الكيميائي العلاجي التشريحي ومنهجية الجرعة المحددة يومياً**

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**الخلاصة:** وتقارن هذه الدراسة بين استخدام وتكاليف الأدوية المضادة للجراثيم في الوحدات الجراحية في مستشفيين حكوميين. وقد قام الباحثون بتقدير استهلاك وتكاليف الأدوية في الوحدتين على مدى شهر واحد في عام 2010، باستخدام التصنيف الكيميائي العلاجي التشريحي، ومنهجية الجرعة العلاجية المحددة يومياً بكل مئة سرير-يوم. فوجدوا أن إجمالي الاستهلاك من الأدوية المضادة للجراثيم قد بلغ 414.1 جرعة محددة يومياً و591.5 جرعة محددة يومياً في مستشفى ثابت ومستشفى الرافدية على التوالي وهي تعادل 133.6 جرعة محدَّدة يومياً لكل مئة سرير-يوم، و162.2 جرعة محددة يومياً لكل مئة سرير-يوم، على التوالي، وهي أرقام أعلى من تلك التي وردت في تقارير الوحدات الجراحية في كثير من البلدان الأخرى. وقد بلغ إجمالي تكاليف الأدوية المضادة للجراثيم خلال المدَّة المدروسة 800 24 وحدة NIS، و481 23 وحدة NIS في مستشفيَيْ الرافدية وثابت على التوالي، وتبين أيضاً أنه تم إعطاء 11.2٪ و18.0٪ من إجمالي المضادات الحيوية في مستشفى الرافدية وثابت لمرضى ذوي جراحات نظيفة، في حين أنه لم يكن هناك أي استطباب لإعطاء هؤلاء المرضى أيّ وقاية بالمضادات الحيوية.

ABSTRACT This study compared the utilization and cost of antibacterial agents in surgical units of 2 government hospitals in Palestine. The consumption and cost of drugs was estimated in the units over a 1-month period in 2010 using the anatomical therapeutic chemical classification and defined daily doses (DDD) per 100 bed-days. The total consumption of antibacterial agents was 414.1 DDD and 591.5 DDD at Thabet and Rafidia hospitals respectively. These corresponded to 133.6 DDD/100 bed-days and 162.2 DDD/100 bed-days respectively, figures that were higher than those reported in surgical units in many other countries. Total cost of antibacterial agents during the study period was 24 800 and 23 481 NIS for Rafidia and Thabet hospitals respectively. Approximately 11.2% and 18.0% of the total antibiotic DDD in Rafidia and Thabet hospitals were given to patients with clean surgeries in which antibiotic prophylaxis is not indicated.

**Utilisation et coût des antibactériens dans deux services de chirurgie générale en Palestine, mesurés à l'aide du système de classification anatomique, thérapeutique et chimique et de la méthodologie des doses thérapeutiques quotidiennes**

RÉSUMÉ La présente étude a comparé l'utilisation et le coût des agents antibactériens dans des services de chirurgie de deux hôpitaux publics en Palestine. La consommation et le coût des médicaments dans les services ont été estimés sur une période d'un mois en 2010 à l'aide du système de classification anatomique, thérapeutique et chimique et des doses thérapeutiques quotidiennes calculées pour 100 jours-patient. La consommation totale des agents antibactériens était de 414,1 doses thérapeutiques quotidiennes dans l'hôpital de Thabet et de 591,5 doses thérapeutiques quotidiennes dans l'hôpital de Rafidia. Elles correspondaient à 133,6 doses thérapeutiques quotidiennes pour 100 jours-patient et à 162,2 doses thérapeutiques quotidiennes pour 100 jours-patient, respectivement. Ces chiffres sont supérieurs à ceux transmis par les services de chirurgie de nombreux autres pays. Le coût total des agents antibactériens pendant la période de l'étude était 24 800 et 23 481 nouveaux shekels israéliens pour les hôpitaux de Rafidia et Thabet, respectivement. Environ 11,2 % et 18,0 % des doses thérapeutiques quotidiennes totales d'antibiotiques dans les hôpitaux de Rafidia et de Thabet ont été administrées à des patients subissant une intervention chirurgicale propre pour lesquelles une antibioprophylaxie n'était pas nécessaire.

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Received: 23/01/11; accepted: 13/03/11

## Introduction

The misuse of antimicrobial agents has led to a rise in the number and types of resistant microorganisms. The Mediterranean region has been identified as an area of hyper-endemicity for multi-resistant hospital pathogens [1]. This is particularly the case for methicillin-resistant *Staphylococcus aureus* (MRSA) and applies to both the European and non-European countries of the Mediterranean region [2].

To assess drug utilization, a drug classification system is needed to facilitate data collection. The most widely used system is the anatomical therapeutic chemical (ATC) classification and defined daily dose (DDD), which is now used by the World Health Organization (WHO) Collaborating Centre for International Drug Monitoring in Europe [3]. In hospital studies the average number of DDD per bed-day is used for comparisons between hospitals. Other indicators for assessing the general quality of drug prescribing habits are the number of drugs accounting for 90% of drug *use* [the drug utilization 90% (DU90%)] and for 90% of drug costs (DC90%) [4].

Monitoring of drug use in only one hospital might be inadequate, as interdepartmental differences in drug use may exist. Therefore, comparisons with other hospitals and between departments in which similar medical disorders are treated should be used in the evaluation of the quality of pharmacotherapy. Comparisons between similar services in different institutions may yield useful information that will help in defining rational antibiotic use in both institutions.

The objective of this study was to assess and compare the utilization pattern and cost of antibacterial agents between general surgical units in 2 governmental hospitals in Palestine.

## Methods

### Study setting and sample

This study was carried out in the surgical units of Rafidia hospital in Nablus city and Martyr Thabet Thabet hospital in Tulkarm city, Palestine. Selection of these 2 hospitals was based on the fact that they are the only government hospitals with general surgical units in the Nablus and Tulkaram districts of Palestine. Over a 1-month period in June 2010 the researchers visited both units daily and analysed the medical files of all patients admitted during the study period. Data collection was made after written approval from the Ministry of Health to carry out the project and verbal approval from each patient. Patients' files were not analysed retrospectively; rather, each patient was followed up until discharge.

### Data collection

Each drug prescribed was recorded using its generic name and ATC code. Topical antibiotics were not included. Paediatric surgery was excluded because of a lack of accurate paediatric DDD. The standard pharmacy protocol in both hospitals requires that hospital physicians prescribe antibiotics for individual patients, but there are no restrictions on antibiotic use.

Patient details, including age, sex, type of surgical procedures and length of hospital stay, were entered into a specially-designed proforma. The type of surgery and the antibiotics prescribed during the patients' hospital stay along with the dose, frequency, duration and route of administration were also recorded. Based on the National Research Council wound classification for antimicrobial prophylaxis in surgery, surgeries were classified as clean, clean–contaminated, contaminated or dirty [5].

The following indicators were calculated:

- DDD for each prescribed antibacterial agent and the total DDD for antibacterial agents prescribed in each surgical department.
- DDD per 100 bed-days. A bed-day was defined as the number of patients in the hospital or each ward per day and was calculated by multiplying the number of admissions by the average length of stay. We followed the World Health Organization DDD/ATC system recommendation for calculation of bed-days in which the day of admission and discharge were counted as one single day [3].
- DU90% index was calculated by ranking the antibiotics by volume of DDD, summing the DDD for these drugs and then determining how many drugs accounted for 90% of drug use [4].
- DC90% index was calculated in a similar way to DU90% by ranking the antibiotics and determining how many drugs accounted for 90% of costs. The costs of medications were obtained from the hospital pharmacy. Costs are presented in new Israel shekels (NIS) (NIS 1= US$ 0.27).

### Data analysis

Statistical was carried out using *SPSS* for Windows, version 16. Independent sample Student *t*-test was used to compare continuous variables in the 2 surgical units.

## Results

During the study period, a total of 200 patients were admitted to the surgical units in the 2 hospitals and were followed up for antibacterial drug use. Details about the 2 hospitals and the types of surgical procedures included in the analysis are shown in Table 1. The most common surgical procedures in both units were appendectomy, cholecystectomy, colorectal, hernioplasty and mastectomy. No statistically significant difference was found between

**Table 1 Background characteristics of the 2 hospitals, types of surgeries investigated for antibiotic use and summaries of prescribing indices**

| Variable | Thabet hospital | Rafidia hospital |
|---|---|---|
| ***Hospital characteristics*** | | |
| Total beds (no.) | 110 | 205 |
| Beds in surgical unit (no.) | 42 | 44 |
| Surgical units (no.) | 7 | 11 |
| Pharmacists and pharmacy technicians (no.) | 8 | 10 |
| Patients admitted during study period (no.) | 100 | 100 |
| Total bed-days during study period (no.) | 308 | 365 |
| Mean (SD) length of hospital stay (days/ patient) | 3.08 (2.34) | 3.65 (2.52) |
| ***Patient characteristics*** | | |
| % male | 53 | 46 |
| Mean (SD) age (years) | 36.0 (16.0) | 36.4 (18.6) |
| ***Type of surgery[a] (%)*** | | |
| Appendectomy | 40 | 42 |
| Cholecystectomy | 11 | 13 |
| Hernioplasty | 18 | 9 |
| Mastectomy | 2 | 4 |
| ***Prescribing indices*** | | |
| Total DDD (no.) | 414.1 | 592.0 |
| DDD per 100 bed-days (no.) | 133.6 | 162.2 |
| DU90% drugs/total drugs (no.) | 4/9 | 5/8 |
| Total drugs in DU90% segment (no.) | 395.1 | 570.1 |
| Total cost of DU90% drugs (NIS) | 23 222 | 23 484 |
| Total cost of DC90% drugs (NIS) | 22 862 | 23 014 |

[a]*Most common operations.*
*SD = standard deviation; DDD = defined daily dose; DU90% = drug utilization 90% index; DC90% = drug cost 90% index; NIS = new Israeli shekels.*

the length of patient's hospital stay in the 2 units [3.08 (SD 2,4) versus 3.65 (SD 2.5) days]. Similarly, there was no statistically significant difference in the mean age of patients attending both units [36.4 (SD 18.6) versus 36.0 (SD 16.0) years]. During the study period, no deaths were registered in either unit.

Table 2 displays the total DDD of the various antibacterial agents utilized in the 2 surgical units. There were 5 drugs in the DU90% segment out of the total of 9 in both hospitals. The DU90% index placed metronidazole injection in the first place in Thabet and Rafidia hospitals with 140.3 and 227.2 DDD respectively. Cefuroxime came in second in both surgical units with 125.3 and 131.8 DDD in Thabet and Rafidia hospitals respectively. The total consumption of antibacterial agents (class J01) at the surgical unit of Thabet hospital accounted for 414.1 DDD while that of Rafidia hospital was 591.5 DDD. These values correspond to 133.6 DDD/100 bed-days in Thabet hospital and 162.2 DDD/100 bed-days in Rafidia hospital. There was no statistically significant difference in the mean DDD/100 bed-days of antibacterial drugs between the 2 surgical units ($P = 0.21$).

Table 3 shows the costs of the various antibacterial agents utilized in the 2 surgical units. The total cost of antibacterial agents during the study period was 23 481 and 24 800 NIS in the surgical units of Thabet and Rafidia hospitals respectively. There were 4 drugs in the DC90% segment out of the total of 9 in both hospitals. The total medication costs calculated from the DC90% segment at Thabet (23 222 NIS) and Rafidia hospitals (23 484 NIS) were not significantly different.

Analysis of antibiotic administration in Thabet hospital showed that of 45 patients who received prophylactic preoperative antibiotics, 10 of them had clean surgery. The DDD of antibiotics given to patients with clean surgeries was 74.6 out of the total DDD of 414.1 (18.0%) (Table 4). In Thabet hospital, 34 patients did not receive indicated prophylaxis, 23 of them had clean–contaminated, 8 had contaminated and 3 had dirty surgery. Post-operatively, antibiotics were given to 73 patients: 30 patients were given antibiotics for 3 days, 35 patients for 2 days and 8 patients for 10 days.

Analysis of antibiotic administration in Rafedia hospital showed that of 61 patients who received prophylactic preoperative antibiotic, 12 of them had clean surgery. The DDD of antibiotics given to patients with clean surgeries in Rafidia hospital was 66.1 out of the total of 591.5 (11.2%) (Table 4). In this hospital 34 patients did not receive the indicated antibiotic prophylaxis: 20 had clean–contaminated, 10 had contaminated and 4 had dirty surgery. Post-operatively, 77 patients were given antibiotics: 37 patients for 3 days, 25 for 5 days and 4 patients for 12 days.

Table 5 shows the distribution of the most utilized antibacterials and their DDD by type of surgery at Thabet and Rafidia hospitals.

Figure 1 shows a comparison of antibacterial agents used in the current study in Palestine, in 2 hospitals in the Islamic Republic of Iran and 3 other European hospitals. The figure shows that the total DDD/100 bed-days in general surgical units was the highest in Palestine compared with the other countries.

**Table 2 Defined daily doses (DDD) by anatomical therapeutic chemical (ATC) codes and drugs comprising more than 90% of DDD utilization of antibacterial drugs (DU90%) for Thabet and Rafidia hospital surgical units over a 1-month period**

| Thabet hospital | | | | Rafidia hospital | | | |
|---|---|---|---|---|---|---|---|
| Antibacterial drug | ATC code | Total DDD (no.) | % | Antibacterial drug | ATC code | Total DDD (no.) | % |
| Metronidazole[a] | (J01XD01) | 140.3[a] | 33.9 | Metronidazole[a] | (J01XD01) | 227.2[a] | 38.4 |
| Cefuroxime[a] | (J01DD04) | 125.3[a] | 30.3 | Cefuroxime[a] | (J01DD04) | 131.8[a] | 22.3 |
| Ceftriaxone[a] | (J01DD04) | 75.5[a] | 18.2 | Ceftriaxone[a] | (J01DD04) | 114.0[a] | 19.3 |
| Gentamicin[a] | (J01GB03) | 31.6[a] | 7.6 | Ampicillin[a] | (J01CA01) | 55.9[a] | 9.5 |
| Meropenem | (J01DH02) | 22.3 | 5.4 | Gentamicin[a] | (J01GB03) | 41.2[a] | 7.0 |
| Ampicillin | (J01CA01) | 15.3 | 3.7 | Meropenem | (J01DH02) | 14.5 | 2.5 |
| Ciprofloxacin | (J01MA02) | 2.0 | 0.5 | Erythromycin | (J01FA01) | 3.5 | 0.6 |
| Cephalexin | (J01DB01) | 1.0 | 0.2 | Cefazoline | (J01DB04) | 3.3 | 0.6 |
| Cloxacillin | (J01CF02) | 0.8 | 0.2 | – | – | – | – |
| Total | – | 414.1 | 100.0 | Total | – | 591.5 | 100.0 |

[a]*DU90% segment (n = 5 drugs).*

## Discussion

In this descriptive prospective study, the utilization of antibacterial agents (J01 class) was compared between the surgical units of 2 governmental hospitals using the WHO ATC/DDD methodology. No statistically significant difference in antibiotic utilization was found between the 2 units when measured by DDD/100 bed days. However, the total DDD of antibacterial agents utilized was more than 100 DDD/100 BD in both units. A closer analysis is needed to identify the reasons for the relatively high utilization of antibacterial agents, and measures are needed to rationalize their use. A study carried out in governmental hospitals of Gaza Strip, Palestine, on bacterial isolates from clinical sources including urine, pus, blood and cerebrospinal fluid found high bacterial resistance to common antibiotics [6]. Another study on paediatric patients at Al-Watani government hospital found a high resistance rate of *Streptococcus pneumoniae* to most antibacterial drug classes [7], while a study in the department of internal medicine at Al-Watani governmental hospital in Nablus, Palestine revealed that the use of antibacterial agents was less than optimal [8]. It has been found that implementation of an antimicrobial prescribing improvement programme can lead to substantial savings in antimicrobial use and expenditures and decreased rates of certain nosocomial infections due to resistant microorganisms [9].

In our study, the mostly commonly used agent in both wards, according to the DDD and DU 90% index, was metronidazole, followed by cefuroxime and ceftriaxone. The number of antibacterial agents which accounted for the DU90%

**Table 3 Cost of drugs by anatomical therapeutic chemical (ATC) codes and drugs comprising more than 90% of costs of antibacterial drugs (DC90%) for Thabet and Rafidia hospital surgical units**

| Thabet hospital | | | | Rafidia hospital | | | |
|---|---|---|---|---|---|---|---|
| Antibacterial drug | ATC code | Total cost (NIS) | % | Antibacterial drug | ATC code | Total cost (NIS) | % |
| Cefuroxime[a] | (J01DD04) | 9 827[a] | 41.8 | Cefuroxime[a] | (J01DD04) | 10 335[a] | 41.7 |
| Meropenem[a] | (J01DH02) | 8 455[a] | 36.0 | Meropenem[a] | (J01DH02) | 5 510[a] | 22.2 |
| Metronidazole[a] | (J01XD01) | 2 315[a] | 9.9 | Metronidazole[a] | (J01XD01) | 3 749[a] | 15.1 |
| Ceftraiaxone[a] | (J01XD01) | 2 265[a] | 9.6 | Ceftriaxone[a] | (J01DD04) | 3 420[a] | 13.8 |
| Gentamicin | (J01GB03) | 361 | 1.5 | Gentamicin | (J01GB03) | 470 | 1.9 |
| Ampicillin | (J01CA01) | 244 | 1.0 | Ampicillin | (J01CA01) | 895 | 3.6 |
| Ciprofloxacin | (J01MA02) | 7 | < 0.1 | Cefazolin | (J01DB04) | 200 | 0.8 |
| Cephalexin | (J01DB01) | 4 | < 0.1 | Erythromycin | (J01FA01) | 221 | 0.8 |
| Cloxacillin | (J01CF02) | 4 | < 0.1 | – | – | – | – |
| Total | – | 23 482 | 100.0 | Total | – | 24 800 | 100.0 |

[a]*DC90% segment (n = 4 drugs).*

**Table 4 Distribution of defined daily doses (DDD) of antibacterial drugs by type of surgery at Thabet and Rafidia hospitals**

| Type of surgery | % of operations | | Patients receiving prophylactic preoperative antibacterial (no.) | | Total DDD (no.) | |
|---|---|---|---|---|---|---|
| | Thabet | Rafidia | Thabet | Rafidia | Thabet | Rafidia |
| Clean | 31 | 17 | 10 | 12 | 74.6 | 66.1 |
| Clean–contaminated | 51 | 59 | 28 | 39 | 217.8 | 313.6 |
| Contaminated | 10 | 16 | 2 | 6 | 52.4 | 100.8 |
| Dirty | 8 | 8 | 5 | 4 | 69.3 | 111.0 |
| Total | 100 | 100 | 45 | 61 | 414.1 | 591.5 |

index was 5 in both units. This small number and lack of diversity of antibacterial agents in Palestinian government hospitals could be due to the limited types of antibacterial agents available in the hospital pharmacy. The dependence of the Palestinian Ministry of Health on donations from European countries or local pharmaceutical companies has led to intensive use of similar kinds antibacterial agents for potentially different types of infections or procedures.

A previous study at the internal medicine department of Al-Watani governmental hospital indicated that utilization of antibacterial agents reached a total of 39 DDD/ 100 bed-days [8]. This is lower than that reported in the surgical units in this study. This is expected since antibiotics are more commonly utilized as prophylaxis in surgical units than in internal medicine departments. In a study carried out in Sari Emam hospital, Islamic Republic of Iran, the total DDD/100 bed-days in general surgery was 121 in 2000 and this declined to 107 in 2005 [10]. Our results are also higher than those reported from surgical departments in hospitals in Spain, Estonia and Sweden [11]. Unfortunately, no data in this regard are available from other neighbouring countries to include in the analysis.

The difference between the results of our study and those published from other countries may be attributed to lack of infection control and prevention programmes, as well as lack of special guidelines for antibiotic use in surgical units. Another potential reason is that surgeons in both units tend not to rely on the results of microbiological cultures, but instead rely on clinical judgement in conjunction with the proven effectiveness of antimicrobial agents that offer a broad spectrum to cover against likely pathogens. Further studies on all units and from a large number of hospitals in Palestine are needed to be able to better analyse the antibacterial utilization in hospitals and to compare it with other countries.

Antimicrobial administration is not recommended for all surgical procedures. Typically, prophylactic antimicrobials are not indicated for clean surgeries [5]. They are particularly beneficial in surgical procedures associated with a high rate of infection and the agent chosen should have

**Table 5 Distribution of most utilized antibacterials and their defined daily doses (DDD) by type of surgery at Thabet and Rafidia hospitals**

| Type of surgery | Thabet hospital | | Rafidia hospital | |
|---|---|---|---|---|
| | Most utilized antibacterials | Total DDD (no.) | Most utilized antibacterials | Total DDD (no.) |
| Clean | Cefuroxime | 43.3 | Cefuroxime | 29.4 |
| | Ceftriaxone | 15.0 | Metronidazole | 8.7 |
| | Metronidazole | 5.7 | Ceftriaxone | 8.0 |
| Clean–contaminated | Metronidazole | 93.7 | Metronidazole | 139.3 |
| | Cefuroxime | 62.3 | Cefuroxime | 85.5 |
| | Ceftriaxone | 55.5 | Ceftriaxone | 58.0 |
| Contaminated | Metronidazole | 24.0 | Metronidazole | 38.1 |
| | Ampicillin | 10.3 | Ceftriaxone | 18.5 |
| | Gentamicin | 9.7 | Ampicillin | 17.8 |
| Dirty | Meropenem | 17.5 | Metronidazole | 38.6 |
| | Metronidazole | 17.0 | Ceftriaxone | 24.5 |
| | Ceftriaxone | 11.0 | Ampicillin | 22.0 |

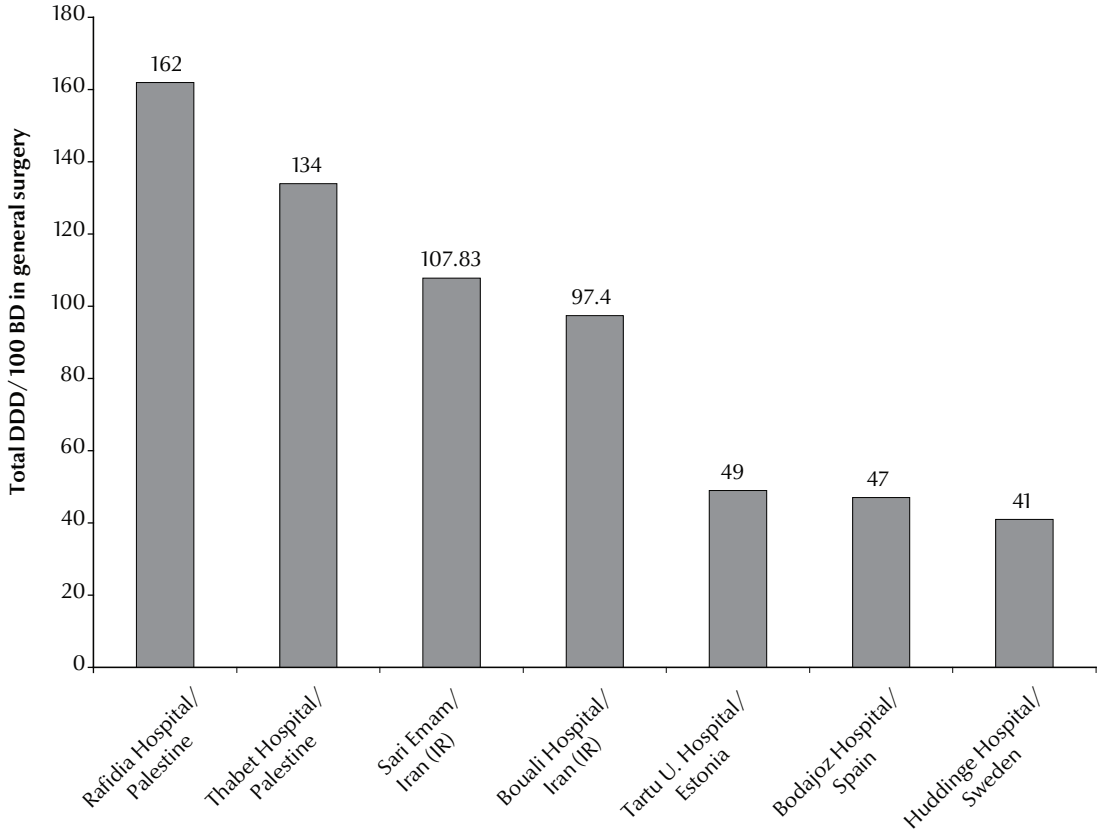


**Figure 1 Use of systemic antibacterial agents in surgical units of 2 hospitals in Palestine, 2 hospitals in Islamic Republic of Iran [10] and 3 hospitals in Europe [11] measured in defined daily doses (DDD)/100 bed-days**

activity against the most common surgical wound pathogens. Cephalosporins (such as cefazolin) are appropriate first-line agents for most surgical procedures, targeting the most likely organisms [5,12]. It is advisable to avoid broad-spectrum antimicrobial therapy that may lead to the development of antimicrobial resistance [13]. In our study, 11.2% and 18.0% of the total antibiotic DDD in Rafedia and Thabet hospitals respectively were administered to patients with clean surgeries. This suggests that these antibiotics were not being appropriately used. Furthermore, the most used antibiotics in both wards according to the DU90% index were metronidazole and the cephalosporins cefuroxime (2nd generation) and ceftriaxone (3rd generation). They were used as first-line empirical treatment either preoperatively or postoperatively for short-term treatment despite possible narrower spectrum alternatives being adequate.

In conclusion, our study showed that consumption of antibacterial agents in surgical unit in Palestine was relatively high. The study emphasizes the need for national antibiotic policies and education programs in infection control and prevention for the health care professionals.

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***The evolving threat of antimicrobial resistance***

Antimicrobial resistance (AMR) is not a recent phenomenon, but it is a critical health issue today. Over several decades, to varying degrees, bacteria causing common infections have developed resistance to each new antibiotic, and AMR has evolved to become a worldwide health threat. With a dearth of new antibiotics coming to market, the need for action to avert a developing global crisis in health care is increasingly urgent.

The World Health Organization has long recognized AMR as a growing global health threat, and the World Health Assembly, through several resolutions over two decades, has called upon Member States and the international community to take measures to curtail the emergence and spread of AMR. The WHO Global strategy for the containment of antimicrobial resistance, published in 2001, set out a comprehensive set of recommendations for AMR control which remain valid today. *The evolving threat of antimicrobial resistance* examines the experiences with implementing some of those recommendations 10 years on, the lessons learnt along the way and the remaining gaps.

Further information about this and other WHO publications is available at: http://apps.who.int/bookorders/anglais/home1.jsp

# L'instauration de la pharmacovigilance dans un nouveau centre hospitalier universitaire au Maroc : comment et pourquoi ?

*Y. Khabbal,[1] L. Alami[2] et C. Nejjari[3]*

**إدخال التيقُّظ الدوائي في مستشفى جامعي جديد في المغرب: كيف ولماذا؟**

يوسف خبّال، لينا عَلَمي، شكيب نجاري

**الخلاصة:** في مسعى لتحسين سلامة المريض، أدخل مستشفى الحسن الثاني في فاس نظاماً للتيقُّظ الدوائي يُعْنَى بأولوية التبليغ عن التفاعلات الدوائية الضائرة. وقد بدأ تطبيق نظام التيقُّظ الدوائي بالفعل في حزيران/ يونيو 2007، إلا أنه أصبح يعمل ميدانيا على نحو ملائم بعد تدشين المجمَّع الجديد الذي يضم هذا النظام. ويرسم هذا التقرير الخطوط العريضة للأنشطة التي اتخذت لإنشاء وتنفيذ هذا النظام، بما في ذلك إطلاع وتدريب العاملين الصحيين، والنتائج التي ترتبت على ذلك. فبدءاً من 2007 وحتى 2009، لم تتجاوز الإبلاغات عن التفاعلات الدوائية الضائرة مئة حالة. إلا أنه حتى حزيران/ يونيو 2011، تم تسجيل خمس مئة وعشرين إبلاغاً عن التفاعلات الدوائية الضائرة. وضَمَّت أصناف الأدوية التي ارتبطت بالأحداث الضائرة أكثر من سواها: أدوية السرطان (26٪)، ومضادات الالتهاب والمضادات الحيوية (15٪ لكلٍ منهما)، والمسكنات (12٪)، والعوامل اليودية المستخدمة في التصوير الشعاعي التَّبايُني (6٪)، ومضادات التخثر والكورتيكوستيرويدات (5٪). وكانتْ أكثرية الأحداث الضائرة جلديةً، ووصل 27٪ من الإبلاغات من قسم الطب الباطني، ثم من قسم طب الكبد والجهاز الهضمي (25٪). وكان 46٪ من الحالات المئتين والخمسين التي أبلغ عنها حالات وخيمة.

RÉSUMÉ Dans un souci d'améliorer la sécurité des patients, le CHU Hassan II de Fès a instauré un système de pharmacovigilance pour la notification des effets indésirables des médicaments en tant qu'objectif prioritaire. La mise en place de l'activité de pharmacovigilance a débuté effectivement en juin 2007 mais ce n'est qu'en 2009, après l'inauguration du nouveau complexe, que le système a connu l'essor qu'il mérite. Ce rapport présente les modalités de mise en place de ce système, et notamment la sensibilisation et la formation des professionnels de santé, ainsi que les résultats obtenus après son instauration. De 2007 à 2009, les notifications d'effets indésirables médicamenteux ne dépassaient pas une centaine de cas. Jusqu'à juin 2011 toutefois, 520 notifications spontanées d'effets indésirables ont été enregistrées. Les classes de médicaments les plus incriminées dans les effets indésirables sont les anticancéreux (26 %), les anti-inflammatoires et les antibiotiques (15 % chaque catégorie), les antalgiques (12 %), les produits de contraste iodé (6 %), les anticoagulants et les corticoïdes (5 %). Les principaux effets indésirables étaient dermatologiques et 27 % des déclarations émanaient du service de médecine interne, suivi par celui d'hépato-gastro-entérologie (25 %). Sur 520 cas notifiés, 46 % étaient des cas graves.

**Introduction of pharmacovigilance in a new university hospital in Morocco: how and why**

ABSTRACT In an effort to improve patient safety, Hassan II hospital in Fez introduced a pharmacovigilance system for notification of adverse drug reactions as a priority objective. The implementation of pharmacovigilance activities actually began in June 2007 but it was in 2009 after the inauguration of the new complex that the system became properly operational. This report outlines the activities carried out to develop and implement this system, including informing and training the health professionals, and the results obtained after its introduction. From 2007 to 2009, fewer than 100 cases of adverse drug reactions were reported. Up to June 2011, however, 520 reports of adverse drug reactions were recorded. The classes of drugs most implicated in adverse events were: cancer drugs (26%), anti-inflammatory drugs and antibiotics (each 15%), analgesics (12%), iodinated contrast agents (6%), and anticoagulants and corticosteroids (5%). The main adverse events were dermatological and 27% of reports came from the internal medicine department, followed by hepatogastroenterology (25%). Of the 520 cases reported, 46% were severe.

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Reçu : 26/12/11; accepté : 05/02/12

## Introduction

L'histoire de la pharmacovigilance internationale remonte à plus de trente ans, quand la Vingtième Assemblée de l'Organisation mondiale de la Santé adopta une résolution sur la création d'un système international de surveillance des effets indésirables des médicaments.

À ce jour, plus de 70 pays participent à ce programme. Le monde d'aujourd'hui est confronté à des défis bien différents de ceux rencontrés au moment de la création du programme. Les nouveaux développements exigent des réactions appropriées et soulèvent de nouvelles questions sur les modalités de surveillance des effets indésirables des médicaments [1].

À cet égard, et dans un souci d'améliorer la sécurité des patients, le Centre hospitalier universitaire (CHU) Hassan II de Fès a fait du développement de l'activité de pharmacovigilance un de ses objectifs prioritaires.

Dans ce travail, nous présentons la stratégie que nous avons suivie et les résultats obtenus après la mise en place de notre système.

## Méthodes

La création d'un système de pharmacovigilance efficace et futuriste nécessite une stratégie bien réfléchie et une mise en place solide [2].

L'activité de pharmacovigilance au CHU Hassan II de Fès a débuté effectivement en juin 2007. Ce processus de développement a été lancé dans les anciens locaux, ce qui a représenté une entrave à une approche plus engagée. Le principal objectif de cette étape, dont la chronologie est décrite ci-après, était de sensibiliser les professionnels de santé de notre établissement.

*Mai 2007 : présentation et validation du projet.* Nous avons présenté le projet de création d'un système local de pharmacovigilance avec une vision futuriste et en tenant compte des contraintes actuelles ; ce projet a été validé par le comité des médicaments et des dispositifs médicaux du CHU Hassan II.

*Juin 2007 : sensibilisation des professionnels de santé.* Au moment de sa création, des efforts importants ont été consacrés à la communication avec les professionnels de santé, surtout les médecins mais aussi les infirmiers et les étudiants en médecine, pour les sensibiliser à la notification spontanée ; dans ce cadre, nous avons organisé une journée scientifique le 25 juin 2007. Cette journée a été animée par un médecin d'un Centre de Pharmacovigilance français et expert auprès de l'Agence française de sécurité sanitaire des produits de santé (AFSSAPS).

*Juillet 2007 : réalisation d'une fiche de notification interne.* Nous avons réalisé plusieurs propositions de fiche de déclaration dont le critère principal était que la notification soit pratique et réalisable en respectant les bonnes pratiques de pharmacovigilance [3]. Cette fiche a été validée par les responsables des services cliniques. Elle comporte essentiellement des données concernant les éléments suivants :

- le patient ;
- l'effet indésirable ;
- le(s) médicament(s) suspect(s) ;
- les autres médicaments associés (y compris ceux pris par automédication) ;
- les facteurs de risque ;
- le nom et l'adresse du notificateur.

*Septembre 2007 : désignation et formation des correspondants locaux de pharmacovigilance.* Le principal obstacle que connaît chaque nouveau système en matière de déclaration est le remplissage de la fiche de notification, souvent perçue comme une contrainte administrative supplémentaire par les prescripteurs.

À cet égard, nous avons désigné et formé des correspondants dans chaque service clinique afin d'optimiser la notification avec plus de disponibilité et de proximité ; ces interlocuteurs sont au nombre de 25.

*Janvier 2008 : création de la Commission de pharmacovigilance et de pharmaco-épidémiologie de Fès (CPPEF).* Cette commission sera chargée en particulier du bon fonctionnement du système de pharmacovigilance.

La CPPEF est formée de 11 membres représentant les services les plus concernés par la pharmacovigilance. Les services représentés sont les suivants : le département de l'épidémiologie, le service de gastro-entérologie, le service de médecine interne, le service de dermatologie, le service de pédiatrie, le service d'oncologie, le service d'endocrinologie, la division des affaires médicales et des soins infirmiers, le service de pharmacie centrale et le service de pharmacologie.

*Mai 2008 : publication du premier bulletin d'information sur le médicament et la pharmacovigilance.* Ce bulletin, sous forme d'un dépliant, est destiné principalement aux professionnels de santé de notre CHU. La majeure partie est consacrée aux actualités relatives au médicament et aux effets indésirables à l'échelle nationale et internationale.

*Juin 2008 : deuxième journée de la Pharmacovigilance.* Cette deuxième journée scientifique avait été organisée avec la collaboration d'un centre de pharmacovigilance français et avec la participation du Centre antipoison et de pharmacovigilance du Maroc. Le thème principal de cette manifestation était l'iatrogénie médicamenteuse.

La mise en place de l'activité de pharmacovigilance au CHU Hassan II de Fès a débuté effectivement en juin 2007, mais c'est à partir de janvier 2009

que le système a connu l'essor qu'il mérite après l'inauguration du nouveau complexe hospitalier par Sa Majesté le Roi Mohammed VI. Ce centre couvre les besoins médicaux d'une région très étendue de plus de quatre millions d'habitants (Régions Fès Boulemane, Meknès-Tafilalet et Taza-Al Hoceima-Taounate) ; il a une capacité de 880 lits, répartis dans 42 services.

*2009-2011 :* durant cette période se sont déroulées les activités suivantes.

- 2009 - Premier séminaire-atelier pour la formation des médecins résidents : imputabilité médicamenteuse (méthode française) [4,5].
- 2 septembre 2010 - Journée de formation à l'hôpital Ibn Khatib, un hôpital régional qui ne dépend pas de notre CHU.
- 2010 - Deuxième séminaire-atelier pour la formation des médecins résidents : les toxidermies.
- 2010 - Troisième séminaire-atelier pour la formation des médecins résidents : les néphropathies médicamenteuses.
- 2011 - troisième journée de la Pharmacovigilance: pharmacovigilance de la reproduction.

## Résultats

La consultation de notre base de données montre que depuis fin juin 2007 jusqu'à fin juin 2009, les notifications d'effets indésirables médicamenteux qui ont été enregistrées par notre unité ne dépassaient pas une centaine de cas. L'ensemble de ces déclarations émanait des praticiens de notre CHU. La méthode de notification pendant cette période était essentiellement spontanée et rarement active. En juin 2011, le nombre de déclarations est de 520 cas, alors que les notifications sont toutes spontanées ayant pour objectif plutôt une demande d'avis qu'une déclaration proprement dite.

Les fiches sont complètes, bien remplies et leur suivi est fait à 100 %.

Ces notifications concernaient 132 hommes (53 %). L'âge moyen des patients était de 40 ans (ET 22, extrêmes 1-80 ans).

Les classes de médicaments les plus incriminées dans les effets indésirables étaient les anticancéreux avec 26 % des cas, suivis par les anti-inflammatoires non stéroïdiens (AINS) et les antibiotiques avec 15 %, les antalgiques 12 %, les produits de contraste iodé 6 %, les anticoagulants et les corticoïdes 5 % (Figure 1).

Vingt-sept pour cent des déclarations émanaient du service de médecine interne ; le deuxième service était celui de l'hépato-gastro-entérologie avec 25 % des déclarations. La répartition des cas selon les services déclarants est représentée dans la figure 2.

Un effet indésirable est qualifié de grave :

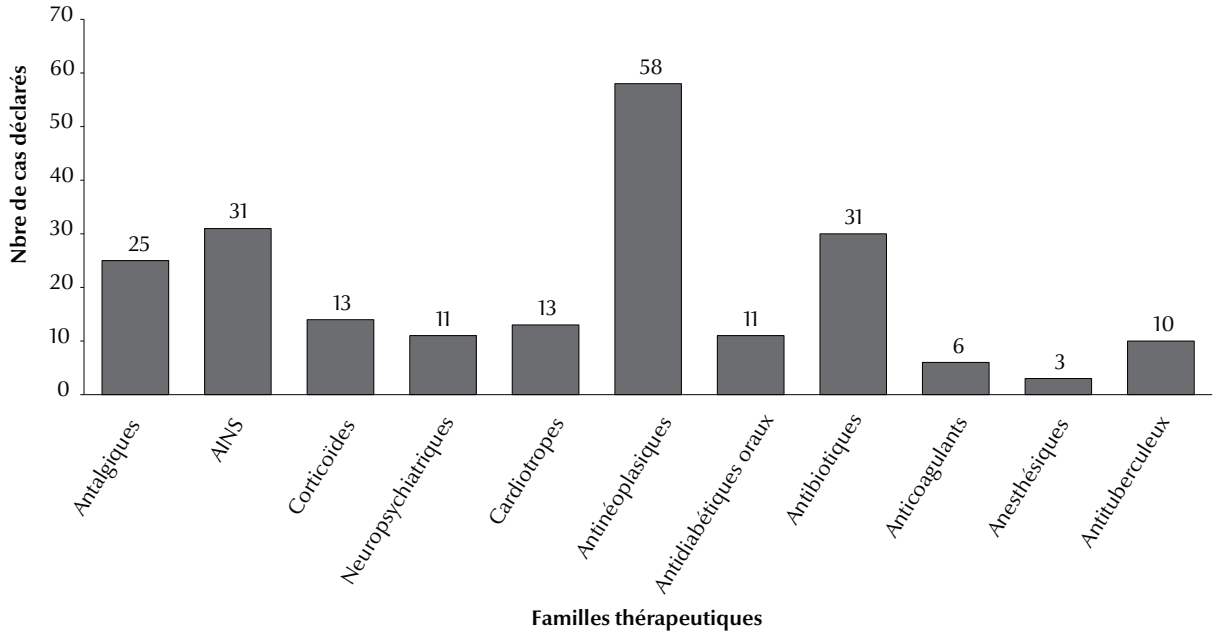


**Figure 1 Répartition selon les familles thérapeutiques. Note : les familles thérapeutiques ayant provoqué moins de trois effets ne sont pas représentées**
*AINS : anti-inflammatoires non stéroïdiens*

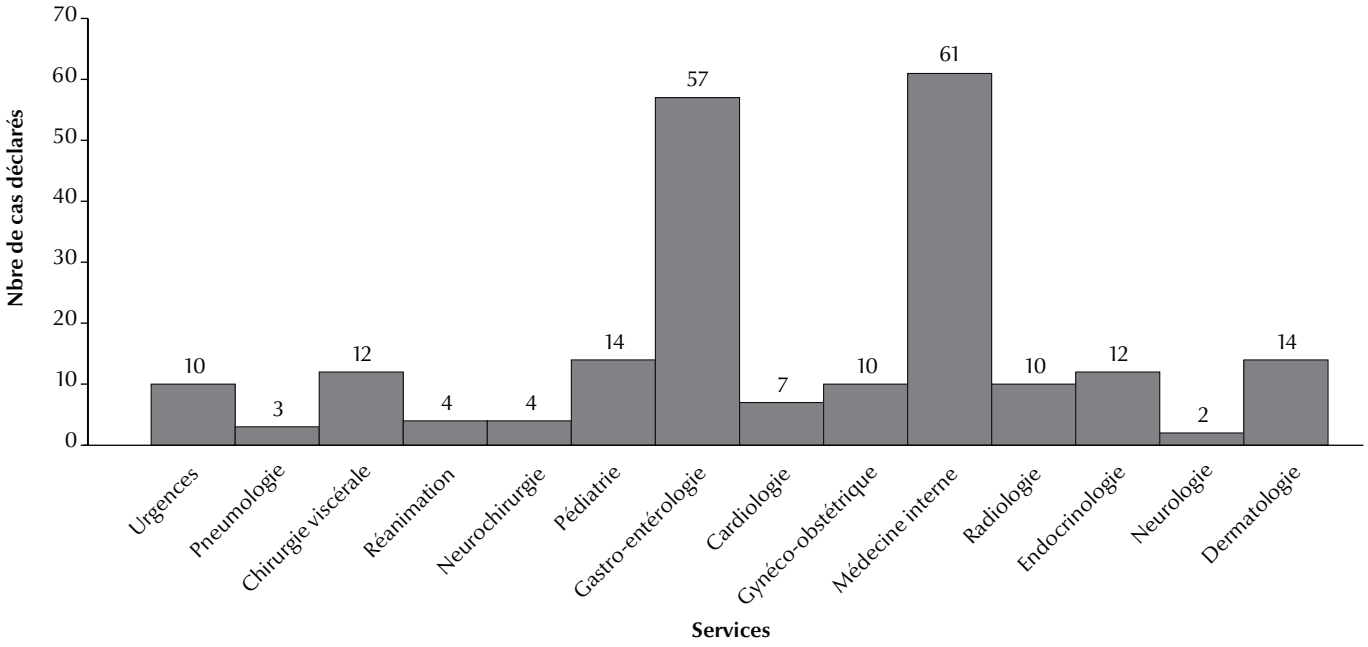


**Figure 2** **Répartition selon les services déclarants**

- lorsqu'il entraîne un décès ou une invalidité ou une incapacité importante ou durable ;
- lorsqu'il provoque ou prolonge une hospitalisation ;
- lorsqu'il se manifeste par une anomalie ou une malformation congénitale [6,7].

Sur 520 cas d'effets indésirables qui nous ont été notifiés, 46 % étaient des cas graves.

## Discussion

La pharmacovigilance des médicaments mis sur le marché comporte un ensemble de techniques d'identification, d'évaluation et de prévention du risque d'effet indésirable des médicaments, que ce risque soit potentiel ou avéré.

La mise en place de plans de gestion des risques prolonge et élargit la démarche de pharmacovigilance pour certaines catégories de produits. Cette approche élargie de surveillance s'attache à identifier au maximum, avant la mise sur le marché, les enjeux et les méthodes de maîtrise des risques. De plus, elle intègre la notion d'évaluation constante du rapport bénéfice/risque dans les conditions réelles d'utilisation.

Les différents acteurs de l'évaluation du médicament vont donc : confirmer (ou infirmer), en situation réelle, l'efficacité du médicament ; affiner et éventuellement étendre ou restreindre ses indications (« Vérification thérapeutique ») ; recenser les effets indésirables et interactions médicamenteuses fâcheuses ; quantifier leur incidence et importance en pratique réelle établissant ainsi les critères d'innocuité (« Pharmacovigilance ») ; et finalement étudier l'ensemble des conséquences médico-économiques imputables à l'usage du médicament (« Pharmaco-économie »).

- C'est à cet égard, et dans un souci d'amélioration de la sécurité des patients, que le CHU Hassan II de Fès a entamé une politique de gestion du risque. La pharmacovigilance représente donc une priorité de notre CHU. Dans notre établissement, et après plus de 4 ans d'activité, nous avons recueilli 520 cas d'effets indésirables. Ce résultat obtenu est déjà satisfaisant mais reste insuffisant vu le nombre annuel des hospitalisations et le nombre des médecins dans cet établissement. Selon une enquête française menée en 1997, 10 % des patients hospitalisés en hôpital public, un jour donné, présentaient au moins un effet indésirable médicamenteux [8].

Le problème de la sous -notification est un phénomène commun à tous les pays ; le corriger est généralement difficile et sa portée peut être variable, voire méconnue. Même dans les centres bien établis, on estime que la notification des effets graves ne dépasse guère les 10 %. Par ailleurs, les premiers pays ayant participé au programme international de pharmacovigilance de l'OMS reçoivent en général 200 notifications par million d'habitants et par an, provenant de 10 % des médecins. Dans beaucoup d'autres pays, cependant, les taux de notification sont bien inférieurs.

La sous-notification peut retarder la détection de signal et amener à sous-estimer l'ampleur d'un problème. Parmi les éléments qui peuvent participer à la sous-notification, on note :

- la crainte, pour certains professionnels de santé, de la remise en cause de leur compétence, voire la peur de répercussions médico-légales ;
- la réticence à déclarer un cas d'effet indésirable quand ils ne sont pas certains du lien de causalité entre la manifestation de l'effet indésirable et le médicament (sachant qu'il est essentiel de déclarer toute réaction suspecte).

## Conclusion

La mise en place d'un système de pharmacovigilance dans un nouveau centre hospitalier au Maroc témoigne de la volonté des praticiens à surveiller, évaluer et prévenir les risques médicamenteux potentiels ou avérés. C'est un moyen essentiel pour promouvoir le bon usage du médicament.

La régionalisation de la pharmacovigilance et la proximité des pharmacologues et/ou pharmaco-vigiles des praticiens hospitaliers facilitent la déclaration d'effets indésirables, et permettent d'apporter une aide et une information aussi efficaces que possible au prescripteur.

## Remerciements

La réalisation de notre projet n'aurait pas été possible sans le travail professionnel des membres de la commission de la pharmacovigilance et leur implication également en tant que partenaires et collaborateurs. Cette commission se compose de personnes dynamiques visant l'excellence. Ces personnes à qui nous tenons à exprimer nos sincères remerciements sont les suivantes : Farida Ajdi, Wafaa Bono, Adil Ibrahimi, Ouadie Kendoussi, Mernissi Fatima Zahra, Omar El Mesbahi et Ouafae Mikou.

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# دراسات ميكروبيولوجية لأقراص لحم الدجاج المفروم المتبّلة في مدينة طرابلس، ليبيا

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**Microbiological study of spiced chicken burgers in Tripoli City, Libya**

ABSTRACT We investigated the microbiological quality of uncooked and cooked spiced chicken burger in restaurants and fast food places in Tripoli city and surrounding areas. Thus 120 samples (64 cooked and 56 uncooked) were analysed microbiologically. All the samples were highly contaminated with bacteria: 66.6%, 25.9%, 29.6%, 20.3% and 12.9% of the uncooked samples were contaminated with *Escherichia coli*, *Aeromonas* spp., *Staphylococcus aureus*, *E. coli* 0157:H7 and *salmonella* respectively. Additionally 10.9%, 3.1%, 4.68%, 3.12% and 1.56 of the cooked samples were contaminated with *E. coli, Aeromonas* spp., *E. coli* 0157:H7, *S. aureus* and *salmonella* respectively.

**الخلاصة:** درس الباحثان جودة أقراص اللحم المفروم المتبّل النيئة والمطبوخة في مطاعم وأماكن تقديم الوجبات السريعة في مدينة طرابلس والمناطق المجاورة لها. وقاما بتحليل 120 عينة (64 منها مطبوخ و56 منها غير مطبوخ) تحليلاً ميكروبيولوجياً. ووجدا أن جميع العينات ملوَّثة تلوُّثاً شديداً بالبكتيريا، بالنسبة للعينات غير المطبوخة وجد الباحثان أن نسبة 66.6٪ من العينات ملوثة بالإيشريكيا القولونية، و25.9٪ بالزوائف و29.6٪ بالعنقوديات المذهبة، و20.3٪ بالإيشريكيا القولونية H7:0157، و12.9 بالسالمونيلات. كما وجدا بالنسبة للعينات المطبوخة منها أن 10.9٪ ملوَّثة بالإيشريكيا القولونية، و3.1٪ ملوثة بالزوائف، و4.68٪ ملوَّثة بالإيشريكيا القولونية H7:0157، و1.56 ملوَّثة بالعنقوديات المذهبة.

**Étude microbiologique de burgers de poulet épicés dans la ville de Tripoli (Libye)**

RÉSUMÉ Nous avons évalué la qualité microbiologique de burgers de poulet épicés crus et cuits dans des établissements de restauration traditionnelle ou de restauration rapide dans la ville de Tripoli et les environs. Au total, 120 échantillons (64 cuits et 56 crus) ont été analysés microbiologiquement. Tous les échantillons étaient fortement contaminés par des bactéries : 66,6 %, 25,9 %, 29,6 %, 20,3 % et 12,9 % des échantillons crus étaient contaminés par *Escherichia coli*, *Aeromonas* spp., *Staphylococcus aureus*, *E. coli* 0157:H7 entérohémorragique et des salmonelles, respectivement. En outre, 10,9 %, 3,1 %, 4,68 %, 3,12 % et 1,56 % des échantillons cuits étaient contaminés par *E. coli*, *Aeromonas* spp., *E. coli* 0157:H7 entérohémorragique, *S. aureus* et des salmonelles respectivement.

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## المقدمة

تعتبر لحوم الدواجن من المواد الغذائية المهمة للإنسان، فهي من أهم مصادر البروتين، بالإضافة إلى احتوائها على مجموعة فيتامينات (B) والكالسيوم والحديد. ويفضل الكثير من المستهلكين لحوم الدواجن على اللحوم الحمراء، وذلك من الناحية الطبية، فمحتواها من الكالوري أقل من اللحوم الحمراء، فهي تعتبر من اللحوم الجيدة التي يستهلكها الأفراد الراغبون في تحديد أوزانهم، ومنع السمنة، حيث تتراوح السعرات الحرارية ما بين 117 إلى 130 كالوري مقارنة مع لحوم الأبقار التي تتراوح ما بين 180 إلى 320 كالوري. كما تصلح لحوم الدواجن كذلك لتغذية المرضى الذين يمرون بفترة النقاهة بعد الإصابة بالأمراض، وذلك لانخفاض كمية الدهون بها [1]. يحتوي لحم الدواجن على 23.4٪ بروتين، 1.2٪ دهن، 73.8٪ ماء، كذلك تكون قيمة pH بين 5.7 إلى 6.2. ويلاحظ أن نسبة الأحماض الدهنية غير المشبعة في هذا النوع من اللحوم تعتبر عالية، حيث أن الدهون التي تحتوي على نسبة عالية من الأحماض الدهنية المشبعة تساعد على ترسيب الكولسترول [2].

وتصنع الأقراص عادة من لحم الدجاج أو الأبقار المفروم، مع إضافة التوابل وبعض المواد الأخرى، كالماء والبروتينات النباتية ومنتجات الحبوب وغيرها، قبل أن تشكل على هيئة أقراص. وتحدد جودة اللحوم وغير ذلك من المواد الجودة النهائية للأقراص المنتجة إضافةً إلى طريقة التجهيز والتصنيع. فاللحوم المفرومة، كما هو معروف، تعتبر مصدراً للعديد من الجراثيم الممرضة مثل: الإشريكية القولونية H7:0157 والسالمونيلا والعنقودية الذهبية وغيرها [3].

هناك بعض الدراسات التي أجريت للتعرف على الجودة الميكروبيولوجية لأقراص لحم الدواجن المفروم. أجريت دراسة [4] حول انتشار جراثيم العنقودية الذهبية، والإشريكية القولونية في أقراص لحم الدواجن المفروم واللحم البقري المفروم، من 17 سوقاً مختلفاً في جنوب أفريقيا وتم أخذ 232 عينة مختلفة، وكانت نسبة وجود جراثيم الإشريكية القولونية 74.5٪ من عينات اللحم البقري المفروم و79.1٪ من عينات لحم الدواجن المفروم، أما العنقودية الذهبية فقد وجدت بنسبة 23.4٪ من عينات أقراص لحم البقري المفروم و39.5٪ في أقراص لحم الدواجن المفروم.

وفي تركيا [5] أجريت بحوث على أنواع من الجراثيم الغازية في العديد من نماذج الأغذية، ومن ضمنها كانت أقراص لحم الدواجن المفروم، حيث وجد أن 20٪ من أصل 23 عينة كانت مصابة بهذه الجراثيم أي بنسبة 86.9٪، وكانت في أقراص اللحم البقري المفروم 67٪ أي 40 عينة مصابة من أصل 59 عينة من أقراص اللحم البقري المفروم وكانت الأنواع السائدة هي الغازية الهوائية والغازية الصوبية *Aeromonas hydrophila*، *A. sobira*.

في دراسة [6] عن جودة أقراص اللحم المفروم في أسبانيا من الناحية الميكروبيولوجية استمرت ثلاث سنوات واستخدم فيها الباحث 559 عينة، حيث قام بتقدير العدد الكلي والكشف عن جراثيم السالمونيلا والجراثيم القولونية، فوجد أن 239 عينة غير مطابقة للقانون الصحي، حيث كان عدد الجراثيم القولونية 5.0 × 210/ غرام، والسالمونيلا كانت في 12٪ منها، والعدد الكلي كان 5 × 10 وحدة تكوين مزرعة لكل غرام (و.ت.م/ غرام) وفي دراسة أخرى [7] عملوا على معرفة تأثير المعاملة الحرارية على جراثيم الإشريكية القولونية H7:0157 في أقراص لحم الدواجن المفروم حيث قاموا بحقن الأقراص بجراثيم الإشريكية القولونية H7:0157 وطهيها لمدة ما بين 2.25 إلى 4 دقائق وكانت درجة الحرارة الداخلية 137 درجة مئوية. بعد ذلك تم الكشف عن جراثيم الإشريكية القولونية H7:0157 بواسطة بيئة tryptic soy agar وكذلك sorbitol MacConkey agar فكانت الاختبارات سالبة وهذا يعني أن المعاملة الحرارية الجيدة في المطاعم يمكنها القضاء على جراثيم الإشريكية القولونية H7:0157.

وتمثل جراثيم الإشريكية القولونية H7:0157، التي تُسبِّب الإسهال والبول المدمان، خصوصاً لدى الأطفال والمسنِّين، العامل الرئيسي للعدوى عن طريق أقراص اللحم المفروم، وذلك وفقاً لبعض التقارير التي نشرت خلال العشر سنوات الأخيرة [8–10].

تهدف هذه الدراسة إلى التعرف على جودة أقراص لحم الدجاج المفروم التي يتم إعدادها في بعض المقاهي والمطاعم الواقعة داخل نطاق مدينة طرابلس، وذلك من الناحية الميكروبيولوجية، للتأكد من مدى مطابقتها للمواصفات الصحية والكشف عن وجود بعض البكتيريا المُمْرِضة فيها.

## المواد والطرق

جمعت أقراص لحم الدجاج المفروم المتبلة، زنة 45 غرام المطبوخة وغير المطبوخة التي اختيرت عشوائيا في المطاعم ومحلات الأطعمة السريعة بمناطق مختلفة في مدينة طرابلس وضواحيها، لتمثل الجودة الميكروبية فيها. وبلغ عدد العينات 120 عينة عشوائية (56 عينة غير مطبوخة و64 عينة مطبوخة). ثم نقلت في حافظة عازلة للحرارة تحتوي على قطع من الثلج حتى وصولها إلى المختبر خلال نصف ساعة من جمعها.

### تجهيز العينات للتحليل

تم إعداد عينة متجانسة من أقراص لحم الدجاج المفروم، ونقل 15 غم منها إلى 135 مل من بيئة المرق المُغَذِّي (nutrient broth) المعقمة وبها لآلئ زجاجية صغيرة الحجم، وبعد ذلك أجريت سلسلة من التخفيفات العشرية.

### تقدير عدد الجراثيم الهوائية الحية

تم تقدير عدد الجراثيم الهوائية الحية باستعمال مُستنبَت المرق المُغَذِّي وحُضِنَت في درجة حرارة 37°لمدة 48 ساعة [11].

### تقدير عدد جراثيم القولون

تم تقدير عدد جراثيم القولون من خلال طريق العدد الأكثر احتمالاً most probable number وذلك باستعمال بيئة مرق ماك كونكي (MacConkey broth) وحُضِنَت في درجة حرارة 37 مئوية لمدة 24 – 48 ساعة [3].

### تقدير عدد جراثيم القولون الغائطية

تم اتباع طريقة العدد الأكثر احتمالاً وذلك باستعمال مَرَق الخُضرة اللامعة مع الصفراء brilliant green bile broth وحُضِنَت في درجة حرارة 44.5 مئوية لمدة 24 ساعة في حمام [3].

### الكشف عن وجود جراثيم الإشريكية القولونية *O157 :H7 Escherichia coli*

استعمل محلول التخفيف ($10^{-1}$) المتبقي من العينة المستخدمة في تقدير عدد الجراثيم الهوائية الحية وحُضِنَت لمدة 4 ساعات في درجة حرارة 37 مئوية لإنعاشها، ثم بعد ذلك تم التخطيط على سطح بيئة أغار ماك كونكي MacConkey agar وأغار ماك كونكي بالسوربيتول sorbitol MacConkey agar في

أطباق بتـري. واستخدمت المستعمرات النموذجية المتكونة في تلقيح الجراثيم triple sugar iron agar في الأنابيب، ثم استعملت بيئة ميلي وطقم API20E من صنع شركة bioMérieux للتعرف على المعزولات [12]. كما استخدمت المصول الضِدِّية *E. coli* H7:0157 antisera من صنع شركة Eurobio للتأكد بشكل قاطع من أن الـمُسْتَفْرَدات isolates هي جراثيم الإشريكية القولونية *E. coli* H7:0157 المرضة.

**الكشف عن وجود جراثيم العنقودية الذهبية *Staphylococcus aureus***

استعمـل محلـول التخفيـف ($10^{-1}$) المتبقي من العيـنة المستخدمـة في تقديـر عـدد الجراثيـم الهوائيـة الحيـة وحُضِنَـت لمـدة 4 ساعات في درجة حرارة 37 مئوية لإنعاشها، ثم خططت على سطح بيئة mannitol salt agar في أطباق بتـري، وحُضِنَت في درجة حرارة 37 مئوية لمدة 24–48 ساعة، ولُوِّنت المستعمرات الذهبية باللون (صفراء اللون) المتكونة بطريقة الغرام للتأكد من أنها موجبة لهذا الملوّن وعنقودية الشكل، وتم إجراء اختبار الكاتالاز catalase واختبـار المخثِّـرة (كواغـولاز) coagulase للتأكـد مـن أن الـمُسْتَفـرَدات isolates هـي جراثيـم *S. aureus* الْمُمْرِضة [11].

**الكشف عن وجود جراثيم الغازية *Aeromonas***

تم تجهيز أقراص اللحم المفروم لهذا الاختبار بإضافة 15 غم من العينة المتجانسة إلى 135 مل من مُستنَبت ماء البـبتون القلوي alkaline peptone water المعقمة في دورق زجاجي مع لآلئ زجاجية، وحُضِن الدورق في درجة حرارة 37 مئوية لمدة 24 ساعة. وعقب ذلك تم التخطيط على سطح مُستنَبت أغار الدم والبنسلين ampicillin blood agar في أطباق بتـري وكان تركيز المضاد الحيوي إمبيسلين 30 ميكروغرام/ مل، وحضنت في درجة حرارة 37 مئوية لمدة 24 – 48 ساعة، وأجري اختبار الأوكسيداز oxidase للمستعمرات المتكونة على سطح الـمُسْتَنبت التي لونها أبيض ومحاطة بهالـة تـدل على تحلـل الـدم. واستخدمـت المستعمـرات الموجبـة لاختبـار الأوكسيـداز oxidase في حقن بيئة EMP [13,12]. استخدمت المستعمرات النموذجية لحقن مُستنَبت الإسكولين Esculin بالإضافة إلى استعمال طقم API20NE من صنع شركة bioMérieux للتعرف على الأنواع المختلفة لجنس الغازيَّة [14]

**الكشف عن بكتيريا السالمونيلا *(Salmonella)***

عقب تحضين العينة مع محلولها ($10^{-1}$) عند درجة حرارة 37 مئوية مئوية لمدة 24 ساعة لإجراء عملية الإنعاش، حضر 10 مل من وسط salanite-F-broth [15]. بعدها تم نقل 1 مل من محلول العينة وأضيف إلى أنبوبة salanite-F-broth، وحضنت عند درجة حرارة 37 مئوية لمدة 24 ساعة، ثم أخذت مسحة بإبرة الزرع ذات العقدة من أعلى السطح بداخل الأنبوب، وخططت على وسط(SSA) salmonella shigella agar [15] وحضنت عند درجة حرارة 37 مئوية لمدة 24 ساعة، في حالة تكون مستعمرات غير مخمرة لسكر اللاكتوز وعدم تكون اللون الوردي، عُزِلت وعُرِّفت باستخدام الاختبارات الكيميائية الحيوية بواسطة أنابيب سكر ثلاثي الحديد (TSIA)، ثم أجري لها اختبار tests IMViC واختبار اليوريز، واختبار الحركة على وسط SIM وكذلك خططت على أطباق وسط citrate agar وحضنت الأنابيب والأطباق عند درجة حرارة 37 مئوية لمدة 24 ساعة ومن ثم أخذت أعزولة من أحد المستعمرات وخططت على وسط nutrient agar وحضنت عند 37 مئوية لمدة 24 ساعة للإنعاش، ومنها أجري لها اختبارات E Api 20 للتأكد من أن الإعزولة هي بكتيريا سالمونيلا أو الشيغيلة [16].

## النتائج والمناقشة

يتبين من الجدول (1) أن متوسط العدد الكلي للجراثيم الهوائية في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة كان $1.7 \times 10^7$ وحدة تكوين مستعمرة/ غم، وأن المدى يتراوح ما بين $2.4 \times 10^5$ إلى $1.4 \times 10^8$ وحدة تكوين مستعمرة/ غم. وأن هناك فروق معنوية بين المناطق التي أجريت عليها هذه الدراسة كما موضح في الجدول (1). إن هذه النتائج جاءت مقاربة مع نتائج (الشريك ومجموعته 2008) [3] حيث كان متوسط العدد الكلي للجراثيم الهوائية في أقراص اللحم البقري المفروم المتبلة وغير المطبوخة $5.5 \times 10^7$ وحدة تكوين مستعمرة/ غم، وأن المدى يتراوح ما بين $9.4 \times 10^4$ إلى $5.4 \times 10^8$ وحدة تكوين مستعمرة/ غم. وقد يعود سبب ارتفاع عدد الجراثيم الهوائية في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة إلى تدني الجودة الميكروبيولوجية للحم المفروم والتوابل والماء المستخدم في صناعة أقراص لحم الدواجن المفروم. وفي دراسة (الشريك ومجموعته 1985) [10] أجريت حول حجم التلوث الميكروبي لأحد مكونات الأقراص (اللحم المفروم) على مستوى مدينة طرابلس تبين أن عدد الجراثيم الهوائية يتراوح ما بين $5.2 \times 10^3$ إلى $5.1 \times 10^7$ وحدة تكوين مستعمرة/ غم، هذه الزيادة في العدد الكلي ربما يكون سببها راجعاً إلى ملامسة سطح الذبيحة للدم أثناء عملية الذبح خاصةً مع التحفظ الواضح في استعمال الماء في الغسيل، وأيضاً من الأخطاء الشائعة نزع الأحشاء وإتمام عملية التجويف، ففي كثير من الأحيان يتم تمزيق الأحشاء وملامسة الفضلات لسطح الذبائح، كذلك حدوث التلوث العرضي الناتج عن ملامسة الأشخاص واستعمال نفس المعدات مثل السكاكين في جميع مراحل عمليات التجهيز دون غسلها في أغلب الأحيان، أو غسلها في أحواض بها ماء بارد ولا تحتوي على أي مواد مطهره ولا يتم تغيير مياهها إلا بعد فترة طويلة.

**جدول 1 المتوسطات العامة وحدود التلوث الدنيا والعليا للعدد الكلي للجراثيم الهوائية حسب المناطق لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة**

| نوع الاختبار (غير مطبوخة) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | الهضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الكلي للجراثيم الهوائية (و.ت. م/ غم) | المتوسط | $7 10 \times 1.7$ | $7 10 \times 2.5^{acd*}$ | $7 10 \times 2.7^{acd*}$ | $6 10 \times 4.7^{c*}$ | $6 10 \times 7.9^{d*}$ |
| | الحد الأعلى | $8 10 \times 1.4$ | $7 10 \times 5.8$ | $8 10 \times 1.4$ | $6 10 \times 8.6$ | $7 10 \times 2.9$ |
| | الحد الأدنى | $5 10 \times 2.4$ | $5 10 \times 3.4$ | $5 10 \times 2.5$ | $6 10 \times 1.9$ | $5 10 \times 2.4$ |

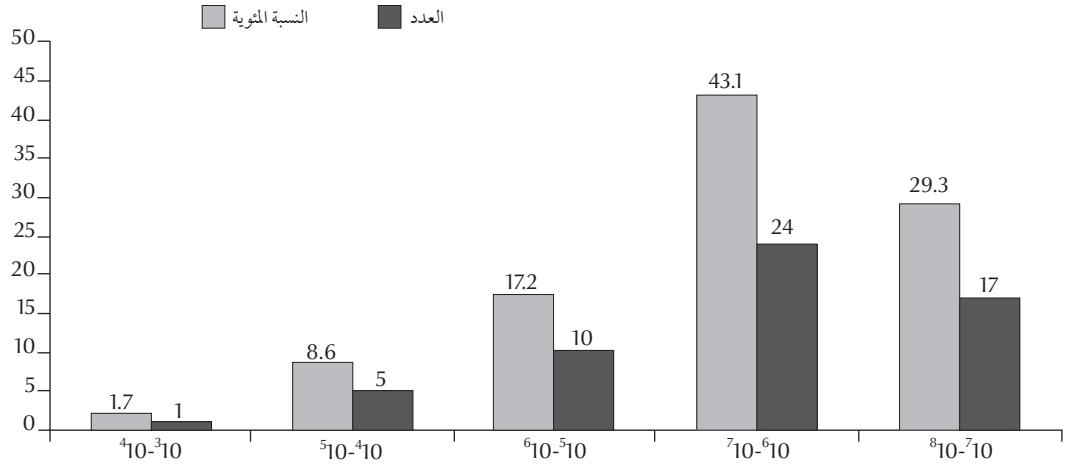
*المتوسطات التي تحمل حروف مختلفة في الصف الواحد بينها فروق معنوية عند مستوى معنوي ($P \leq 0.05$).

نظراً لعدم اعتماد مشروع المواصفة القياسية الليبية لأقراص اللحم المفروم لحين إعداد هذه الدراسة، فقد تم مقارنة النتائج التي تم الحصول عليها من خلال هذه الدراسة مع بعض المواصفات القياسية العالمية ومنها المواصفة المصرية (غنيم، 1992) التي تنص على ألا يزيد العدد الكلي للجراثيم الهوائية لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة عن $1.0 \times 10^5$ وحدة تكوين مستعمرة/ غم. كذلك أظهرت الدراسة إن 90٪ من أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، كانت غير مطابقة للمواصفة المصرية حيث كانت أكثر من $1.0 \times 510$ وحدة تكوين مستعمرة/ غم .كما أشار فليس ومجموعته [17] إلى أن العدد الكلي المبدئي عموماً يشكل أو يشمل مجاميع واسعة التنوع من الكائنات الدقيقة، وبين أن الذبائح الطازجة تحتوي تقريباً من 210 إلى 410 وحدة تكوين مستعمرة/ غم، ويعتبر اختبار العدد الكلي وسيلة من وسائل الكشف والاستدلال على مدى التلوث الواقع لمواد الخام، حيث إن ارتفاع العدد الكلي يعبر عن سوء الظروف الصحية التي يُعرَّض إليها الحيوان قبل وبعد الذبح، بينما العدد المنخفض يعبر عن الظروف الجيدة، إلا أنه لا يعطي تأكيدات على أن اللحم خالٍ من الكائنات الدقيقة المُمْرِضة. ففي دراسة [18] حول مستوى التلوث بالكائنات الدقيقة، وجد أن اللحم المفروم يتعرض للكثير من المداولة وبالتالي للتلوث من قبل أيدي العاملين وآلات الفرم وبالتالي تكون الحصيلة لحم مفروم بعدد بكتيري ابتدائي مرتفع، وغالباً ما يباع هذا اللحم المفروم غير مطبوخ وممكن أن يستهلك غير مطبوخ أيضاً وهذا ما يجعله مصدراً للخطر، ولذلك يجب مراعاة إنتاج لحم مفروم بأقل عدد ميكروبي ابتدائي.

ونلاحظ من شكل (1) التوزيع التكراري لأعداد جراثيم الهوائية الكلية لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، حيث يتضح أن 29.3٪ من العينات تتراوح أعداد الجراثيم الهوائية فيها ما بين 710 إلى 810 وحدة تكوين مستعمرة/ غم، وأن هذه النسبة تعتبر مرتفعة جداً، إذ تشير الدراسات أن وصول أعداد الجراثيم إلى أكثر من $10^6$ وحدة تكوين مستعمرة/ غم، يبدأ الفساد الميكروبي بدون تكون رائحة، وأن وصول أعداد الجراثيم إلى أكثر من $10^7$ وحدة تكوين مستعمرة/ غم، يبدأ الفساد الميكروبي مع تكون رائحة، بينما وصول أعداد الجراثيم إلى أكثر من $10^8$ وحدة تكوين مستعمرة / غم، يصل الفساد الميكروبي إلى مرحلة اللزوجة [11].

وتبيَّن من تحليل نتائج هذه الدراسة أن هناك فروقاً معنوية عند مستوى 0.05 بين المناطق التي تم أخذ العينات منها ويعود هذا التباين ربما للاختلاف في طرق إعداد الأقراص وتجهيزها واتباع النظم والقواعد الصحية في التجهيز.

أما أقراص لحم الدواجن المفروم المتبلة والمطبوخة فيتبين من الجدول (2) أن متوسط العدد الكلي للجراثيم الهوائية $3.4 \times 10^4$ وحدة تكوين مستعمرة/ غم، وأن المدى يتراوح ما بين $2.7 \times 10^3$ إلى $1.5 \times 10^5$ وحدة تكوين مستعمرة/ غم. أن هذه النتائج جاءت مقاربة مع نتائج الشريك ومجموعته [8] حيث كان متوسط العدد الكلي للجراثيم الهوائية في أقراص اللحم المفروم المتبلة والمطبوخة $2.85 \times 10^4$ وحدة تكوين مستعمرة/ غم، وأن المدى يتراوح ما بين $2.6 \times 10^2$ إلى $4.5 \times 10^4$ وحدة تكوين مستعمرة/ غم. ربما يعود هذا الارتفاع في مستوى التلوث بالكائنات الدقيقة في أقراص لحم الدواجن المفروم المتبلة والمطبوخة إلى تدني جودة أقراص اللحم المفروم، وربما رجع إلى أن عمليات الطبخ لمعظم هذه الأقراص لم تكن




**شكل 1** التوزيع التكراري لأعداد بكتريا الهوائية الكلية لاقراص لحم الدواجن المفروم المتبلة وغير المطهية (البرجر) (و.ت. م/ غم).

**جدول 2** المتوسطات العامة وحدود التلوث الدنيا والعليا للعدد الكلي حسب المناطق للبكتريا الهوائية لأقراص لحم الدواجن المفروم المتبلة المطبوخة

| نوع الاختبار (مطهية) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | المضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الكلي للجراثيم الهوائية (و.ت.م/ غم) | المتوسط | $3.4 \times 10^4$ | $3.2 \times 10^{4*}$ | $2.0 \times 10^{4*}$ | $4.1 \times 10^{4*}$ | $3.7 \times 10^{4*}$ |
| | الحد الأعلى | $1.5 \times 10^5$ | $8.9 \times 10^4$ | $4.9 \times 10^4$ | $1.5 \times 10^5$ | $8.0 \times 10^4$ |
| | الحد الأدنى | 10> | $2.7 \times 10^3$ | 10> | $2.0 \times 10^3$ | $6.0 \times 10^3$ |

*المتوسطات التي في الصف الواحد ليس بينها فروق معنوية عند مستوى معنوي ($P < 0.05$).

كافية من أجل خفض محتوى التلوث الميكروبي للحد المقبول، ربما يعود كذلك إلى الاختلاف في سُمْك الأقراص، وأن هذا الاختلاف في سمك الأقراص يؤدي إلى عدم تساوي درجات الحرارة داخل الأقراص، وربما يحدث التلوث بعد عملية الطبخ نتيجة لعدم نظافة العاملين وعدم النظافة وسوء التداول، نتيجة لسوء الظروف المحيطة.

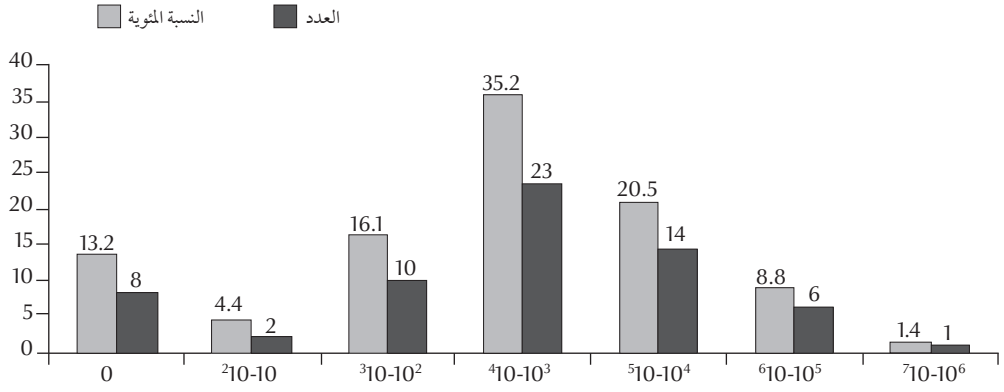
نلاحظ من شكل (2) التوزيع التكراري لأعداد جراثيم الهوائية الكلية لأقراص لحم الدواجن المفروم المتبلة والمطبوخة، حيث يتضح أن 35.2٪ من العينات تتراوح أعداد الجراثيم الهوائية فيها ما بين $10^3$ إلى $10^4$ و.ت.م/ غم، وهذا دليل على عدم اتباع الشروط الصحية في إعداد وتجهيز وطهي هذه الأقراص.

ومن خلال التحليل الإحصائي لأقراص لحم الدواجن المفروم المتبلة المطبوخة في هذه الدراسة، يتضح أنه ليس هناك فروق معنوية عند مستوى احتمال 0.05 مما يشير إلى عدم الاختلاف في مدى جودة الأقراص، وفي عدم تطبيق الاشتراطات الصحية في المنشآت الغذائية.

لقد تم اتباع طريقة العدد الأكثر احتمالاً في تقدير عدد الجراثيم القولونية (MPN) ويتبين من الجدول (3) إن متوسط عدد جراثيم القولون في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة $2.4 \times 10^4$/ غم، وأن المدى يتراوح ما بين $1.2 \times 10^2$ إلى $1.1 \times 10^5$/ غم، وبمقارنة هذه النتائج مع (الشريك ومجموعته) [3] تعتبر عالية، حيث وجد أن متوسط عدد جراثيم القولون في أقراص اللحم المفروم المتبلة وغير المطبوخة $1.0 \times 10^3$/ غم، وأن المدى يتراوح ما بين 1.7 إلى $1.8 \times 10^3$/ غم، وبمقارنة النتائج في جدول (3) مع بعض المواصفات القياسية العالمية، نظراً لعدم اعتماد مشروع المواصفة القياسية الليبية لحد إعداد هذه الدراسة، قورنت النتائج مع المواصفة الكندية لأقراص اللحم المفروم، حيث تشير إلى أن جراثيم القولون في أقراص لحم الدواجن المفروم غير المطبوخة يجب ألا تزيد عن $1.0 \times 10^2$ وحدة تكوين مستعمرة/غم (و ت م/ غرام). ومن خلال نتائج هذه الدراسة، نلاحظ أن 94٪ من العينات غير مطابق للمواصفات القياسية الكندية، هذا الارتفاع في عدد جراثيم القولون قد يعود إلى انخفاض جودة المواد الخام الداخلة بالتصنيع والتوابل والماء، وفي دراسة (للشريك ومجموعته 1985) [10] على أحد مكونات الأقراص (اللحم المفروم) [19] في مستوى مدينة طرابلس تبين أن عدد جراثيم القولون للحم المفروم تتراوح ما بين $2.0 \times 10^3$ إلى $2.0 \times 10^7$، وحدة تكوين مستعمرة/ غم. كما بين فليس ومجموعته [17] في دراسة قام بها، حيث تم أخذ عينات من أقراص لحم الدواجن المفروم، كان العدد الكلي لجراثيم القولون $1.5 \times 10^5$/ غم. وفي دراسة قام بها مورينو [6] عن الجودة الميكربيولوجية لأقراص اللحم المفروم في أسبانيا حيث وجد 42٪ من العينات غير مطابقة للمواصفات والشروط الصحية، وكان متوسط عدد جراثيم القولون $5.0 \times 10^2$/ غم، وفي دراسة أخرى حول جودة أقراص اللحم المفروم المتبلة وغير المطبوخة على مستوى مقاهي جامعة الفاتح في طرابلس بين (المرغني ومجموعته) [13] أن متوسط أعداد جراثيم القولون في العينات غير المطبوخة يتراوح بين $6.2 \times 10^4$/غم إلى $2.4 \times 10^4$/ غم.

كما يبين شكل (3) التوزيع التكراري لأعداد جراثيم القولون لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، ونلاحظ أن 44.6٪ من العينات كان أعداد جراثيم القولون فيها يتراوح ما بين $10^3$ إلى $10^4$/ غم، وهذه النسبة تدل على عدم التقيد بالشروط الصحية وانخفاض جودة اللحوم المستخدمة.

ومن خلال التحليل الإحصائي لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة يتضح أنه هناك فروق معنوية عند مستوى احتمال 0.05، مما يشير إلى أن هنالك تفاوت في مدى جودة




شكل 2 التوزيع التكراري لأعداد بكتريا الهوائية الكلية لاقراص لحم الدواجن المفروم المتبلة والمطهية (البرجر) (و.ت. م/ غم).

جدول 3 المتوسطات العامة وحدود التلوث الدنيا والعليا للعدد الكلي لجراثيم القولون حسب المناطق لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة

| نوع الاختبار (مطهية) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | المضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الكلي للجراثيم الهوائية (و.ت.م/ غم) | المتوسط | $2.4 \times 10^4$ | $2.1 \times 10^3$ *acd | $3.8 \times 10^3$ *bcd | $4.7 \times 10^4$ *c | $4.2 \times 10^4$ *d |
| | الحد الأعلى | $1.1 \times 10^5$ | $4.6 \times 10^3$ | $1.1 \times 10^4$ | $1.1 \times 10^5$ | $1.1 \times 10^5$ |
| | الحد الأدنى | $1.2 \times 10^2$ | $1.5 \times 10^2$ | $1.2 \times 10^2$ | $1.1 \times 10^4$ | $2.4 \times 10^3$ |

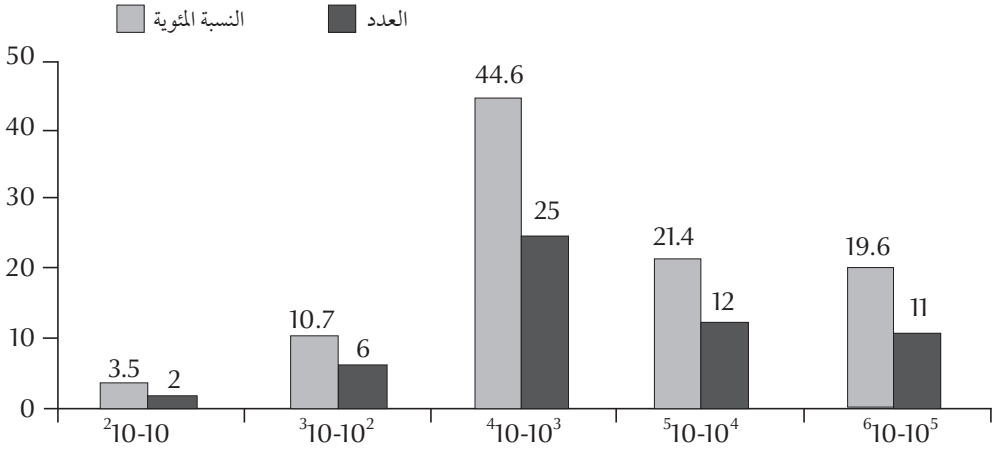
*المتوسطات التي في الصف الواحد ليس بينها فروق معنوية عند مستوى معنوي ($P < 0.05$).

الأقراص وعدم تطبيق الاشتراطات الصحية في المنشآت الغذائية.

تم دراسة نسبة تواجد جراثيم الإشريكية القولونية *E. coli* بصورة عامة في أقراص لحم الدواجن المفروم والمتبلة المطبوخة وغير المطبوخة (البرجر)، حيث يبين جدول (4) أن نسبة الأقراص الملوثة الإشريكية القولونية تمثل 66.6٪ من العينات غير المطبوخة. يلاحظ من خلال النتائج في هذه الدراسة أن أقراص لحم الدواجن المتبلة وغير المطبوخة، جميعها كانت ملوثة ببكتريا القولون وبكتريا القولون البرازية وأن 66.6٪ كانت مُلوَّثة ببكتريا الإشريكية القولونية *E. coli*، وقد تم التأكد من العزولات بواسطة الاختبارات الكيميائية الحيوية. هذا الارتفاع في نسبة التلوث في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، ربما يعود إلى الإهمال وعدم الالتزام وعدم الإلمام بالإجراءات والوسائل الصحية اللازمة لعمل وتجهيز أقراص لحم الدواجن المفروم، وقد يعود سبب الارتفاع إلى تدنى جودة المواد الداخلة في صناعة أقراص لحم الدواجن المفروم. ومن خلال مقارنة نتائج هذه الدراسة ببعض الدراسات الأخرى نجد أنها تتفق مع دراسة (الطويل ومجموعته) [12] لأحد مكونات الأقراص (اللحم المفروم) [19] بمدينة طرابلس، حيث كانت 74 عينة من أصل 117 عينة ملوثة ببكتريا الإشريكية القولونية *E. coli*، أي بنسبة 63.1٪، والتي أعزت التلوث إلى احتمال النظافة الشخصية للعاملين في المنشآت الغذائية أو سوء التداول وعمليات التخزين خلال عمليات التصنيع والإعداد. أما في دراسة (الشريك ومجموعته) [20] على أقراص اللحم المفروم المتبلة على مستوى مدينة طرابلس، وجد نسبة بكتريا الإشريكية القولونية *E. coli*، كانت 74.5٪ وهذه النسبة أعلى من النتائج المتحصل عليها من هذه الدراسة حيث كانت نسبة بكتريا الإشريكية القولونية *E. coli* في أقراص لحم الدواجن المفروم غير المطبوخة والمتبلة 66.6٪. وفي الدراسة التي قام بها (فورستر ومجموعته) [4] حول انتشار بكتريا الإشريكية القولونية *E. coli*، من عينات لحم الدواجن المفروم في 232 عينة من جنوب أفريقيا، وجد أن 79.1٪ ملوثة بهذه البكتريا، وهذه النسبة أعلى من النتائج المتحصل عليها من هذه الدراسة. أما عبد الرؤوف [21] فقام بدراسة حول انتشار الإشريكية القولونية *E. coli* في بعض الأغذية المنتشرة في جمهورية مصر العربية، حيث أخذ 125 عينة من لحوم مفرومة مختلفة، وجد 2 من 50 (4٪) من لحم الدواجن المفروم ملوثة بهذه البكتريا، وهذه النتائج أقل بكثير من النتائج المتحصل عليها في هذه الدراسة. أما فيما يخص أقراص لحم الدواجن المفروم المتبلة والمطبوخة، فكانت نسبة تواجد بكتريا الإشريكية القولونية *E. coli* فيها 10.9٪ من العينات. ويعتبر تلوث أقراص لحم الدواجن المفروم المتبلة المطبوخة بهذه البكتريا دليلاً على عدم الطبخ الجيد، حيث وُجِد أن درجة الطهي 70 س° كافية للقضاء على هذه البكتريا أو نتيجة لعدم نظافة الشخصية للقائمين بالأعداد أو ترك الأقراص لفترة زمنية أكثر من اللازم في أجواء تكون تفتقر للشروط الصحية السليمة.

جدول (4) نسبة التلوث ببكتريا *E. coli* وعدد العزولات من أقراص لحم الدواجن المفروم المطبوخة وغير المطبوخة

أما فيما يخص أقراص لحم الدواجن المفروم المتبلة والمطبوخة فيتبين من جدول (5) أن متوسط عدد جراثيم القولون 2.20 و.ت.م/غم، وأن المدى يتراوح ما بين 3> إلى 23/غم. وجاءت مقاربة مع النتائج التي توصل إليها الشريك ومجموعته [3] حيث كان متوسط العدد الكلي لجراثيم القولون 2.15/غم، وأن المدى يتراوح ما بين 0.0 إلى 35/غم. وهذه النتائج تعتبر منخفضة مقارنة مع دراسة الطويل ومجموعته [13] لأقراص اللحم المفروم المتبلة والمطبوخة بمدينة طرابلس، حيث كان متوسط




شكل 3 التوزيع التكراري لأعداد بكتريا القولون لأقراص لحم الدواجن المفروم المتبلة وغير المطهية (البرجر)/ غم

جدول 4 نسبة التلوث ببكتريا *E. coli* وعدد العزولات من أقراص لحم الدواجن المفروم المطبوخة وغير المطبوخة

| حالة الأقراص | نسبة التلوث (٪) | عدد العزولات التي تم التأكُّد منها |
|---|---|---|
| غير مطبوخة | 66.6 | 108 |
| مطبوخة | 10.9 | 21 |

جدول 5 المتوسطات العامة وحدود التلوث الدنيا والعليا للعدد الكلي لجراثيم القولون حسب المناطق لأقراص لحم الدواجن المفروم المتبلة المطبوخة

| نوع الاختبار (مطبوخة) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | الهضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الأكثر احتمالاً لجراثيم القولون/ غم | المتوسط | 2.20 | 2.50* | 2.21* | 1.64 * | 1.78 * |
| | الحد الأعلى | 23 | 23 | 23 | 11 | 11 |
| | الحد الأدنى | 3> | 3> | 3> | 3> | 3> |

* المتوسطات التي في الصف الواحد ليس بينها فروق معنوية عند مستوى معنوي ($P \leq 0.05$).

العدد الأكثر احتمالاً لجراثيم القولون 9.13 وحدة تكوين مستعمرة/ غم. وفي دراسة أخرى [22] كان عدد جراثيم القولون في أقراص اللحم المفروم المتبلة والمطبوخة بمقاهي في جامعة الفاتح، يتراوح بين 1.0 × $10^2$ إلى 1.9 × / غم. ويعود التلوث بجراثيم القولون في الأقراص المطبوخة إلى الطهي غير الجيد حيث يمكن القضاء على جراثيم القولون على حرارة 70 مئوية وكذلك يعود السبب إلى الافتقار إلى الأسلوب الصحي وعدم الالتزام بالتنظيف وتطهير الأدوات المستخدمة في التصنيع.

ويبين شكل (4) التوزيع التكراري لإعداد جراثيم القولون لأقراص لحم الدواجن المفروم المتبلة والمطبوخة، حيث نجد أن 87.5٪ من العينات، كانت أقل من 3/ غم، وهذا مؤشر على مدى حساسيتها للحرارة.

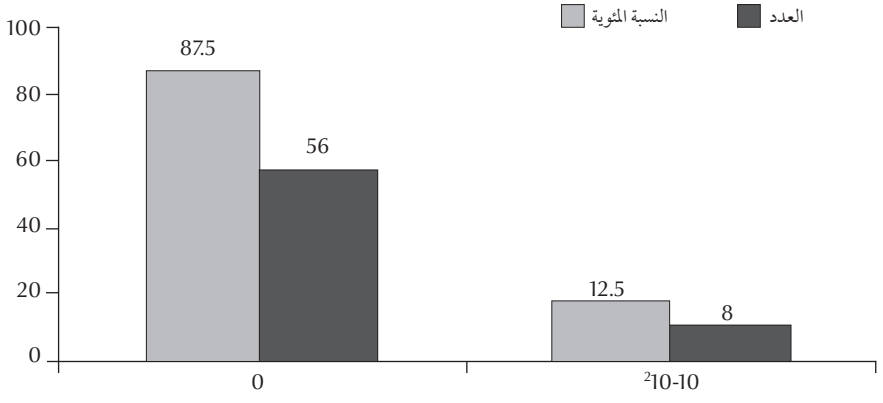
ومن خلال التحليل الإحصائي لأقراص لحم الدواجن المفروم المتبلة المطبوخة في هذه الدراسة، يتضح أنه ليس هناك فروق معنوية عند مستوى احتمال 0.05 مما يشير إلى عدم التفاوت في مدى جودة الأقراص وعدم تطبيق الاشتراطات الصحية في المنشآت الغذائية.

لقد تم اتباع طريقة العدد الأكثر احتمالاً (MPN) في تقدير عدد الجراثيم القولونية الغائطية، حيث يتبين من الجدول (6) أن متوسط العدد الكلي لجراثيم القولون الغائطية في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة 1.9 × $10^4$/ غم، وأن المدى يتراوح ما بين 1.2 × $10^2$ إلى 1.1 × $10^5$/ غم. وفي دراسة الشريك ومجموعته [3] على أقراص اللحم المفروم المتبلة وغير المطبوخة كان المتوسط لعدد جراثيم القولون الغائطية 8.6 × $10^2$/ غم، وتراوح المدى ما بين 1.0 إلى 1.8 × $10^3$/ غم. ونلاحظ من خلال هذه الدراسة أن 96.4٪ من العينات غير المطبوخة مُلوَّثة بجراثيم القولون الغائطية. وهذه النتيجة مقاربة لدراسة الشريك ومجموعته (2008) حيث وجد جميع العينات من أقراص اللحم المفروم المتبلة وغير المطبوخة ملوثة بجراثيم القولون الغائطية، وتعتبر بكتيريا القولون الغائطية من أنواع بكتيريا القولون، وأغلب مصادرها يكون من براز الإنسان أو الحيوان. وقد بين إنغرام [23] أن وجود بكتيريا القولون الغائطية يعتبر مؤشراً على وجود الكائنات الدقيقة الـمُمرِّضة، كذلك يمكن التعرف من خلالها على مصدر الخطر في اللحوم. كما أشار كروناكي (Kornacki ومجموعته 2001) إلى أن هذه البكتيريا لها القدرة على أن تخمُّر اللاكتوز وتنتج حامضاً وغازاً. وربما يعود هذا التلوث للأقراص غير المطبوخة إلى انخفاض جودة المواد المستخدمة بالأقراص غير المطبوخة أو لعدم كفاءة عمليات التنظيف والتطهير والمواد المستخدمة في التصنيع وعدم النظافة الشخصية للعاملين.

كما يبين شكل (5) التوزيع التكراري لأعداد جراثيم القولون لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، ونلاحظ أن 39.2٪ من العينات كان أعداد جراثيم القولون فيها يتراوح ما بين $10^3$ إلى $10^4$/ غم، وهذه النسبة تدل على عدم التقيد بالنظافة والغسيل الجيد وانخفاض جودة اللحوم المستخدمة.

ومن خلال التحليل الإحصائي لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة يتضح أنه هناك فروق معنوية عند مستوى احتمال 0.05 مما يشير إلى أن هنالك تفاوت في مدى جودة الأقراص وعدم تطبيق الاشتراطات الصحية في المنشآت الغذائية.

أما فيما يخص أقراص لحم الدواجن المفروم المتبلة والمطبوخة يوضح جدول (7) أن متوسط جراثيم القولون الغائطية 1.44/ غم، وأن المدى يتراوح ما بين 3> إلى 23/ غم. وفي دراسة الشريك ومجموعته [3] على أقراص اللحم المفروم المتبلة كان المتوسط لعدد جراثيم القولون الغائطية 0.268/ غم، وتراوح المدى ما بين 0.0 إلى 13/ غم، ونلاحظ من خلال هذه الدراسة




شكل 4 التوزيع التكرارى لأعداد بكتريا القولون الكلية لاقراص لحم الدواجن المفروم المتبلة والمطهية (البرجر) / غم.

جدول 6 المتوسطات العامة وحدود التلوث الدُنيا للعدد الكلي لجراثيم القولون أليفة الحرارة (الغائطية) حسب المناطق لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة

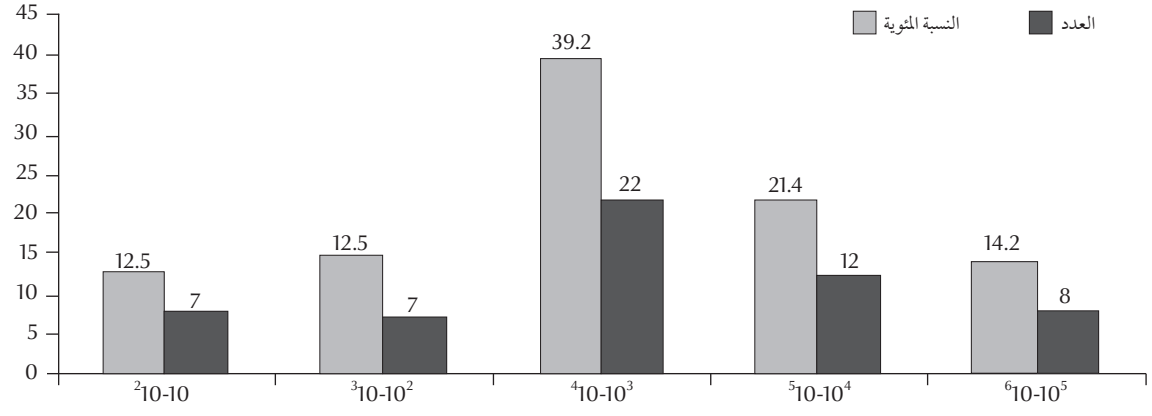
| نوع الاختيار (غير مطبوخة) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | المضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الأكثر احتمالاً لجراثيم القولون أليفة الحرارة (الغائطية)/ غم | المتوسط | $4_{10} \times 1.9$ | $3_{10} \times 1.7^{acd*}$ | $3_{10} \times 2.9^{bcd*}$ | $4_{10} \times 3.3^{e*}$ | $4_{10} \times 3.6^{d*}$ |
| | الحد الأعلى | $5_{10} \times 1.1$ | $3_{10} \times 4.6$ | $4_{10} \times 1.1$ | $5_{10} \times 1.1$ | $5_{10} \times 1.1$ |
| | الحد الأدنى | $2_{10} \times 1.2$ | $2_{10} \times 1.5$ | $2_{10} \times 1.2$ | $3_{10} \times 1.1$ | $3_{10} \times 2.4$ |

*المتوسطات التي تحمل حروف مختلفة في الصف الواحد بينها فروق معنوية عند مستوى معنوي ($P \leq 0.05$).

أن 12.3٪ من العينات المطبوخة ملوثة بجراثيم القولون الغائطية. إن سبب التلوث بجراثيم القولون الغائطية في الأقراص المطبوخة يعود إلى عدم كفاءة عملية الطبخ لأقراص لحم الدواجن المفروم المتبلة والمطبوخة أو ترك الأقراص مُعرَّضة لعوامل التلوث المحيطة بها أو حدوث تلوث عرضي من قبل العاملين في المنشآت الغذائية. حيث من المفروض أن تكون الأقراص المطبوخة خالية من جراثيم القولون الغائطية. وفي دراسة الطويل ومجموعته [13] وُجد أن متوسط العدد الأكثر احتمالاً لجراثيم القولون الغائطية في أقراص اللحم المفروم المتبلة والمطبوخة على مستوى مدينة طرابلس 4.83/ جرام. وهذه النتيجة تعتبر عالية مقارنة مع هذه الدراسة.

ومن خلال التحليل الإحصائي لأقراص لحم الدواجن المفروم المتبلة المطبوخة، يتضح أنه ليس هناك فروق معنوية عند مستوى احتمال 0.05، مما يشير إلى عدم التفاوت في مدى جودة الأقراص وعدم تطبيق الاشتراطات الصحية في المنشآت الغذائية، مما يدل على أن المعاملة الحرارية متقاربة في أكثر المنشآت الغذائية، وان هذا التلوث قد يعود إلى الاختلافات في تطبيق الاشتراطات الصحية في هذه المنشآت الغذائية .

يتضح من هذه الدراسة أن نسبة التلوث لأقراص لحم الدواجن المفروم المتبلة وغير المطبوخة بجراثيم H7:0157 الإشريكية القولونية *E. coli* تصل إلى 20.3٪، وقد تم التأكد من العزولات بواسطة الاختبارات الكيميائية الحيوية، ونظراً لعدم اعتماد مشروع المواصفة القياسية الليبية لأقراص اللحم المفروم، فقد تم الرجوع إلى بعض المواصفات العالمية منها المواصفة المصرية (غنيم، 1992) التي تنص على أنه يجب أن تكون أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة خالية من جراثيم H7:0157 الإشريكية القولونية *E. coli* وكذلك ينص مشروع المواصفة القياسية الليبية على خلو الأقراص من هذه الجراثيم. من خلال مقارنة نتائج هذه الدراسة ببعض الدراسات الأخرى فقد وجد فلدسين (Feldsine ومجموعته 1997) في الولايات المتحدة الأمريكية إصابة 473 عينة من أصل 1304 عينة من أقراص لحم الدواجن المفروم، أي أن نسبة 36٪ كانت مصابة بجراثيم H7:0157 الإشريكية القولونية *E. coli*، أما جون ومجموعته [7] فقد عملوا على معرفة تأثير المعاملة الحرارية على جراثيم *E. coli* 0157:H7 في أقراص لحم الدواجن المفروم حيث قاموا بحقن الأقراص بجراثيم الإشريكية القولونية *E. coli* 0157:H7 وطهيها لمدة تتراوح 2.25–4 دقائق وكانت درجة الحرارة الداخلية 137 م°. بعد ذلك تم الكشف عن جراثيم الإشريكية القولونية *E. coli* 0157:H7 فكانت الاختبارات سالبة وهذا يعني أن المعاملة الحرارية الجيدة في المطاعم يمكنها القضاء على الإشريكية القولونية *E. coli* 0157:H7. وفي دراسة [3] وجد أن نسبة التلوث في الأقراص اللحم المفروم غير المطبوخة والمتبلة بجراثيم الإشريكية القولونية *E. coli* 0157:H7 كانت 27.1٪ وهذه النسبة أعلى من النتائج المتحصل عليها في هذه الدراسة. أما دراسة [24] فوجدت 178 قرصاً بجراثيم الإشريكية القولونية *E. coli* 0157:H7 من أصل 1115 عينة من أقراص اللحم المفروم، أي بنسبة 15.9٪ وهي أقل تلوث من أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة التي تُبَاع في مدينة طرابلس. وربما يعود ارتفاع نسبة التلوث بجراثيم الإشريكية القولونية *E. coli* 0157:H7 إلى انخفاض الوعي الصحي وتدني جودة الـلحم المستخدم والمواد الأخرى الداخلة في تركيب الأقراص، وقد يرجع السبب إلى عدم النظافة وعدم اتباع الشروط الصحية وتنظيف الأدوات وتطهير المعدات والأدوات المستخدمة في التصنيع. أما بالنسبة لأقراص




شكل 5 التوزيع التكراري لأعداد بكتريا القولون الكلية لاقراص لحم الدواجن المفروم المتبلة والمطهية (البرجر) / غم.

جدول 7 المتوسطات العامة وحدود التلوث الدُنيا والعُليا للعدد الكلي لجراثيم القولون أليفة الحرارة (البرازية) حسب المناطق لأقراص لحم الدواجن المفروم المتبلة والمطبوخة

| نوع الاختبار (غير مطبوخة) | الحدود والمتوسطات | إجمالي العينات | وسط المدينة | قرقارش | الظهرة | المضبة الشرقية |
|---|---|---|---|---|---|---|
| العدد الأكثر احتمالاً لجراثيم القولون أليفة الحرارة (البرازية)/ غم | المتوسط | 1.44* | 1.92* | 1.84* | 0.57* | 1.28* |
| | الحد الأعلى | 23 | 23 | 23 | 4 | 11 |
| | الحد الأدنى | <3 | <3 | <3 | <3 | <3 |

*المتوسطات التي تحمل حروف مختلفة في الصف الواحد بينها فروق معنوية عند مستوى معنوي ($P \leq 0.50$).

لحم الدواجن المفروم المطبوخة والمتبلة، فكانت نسبة التلوث بجراثيم الإشريكية القولونية *E. coli* 0157:H7 هي 4.68٪، وهذه النتيجة أتت مقاربة لدراسة [3] حيث وجدت أن نسبة التلوث لأقراص اللحم المفروم المطبوخة والمتبلة كانت 5.4٪. أن هذا التلوث قد يعود إلى سوء العادات الصحية لدى العاملين في المنشآت الغذائية والمقاهي والمطاعم ومحلات الوجبة السريعة وكذلك قد يعود السبب إلى عدم الطبخ الجيد وترك الأقراص المطبوخة فترة طويلة في ظروف غير صحية . حيث بين جون ومجموعته [7] أنه يمكن القضاء على الجراثيم الإشريكية القولونية *E. coli* 0157:H7 عند درجة حرارة 68.3 مئوية أي المعاملة الحرارية في المنشآت الغذائية يجب أن تكون كافية للقضاء على جميع أنواع الجراثيم الـمُمْرِضة الموجودة بالمادة الغذائية.

يتضح من النتائج المتحصل عليها أن نسبة التلوث في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة هي 29.6٪ وقد تم التأكد منها بواسطة الاختبارات الكيميائية الحيوية واختبار التخثر الكواكليز (coagulase) وحدوث تحلل للدم في وسط أغار الدموي blood agar، وتعتبر هذه النسبة مقاربة لما توصل إليه الشريك ومجموعته [3] حيث كانت نسبة التلوث بالجراثيم العنقودية الذهبية في أقراص اللحم المفروم المتبلة وغير المطبوخة 28.8٪، وهذه النسبة أقل بكثير من تلك التي توصل إليها المرغني ومجموعته [20] لأقراص اللحم المفروم المتبلة وغير المطبوخة على مستوى مقاهي جامعة الفاتح والتي بلغت 100٪. أن ارتفاع نسبة التلوث لأقراص اللحم المفروم بهذه الجراثيم، وأرجعت الدراسة السبب إلى سوء السلوك الصحي للعاملين بالمنشآت الغذائية حيث تنتشر جراثيم العنقودية الذهبية على جلد الإنسان والشعر والأظافر وأن حوالي 40–50٪ من الأشخاص حاملون لهذه الجرثومة. وفي دراسة [25] أخذت نماذج من لحم الدواجن المفروم المستخدم في صناعة الأقراص، وتم فحص 232 عينة للكشف عن وجود جراثيم العنقودية الذهبية. وتبين أن نسبة التلوث 39.5٪ في لحم الدواجن المفروم المستخدم في المنتجات الغذائية، وهذه النسبة أعلى من المتحصل عليها في هذه الدراسة 29.6٪، كما وُجد جيرميني [26] في زاميبا أن هناك نسبة عالية من التلوث بالكائنات الدقيقة الممرضة في أقراص لحم الدواجن المفروم وكذلك وجراثيم العنقودية الذهبية حيث وجد 105 عينة مصابة بجراثيم العنقودية الذهبية في لحم الدواجن المفروم. أما بالنسبة لأقراص لحم الدواجن المفروم المتبلة والمطبوخة نسبة التلوث بجراثيم العنقودية الذهبية كانت 3.12٪، وأن هذه النسبة مقاربة لما توصل إليه [3] حيث كانت نسبة التلوث لأقراص اللحم المفروم 3.2٪. وقد يعود سبب التلوث إلى عدم الطهي الجيد وان إضافة الملح إلى الأقراص عند التجهيز قد يساعد في توفير الظروف المناسبة لزيادة معدل نموها وإعاقة نمو الميكروبات الأخرى التي يعتبر الملح مضاد لنموها.

تشير النتائج أيضا إلى أن نسبة التلوث في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة هي 25.9٪. وقد تم التأكد منها بواسطة الاختبارات الكيميائية الحيوية. ويعد هذه النتيجة أعلى من نتيجة الشريك ومجموعته [3] حيث كانت نسبة التلوث 18.6٪ من أقراص اللحم المفروم المتبلة وغير المطبوخة. كما أرجعت التلوث بهذه الجراثيم إلى الأتربة والغبار المحيط بجو عمليات التصنيع وعدم التنظيف الجيد للأدوات المستخدمة في تصنيع أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة، أو قد يكون مصدر التلوث من المياه المستعملة في تصنيع الأقراص حيث تنتشر هذه الجراثيم بالمياه. وقد وُجد الطويل ومجموعته في دراستهم [12] للحم المفروم على مستوى مدينة طرابلس وضواحيها أن 57.2٪ من العينات كانت ملوثة بجراثيم *Aeromonas*، أي نحو 57 من أصل 117 عينة. وقام كيشي ونيشكاوا، 1987 [27] بدراسة حول الأغذية الخفيفة المقدمة في وجبات المدارس في اليابان، للبحث عن الجراثيم المتحركة الغازية *Aeromonas*، حيث أشارت النتائج إلى تلوث 70٪ من لحم الدواجن المفروم بجراثيم الغازية *Aeromonas*، وكانت الأنواع السائدة *A. sobira* و*A. hydrophila* . وان هذه النتيجة تتفق مع دراسة يوكال، 2003 [5] في تركيا على أنواع من جراثيم الغازية *Aeromonas* المتحركة في العديد من نماذج الأغذية وجاء من بينها لحم الدواجن المفروم (البرجر)، حيث وجد أن 20 من أصل 23 عينة كانت مصابة بجراثيم الغازية *Aeromonas* أي بنسبة 86.9٪.

أما بالنسبة لأقراص لحم الدواجن المفروم المتبلة والمطبوخة كانت نسبة التلوث 3.12٪ وهذه النتيجة أقل من نتيجة الشريك ومجموعته [3] حيث كانت نسبة التلوث 9.61٪ من أقراص اللحم المفروم المتبلة والمطبوخة. قد يعود هذا التلوث إلى عدم اتباع الطرق الصحية وعدم الطهي الجيد عند إعداد أقراص لحم الدواجن المفروم المتبلة والمطبوخة وهذه الميكروبات تكون من الأنواع المسببة للإسهال والتهاب المعدة وتعتبر كذلك من الجراثيم التي تسبب التهاب السحايا والتهاب العظم والرئة والمسالك [28]. كذلك بين أن درجة حرارة تخزين الأغذية عند 5 إلى 7 درجة مئوية ولمدة 10 أيام تقريباً، تكون مناسبة لحدوث الفساد في الأغذية الطازجة خاصة ذات الأصل الحيواني. وأوضحت الدراسة كذلك أن العدد الكلي من هذه البكتيريا الذي يكون كافياً لإفراز السم المعوي ولإحداث التحلل الدموي يجب أن يتجاوز $10^8$ و.ت.م/ غم.

وصلت نسبة التلوث في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة بجراثيم *Salmonella* هي 12.9٪. وهذه النسبة جاءت مقاربة لنتائج الدراسة التي قام بها مورينو، 1997 [6] عن جودة أقراص لحم الدواجن المفروم في أسبانيا من الناحية الميكروبيولوجية لثلاث سنوات واستخدم 559 عينة، حيث وجد أن 239 عينة غير مطابقة للقانون الصحي حيث كانت نسبة جراثيم *Salmonella* 12٪. كذلك اشترك أوكاماتو [29] في اليابان في بحث عن أقراص لحم الدواجن المفروم، ووجدوا أن

46 من 56 مصابة بجراثيم *Salmonella* أي بنسبة 82.1٪، وهذه النتيجة أعلى بكثير من نتيجة هذه الدراسة حيث كانت نسبة التلوث في أقراص لحم الدواجن المفروم المتبلة وغير المطبوخة بجراثيم *Salmonella* هي 12.9٪، وكذلك تشير معظم المواصفات القياسية العالمية إلى خلو الأقراص من جراثيم *Salmonella* الـمُمْرضة. وتسبب جراثيم *Salmonella* العديد من الأمراض للإنسان والحيوان. وتدل هذه النسبة المتحصل عليها من الدراسة على عدم أتباع الأساليب الصحية والنظافة عند تحضير وتجهيز هذه الأقراص وقد وجد البحث أن *Salmonella typhimurium* هي أكثر انتشاراً في العالم وهي أكثر أنواع السالمونيلا المسببة لمرض للإنسان نتيجة نموها بالطعام، وتسبب الحمى الباراتيفوئيد للإنسان وتنتشر هذه الجراثيم من خلال تلوث اللحوم والدواجن والكثير من الأغذية البروتينية التي يتم إنتاجها تحت ظروف غير صحية. ويكون المصدر الرئيسي للعدوى بجراثيم *Salmonella* هو الحيوان، أما بالنسبة للعينات المطبوخة كانت نتائج جراثيم *Salmonella* 3.12٪ وجراثيم الشيغيلة *Shigella* 0٪، وقد ينتج التلوث بجراثيم *Salmonella* في العينات المطبوخة من لحم الدواجن المفروم أو عن درجة حرارة الطهي غير الكافية للقضاء عليها أو قد يكون من طريقة النقل والإعداد غير المناسب وغير الآمن من الناحية الميكروبيولوجية.

## الخلاصة

تبين النتائج التي تم التوصل إليها في هذه الدراسة بوضوح أن أقراص اللحم المفروم المطبوخة وغير المطبوخة، التي يتم تجهيزها وبيعها في معظم المقاهي والمطاعم المختلفة التي اختيرت عشوائيا لتمثل الجودة الميكروبية في مدينة طرابلس التي شملتها الدراسة، غير مطابقة للمواصفات القياسية من الناحية الميكروبيولوجية، وذلك بسبب ارتفاع محتواها من العدد الكلي للجراثيم الهوائية الحية، وارتفاع العدد الأكثر احتمالاً لجراثيم القولون وللقولونيات الغائطية، إضافة إلى تلوث العديد منها بالجراثيم الممرضة الإشريكية القولونية *E. coli* 0157: H7، العنقودية الذهبية *S. aureus* الموجبة لاختبار المخثِّرة وكذلك أنواع الغازيَّة *Aeromonas*. ويمكن اعتبار هذه النتائج مؤشراً خطيراً يدل على عدم اتِّباع الاشتراطات الصحية في أغلب هذه المنشآت، وبالتالي ضرورة تشديد الرقابة الصحية عليها حفاظاً على الصحة العامة في جميع أنحاء مدينة طرابلس.

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# Health needs and eHealth readiness assessment of health care organizations in Kabul and Bamyan, Afghanistan

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**تقييم الاحتياجات الصحية والاستعداد للصحة للإلكترونية في مؤسسات الرعاية الصحية في كابول وباميان في أفغانستان**

حماد دُرَّاني، شارق خوجا، عذرا نسيم، رتشرد أ سكوت، عادل غُلْ، جان رفت

**الخلاصة:** قيَّمَت هذه الدراسة مدى احتياج واستعداد مؤسسات الرعاية الصحية في كابول وباميان في أفغانستان لتطبيق تقنيات المعلومات والاتصالات في الرعاية الصحية (الصحة الإلكترونية). وقد تم اعتماد تصميم مؤلّف من مزيج من الطرق في مؤسستين ضمن شبكة أغاخان للتنمية في أفغانستان، وهما المعهد الطبي الفرنسي للأطفال في كابول ومستشفى المقاطعة في باميان. وقد جمع الباحثون المعلومات اللازمة لتقييم الاحتياجات من المقابَلات ومن مجموعات التركيز البؤرية، ثم قاموا بتقييم الاستعداد لتطبيق لصحة الإلكترونية باستخدام وسيلة مصدوقة للمسح. وقد صنَّف الباحثون احتياجات المؤسسات في شبكة أغاخان للتنمية في أفغانستان كما يلي: احتياجات تقديم الرعاية؛ واحتياجات التعلُّم؛ واحتياجات إدارة المعلومات. وكان معدَّل الاستعداد للصحة الإلكترونية أقل في باميان منه في كابول في جميع مجالات تقييم الاستعداد. وسوف يكون من الممكن لمؤسسات أخرى في أفغانستان أن تستفيد من تطبيق نموذج تقييم الاحتياجات والاستعداد الذي استخدمه الباحثون في مؤسسات شبكة أغاخان للتنمية.

ABSTRACT This study assessed the need and readiness of health care institutions in Kabul and Bamyan, Afghanistan for successful implementation of information and communication technology in health care (eHealth). A mixed methods design was adopted at 2 institutions in the Aga Khan Development Network in Afghanistan: the French Medical Institute for Children in Kabul and Bamyan Provincial Hospital, Bamyan. Information for the needs assessment was obtained from interviews and focus groups and eHealth readiness was assessed using a validated survey tool. The needs of institutions in the Aga Khan Development Network in Afghanistan were categorized as follows: provision of care needs; learning needs; and information management needs. eHealth readiness on average was lower in Bamyan compared with Kabul in all areas of the readiness assessment. Other institutions in Afghanistan may benefit from adopting the model of needs and readiness assessment used for Aga Khan Development Network institutions.

**Évaluation des besoins en matière de santé et de la préparation à la cybersanté dans des établissements de soins de santé à Kaboul et Bamyan (Afghanistan)**

RÉSUMÉ La présente étude a évalué le besoin et la préparation d'instituts de soins de santé à Kaboul et Bamyan (Afghanistan) pour une mise en œuvre réussie de la technologie de l'information et de la communication en matière de santé (cybersanté). Un modèle méthodique mixte a été adopté dans deux institutions du Réseau Aga Khan de développement en Afghanistan : l'Institut médical français pour l'enfant de Kaboul et l'hôpital provincial de Bamyan. L'évaluation des besoins a été réalisée à partir d'entrevues et de groupes thématiques et la préparation à la cybersanté a été évaluée à l'aide d'un outil d'enquête validé. Les besoins des institutions du Réseau Aga Khan de développement en Afghanistan ont été classés comme suit : besoins en fourniture de soins, besoins en connaissances, et besoins en gestion des informations. La préparation à la cybersanté en moyenne était plus faible à Bamyan qu'à Kaboul dans tous les domaines de la préparation. D'autres institutions en Afghanistan pourraient tirer avantage de l'adoption du modèle d'évaluation des besoins et de la préparation utilisé pour les institutions du Réseau Aga Khan de développement.

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Received: 20/07/10; accepted: 16/03/11

## Introduction

eHealth is the cost-effective and secure use of information and communications technology (ICT) in support of health and health-related fields, including health care services, health surveillance, health literature and health education, knowledge and research [1,2]. ICTs are currently being used in developed [3] and developing countries [4–6] and have been used to improve access to sources of knowledge for both patients and health care providers. However, the undersized health and ICT sector in a country such as Afghanistan limits its potential and wider benefits [7].

Afghanistan is a developing country with a huge diversity of languages and cultures. Long lasting wars, insecurity and difficult terrains have made Afghanistan one of the least developed countries in the world [8,9]. Most of the Afghan population does not have access to even basic health services. The most important constraint to improving health status is the lack of physical infrastructure in the country [10]. In Kabul, around half of the population has to travel less than 5 km and more than one-fifth of the population has to travel more than 10 km to reach their closest health centre [11]. In Bamyan province access to health care is more difficult for many people, with nearly three-quarters of the population having to travel over 10 km to get medical attention: 70% for access to health centres and 72% for dispensaries [12].

Three decades of continuous war has left the land-based communications networks of Afghanistan shattered. The Afghanistan telecommunications sector started its development activities in 2002, when the telephone penetration was less than 0.05% and telecoms infrastructures were much damaged. Currently Afghanistan has more than 12.5 million telephone subscribers (50% phone-density). Investment in the telecommunications sector, as per the reports provided at the end of the last quarter of 2009, exceeds US$ 1.3 billion, and about 80% of the country's population has access to telecommunications services. There are 5 licensed mobile companies trying to increase coverage of mobile telephony in different provinces of Afghanistan, and around 75% of the population has mobile coverage, mostly GSM [global system for mobile communication], aside from Kabul and other major cities where there is GPRS [general packet radio system] facilities. Internet services are available, although mostly through satellite, which makes the service very costly. There are 23 small- and medium-sized Internet service provider licensees in the country, serving about 1 million internet users throughout the country. Efforts are also being made to lay down an extensive fibre optic skeleton throughout Afghanistan by the Ministry of Telecom [11–14]. Some ICT parameters of Afghanistan are shown in Table 1.

### eHealth for Afghanistan

There is a severe shortage of health facilities and health human resources to provide even basic services to the population in Afghanistan. Several agencies and nongovernmental organizations are working to provide health care facilities to the population. Aga Khan Development Network (AKDN) is one of the few agencies actively working in Afghanistan providing health services at all levels of care through a group of development agencies [15] (Aga Khan Health Services, Aga Khan University, French Medical Institute for Children and the Aga Khan Foundation) working in close collaboration with Afghanistan's Ministry of Public Health.

AKDN recognizes the role eHealth can play in bringing different institutions and providers in the network together, providing coordinated care to the population, ensuring a continuum of care at all levels, and minimizing the barriers of distance and time. These benefits inspire the network to explore the potential benefits of eHealth for the institutions and agencies working for it. However, the diffusion and adoption of eHealth in Afghanistan requires health care institutions to identify their needs and readiness, in order to prepare individuals and organizations for any organizational change. This process involves in-depth

**Table 1 Information and communications technology (ICT) indicators in Afghanistan**

| Indicator | Value | Year |
|---|---|---|
| Telecommunications revenue (% of GDP) | 5.5 | 2008 |
| Telecommunications investment (% of revenue) | 37.8 | 2008 |
| Telephone lines (per 100 people) | 0.3 | 2008 |
| Population covered by mobile cellular network (%) | 75 | 2008 |
| Personal computers (per 100 people) | 0.4 | 2008 |
| Internet users (per 100 people) | 1.7 | 2008 |
| Mobile cellular subscriptions (per 100 people) | 27.2 | 2008 |
| Fixed Internet subscribers (per 100 people) | 0.24 | 2008 |
| Fixed broadband subscribers (% of total Internet subscribers) | 18.3 | 2008 |
| International Internet bandwidth (bits per second per person) | 1.0 | 2008 |
| Secure Internet servers (per 1 million people) | 0.3 | 2009 |
| Internet affordability (US$/month) | 24 | 2007 |
| Mobile affordability (US$/month) | 5.6 | 2007 |

*Sources: International Telecommunication Union (http://www.itu.int); Millennium Development Goals indicators (http://mdgs.un.org/unsd/mdg)/; World Development Indicators Database (http://data.worldbank.org/data-catalog/world-development-indicators); Central Intelligence Agency (http://www.cia.gov); World Bank information and communication At-a-Glance (http://data.worldbank.org/data-catalog/ICT-table)*
*GDP = gross domestic product.*

needs and readiness assessment, so that technologically appropriate and culturally sensitive eHealth solutions can be identified, aligned and prioritized in a manner that maximizes the efficiency and effectiveness of investment in any given setting.

## Methods

The study was designed to identify and prioritize the needs of AKDN health care institutions working in Afghanistan, ascertain eHealth solutions to address those needs and also assess the eHealth readiness of these institutions in implementing such initiatives.

A research team was developed at AKDN to carry out this study with expertise in areas related to the study such as needs and eHealth readiness assessment, eHealth policy, nursing services and eLearning. The study was conducted between September 2007 and August 2008. Site visits to AKDN hospitals and health centres in Kabul and Bamyan were conducted by the research team to perform a detailed needs and readiness assessment. The following steps were taken.

- Core stakeholder team. A team of key stakeholders comprising of health care providers, managers, and information technology staff was established at the French Medical Institute for Children, Kabul. The team worked closely with the AKDN eHealth team to monitor and make decisions on the process of needs and readiness assessment in the country.
- Approach. A mixed methods approach [16] was used, including a case study (qualitative) for needs assessment and a survey for readiness assessment (quantitative).
- Health needs assessment. The needs analysis involved focus group discussions and key informant interviews with stakeholders from all potential user-groups of the hospital (IT, hospital and nursing administration and services) within the selected AKDN institutions and partner agencies. Purposive sampling was done to identify these participants and data collection finished after reaching saturation. The key informant interviewees included officials of the Afghanistan Ministry of Public Health to include the views of the government. Separate guidelines for both the interview and focus groups were developed. The interviews/discussions were tape-recorded where permission was granted; notes were also taken in all interviews and focus groups.
- Conducting readiness assessment of network institutions. For readiness assessment the interviewees, focus group participants and other health care providers and managers were asked to complete the validated tools for institutional eHealth readiness assessment [17–19]. Participants rated the levels of readiness of their institutions on a scale of 1–5 (1 being the minimum and 5 being the maximum) in 5 areas as follows;
- Core readiness: questions related to the overall planning process for the proposed eHealth programme, along with assessing the knowledge and experience of planners with programmes using ICT.
- Technological readiness: questions related to the availability and affordability of required ICT along with the hardware and software needed to implement the proposed programme. This category was included in the tool for managers only.
- Learning readiness: questions related to the existence of programmes and resources to provide training to health care providers in using the technology suggested in the proposed eHealth programme. This category was included in the tool for health care providers only.
- Societal readiness (ICT use and interaction): the existing interaction of the concerned institution with other health care institutions in the region and beyond.
- Policy readiness (at institutional and government levels): the existence of policies at the government and institutional levels to deal with common issues such as licensing, liability and reimbursement.

For the needs analysis 10 key informant interviews and 8 focus group discussions were conducted (Table 2). The interview and focus group data were analysed by 2 research team members independently who coded and analysed the data [20]. The codes were clustered into broad themes, which led to the identification of the needs of the

**Table 2 Details of interviews and focus groups**

| Institution | No. of key informant interviews | No. of focus group discussions |
|---|---|---|
| French Medical Institute for Children, Kabul | 6 | 3 |
| Aga Khan Health Services in Kabul and Bamyan, including Bamyan Provincial Hospital and field programmes | 1 | 2 |
| Roshan Telecommunications | 1 | 2 |
| Aga Khan Foundation | 1 | 0 |
| Ministry of Public Health, Afghanistan/Institute of Health Sciences | 1 | 1 |
| Total | 10 | 8 |

health care institutions in Afghanistan that can be addressed through eHealth.

eHealth readiness was studied in depth at 2 institutions: the French Medical Institute for Children and the Bamyan Provincial Hospital. Both hospitals are managed by agencies of Aga Khan Development Network, i.e. Aga Khan University and Aga Khan Health Services Afghanistan, respectively. These institutions were selected to initiate the eHealth programme in Afghanistan based on their cooperation and willingness to implement eHealth at their respective hospitals. The French Medical Institute for Children in Kabul is an 85-bed state-of-the-science tertiary care facility, providing services in paediatric inpatient and paediatric/adult outpatient services, i.e. in medical, surgical, cardiology and orthopaedics. Bamyan Provincial Hospital is the main secondary referral facility in Bamyan province and delivers health care to approximately 670 000 people in the province. Since Aga Khan Health Services, Afghanistan took over the hospital in 2004, the facility provides a range of health services such as acute hospital services, surgery, internal medicine, maternal and child services, dental, ophthalmology and diagnostic services.

## Results

### Key findings of health needs assessment

Based upon the information obtained through interviews and focus groups, the needs of the AKDN institutions in Kabul and Bamyan, Afghanistan were categorized as:

- Needs in provision of care;
- Learning needs;
- Needs in information management.

#### *Needs in provision of care*

Participants identified several gaps where new ideas and technologies could help in providing better quality and timely care to the population. A number of key findings emerged:

- Shortage of health human resources. The shortage of qualified physicians and nurses was a major problem in both Kabul and Bamyan, due to years of conflict and the poor security situation in the country. Most of the specialists working in the hospitals did not possess postgraduate degrees. Many of them also lacked experience working in peacetime conditions, and dealing with cases other than trauma. There was a severe shortage of nurses and midwives especially in Bamyan. Lack of quality institutions to train doctors, nurses and other health professionals also magnified the situation.
- Difficulties in referral systems. Tough mountainous terrains and lack of transport systems made it extremely hard for patients to be transferred from Bamyan to cities. Participants gave emphasis to improving the capacity of the local health care providers and bring services closer to the communities as the only solution to reduce the burden of illness.
- Government policies. Participants also criticized government policies for not allowing health care providers in rural areas to provide more than the approved list of services or dispensing more than the official list of drugs. This policy greatly limited the number of services these health professionals could provide, giving them no other choice than to refer the patients to next level of care.
- Issues with service utilization. Some issues were also identified that may hinder the ability of population to utilize the services. The security situation in Kabul and lack of electricity at Bamyan were major barriers to providing medical services 24 hours a day, 7 days a week. Another issue was the traditional beliefs of people which led to them use home remedies and untrained health care providers before patients are brought to hospital. This can delay patients' care to such an extent that it is difficult to treat them successfully.
- There was also uncertainty about policies and procedures regarding consultations, referrals (between institutions), education, communication and information and knowledge transfer, and there was a perceived general lack of enabling strategies and policies for the adoption of eHealth solutions.

#### *Learning needs*

Participants identified training of new and existing health human resources to enhance the competence and credentials of health care providers as the most crucial and urgent need for improving health services in Kabul and Bamyan, Afghanistan. The following findings emerged:

- Lack of continuing education programmes. Participants at Bamyan talked about the clear need for short and long-term courses for doctors, nursing and allied professions to enhance their learning on a regular basis.
- Lack of access to current information and research. Another problem related to the learning needs of the providers was the lack of access to policies, procedures, guidelines and research databases. This was seen to lead to professional isolation of health care providers and to limit the capacity of managers to introduce best practice guidelines based on current research. Lack of access to research databases also limited the research capability among health care providers. There was limited access to computers at hospitals for staff to enhance their knowledge and communication. A need to improve the low level of ICT literacy among nursing and allied health staff, especially in Bamyan, was highlighted. Participants also identified the need for simple and comprehensive access to current specialized literature, such as guidelines and policies regarding best practices.

#### *Needs in information management*

Better management of information in hospitals and communities in Kabul and Bamyan was emphasized as a key to better planning of health care resources

and planning for the future. Key findings were:

- Paper-based medical record systems. Several participants from institutions in both Kabul and Bamyan pointed out the need for proper medical records to provide quality services and facilitate referral of patients. They said that most records were still in paper format, which lead to missing information, and also caused delays in access to records at times.
- Communication between institutions and providers for information sharing. There was a need for timely access to patient's information through appropriate medical record systems. Participants also identified a need for improved materials management and to place strategies or policies to permit seamless, interjurisdictional sharing of health information within and between institutions and different countries.

## Key findings of eHealth readiness

The study used eHealth readiness assessment tools to collect information on the areas that needed more attention during the planning for eHealth programmes. Readiness assessment was conducted at the French Medical Institute for Children in Kabul and Bamyan Provincial Hospital, Bamyan . A total of 17 health care providers and 6 managers provided information on eHealth readiness. The demographic characteristics of these participants and their involvement in eHealth are shown in Table 3. Overall 65% of them had been involved in eHealth planning and 23% in implementing eHealth.

The results suggested that the health care providers at the 2 institutions rated their overall eHealth readiness nearly equally. However, managers at the Kabul hospital rated their readiness higher than the managers at Bamyan Provincial Hospital. Table 4 provides a summary of the results for the eHealth readiness categories described earlier (a higher score indicates greater readiness, to a maximum of 5).

### *Core readiness*

Health care providers and managers at the Kabul hospital generally rated their core-readiness as high. Both the groups expressed the need to be involved in prioritization of eHealth related needs. Health care providers at the Bamyan hospital showed low levels of comfort with the use of technology. They also rated their involvement in the planning process as low, and wanted to be involved in prioritizing the needs for eHealth. Managers in Bamyan also rated their overall core-readiness as low, especially the process of needs identification, awareness and comfort with the technology

### *Technological readiness*

Managers at the Kabul hospital rated technological readiness as high, except that they saw a need for improving hardware and software at the hospital. Managers in the provincial hospital in Bamyan, on the other hand, graded their technological readiness as low, and emphasized a need for improving the quality of Internet, availability and affordability of desired technologies and institutional access to ICT training.

### *Learning readiness*

Health care providers at both institutions emphasized the need for using ICT to train health care providers. Health care providers in Bamyan highlighted the need for ICT related training and their involvement in the planning and implementation of eHealth programmes

**Table 3 Demographic characteristics of participants for eHealth readiness assessment study in Afghanistan**

| Characteristics | Health care providers (*n* = 17) | Managers (*n* = 6) | Total (*n* = 23) |
|---|---|---|---|
| ***Institution (no. of respondents)*** | | | |
| French Medical Institute for Children | 11 | 2 | 13 |
| Bamyan Provincial Hospital | 6 | 4 | 10 |
| ***Sex (no. of respondents)*** | | | |
| Female | 4 | 2 | 6 |
| Male | 13 | 4 | 17 |
| ***Experience (years)*** | | | |
| Mean duration in current institution | 3.2 | 2.0 | 2.6 |
| Mean duration in current job position | 5 | 7 | 6 |
| ***eHealth experience (no. of respondents.)*** | | | |
| Involvement in planning of eHealth | 11 | 4 | 15 |
| Involvement in implementing eHealth | 1 | 4 | 5 |
| eHealth programmes in institution in last 1 year | 11 | 1 | 12 |
| Involvement in eHealth programmes in institution in last 1 year | 8 | 0 | 8 |

**Table 4 eHealth readiness scores according to different types of respondents in the 2 institutions**

| Readiness categories | Mean scores[a] | | | |
|---|---|---|---|---|
| | Health care providers | | Managers | |
| | FMIC (*n* = 11) | BPH (*n* = 6) | FMIC (*n* = 2) | BPH (*n* = 4) |
| Core readiness | 3.9 | 4.1 | 4.6 | 2.8 |
| Technological readiness | – | – | 4.2 | 3.2 |
| Learning readiness | 3.6 | 3.6 | – | – |
| Societal readiness | 3.8 | 3.2 | 4.0 | 2.0 |
| Policy readiness | 4.0 | 3.6 | 4.2 | 2.0 |

[a]*Higher score indicates greater readiness; maximum of 5.*
*FMIC = French Medical Institute for Children, Kabul; BPH = Bamyan Provincial Hospital, Bamyan.*

***Societal readiness***

Health care providers and managers at the Kabul hospital rated their societal readiness as generally high, but identified a need for improving communication with other institutions. Both providers and managers at Bamyan Provincial Hospital rated their societal readiness as low, noting the need for communication with other organizations and health care providers for coordinated patient care. They also noted the need to consider sociocultural factors among staff and clients.

***Policy readiness***

Health care providers and managers at the Kabul hospital generally rated their institutional policy readiness as high, but felt a need to improve such readiness among politicians. In contrast, managers at the Bamyan hospital showed a need for better policies for licensure, liability and reimbursement when providing care through eHealth. Managers in Bamyan also showed a need for creating awareness among politicians, policy-makers and health care providers at the institutional level regarding eHealth, to acquire more support for eHealth programmes.

## Discussion

The results of this survey explain the eHealth needs of 2 different health care institutions working in Kabul and Bamyan respectively under the AKDN. The results also give us a picture and degree of readiness of these institutions regarding eHealth implementation.

The eHealth needs assessment identified needs in 3 categories: care provision, learning and information management. In all these categories 2 main themes emerged prominently, first the lack of capacities (both in technical and infrastructural) and secondly lack of awareness and policies regarding eHealth. The institutions called for specialized human resources and to put in place structures to improve technical proficiencies in eHealth that would lead to a more sustainable implementation of eHealth. Though the study's main focus was on AKDN institutions, considering the overall condition of Afghanistan, the results can be generalized to other parts of the country especially the rural parts of Afghanistan where conditions and capacities are more or less the same.

These findings are further corroborated by the results of the readiness assessment, which was considerably lower in Bamyan Provincial Hospital than in the French Medical Institute for Children. The difference of readiness levels between the 2 hospitals highlights the contrast in availability and use of technology in different provinces of Afghanistan, i.e. Kabul versus Bamyan. The readiness level of Bamyan health care managers was low in all categories, with policy and societal readiness at the lowest. In a broader perspective this indicates not only a danger of widening the digital divide in different provinces of Afghanistan, but connects to other issues, such as lack and retention of specialized health human resources, continuous capacity problems, lack of infrastructure, plus uncertain and undefined institutional and organizational policies.

The survey identified that these gaps could be addressed, however, through giving more importance to the areas of low score and designing culturally acceptable and technologically sustainable eHealth solutions. Linking eHealth planning and implementation to defining needs and eHealth readiness might first appear to be a longer path. On the contrary, such an approach can flag up problems and minimize challenges and yield more positive results, leading to a much smoother processes. An appropriate plan cannot be designed without accurate knowledge of what exists on the ground, i.e. the actual needs and skills of an organization to provide health care to their population.

In the final way forward, the drive to transform developing countries into knowledge-based societies will necessitate intergovernmental as well as private sector cooperation. AKDN as a private network is using the results of the study and have initiated few eHealth activities in collaboration with other public and private entities in Afghanistan. Recently, the teleradiology project between French Medical Institute for

Children, Kabul and Aga Khan University Hospital, Karachi, Pakistan is one example where private and government bodies have come together successfully to provide diagnostic services for computerized tomography scanning studies and medical education. To establish a sustainable model, various organizations contributed technical, financial and logistic support. These organizations include the telecommunications company Roshan, the Afghanistan Ministry of Public Health and the networking specialist Cisco [10]. The project has recently been extended to Bamyan province, where the provincial hospital of Bamyan is connected to the French Medical Institute for Children in Kabul for exchanging advice on simple X-rays along with sessions on continued professional development of health care providers (doctors, nurses and other hospital support staff). According to one of the reports, more than 340 patients have benefited from this telehealth model and more than 231 Afghan medical personnel have participated in diagnostic and training opportunities facilitated by the technology between Aga Khan University Hospital, Karachi; French Medical Institute for Children, Kabul; and Bamyan Provincial Hospital, Bamyan [16].

Most of the other institutions in Kabul and Bamyan are trying to learn from and follow the eHealth model adopted by AKDN. Better understanding of the needs and readiness of these institutions will enable comparison with other institutions and modification of their eHealth programmes accordingly.

## Conclusion

This study has shown that any eHealth programme in Kabul and Bamyan, or indeed other parts of Afghanistan, must consider and address the issues above-mentioned before embarking on a technological solution. Rushing into projects without an assessment of the range of needs and the priorities is a costly experiment, which poor countries cannot afford. Where resources are scarce, priorities have to be focused, and linkages have to be maximized to lay a solid base for future development of any organization. Institutions first need to analyse where health care providers and other users stand in respect to readiness levels, followed by defining their needs in terms of readiness outputs, so that the final implementation accurately reflects the ground reality of the institution. This model also allows eHealth to broaden the vision of the institutions and organization as a whole, supporting a relatively smooth eHealth diffusion and adoption process. The study has also shown that as we strive to use eHealth to provide larger benefit to institutions across the globe, each institution must adopt a "network" mindset as they address issues such as readiness, change management, health human resources and selection of different technology options. To address this array of issues, health care organizations need to develop, individually and collectively, proper protocols, policies and legislations to support networked eHealth implementation and application.

## Acknowledgements

We acknowledge the Aga Khan Foundation, Geneva, for funding, and AKDN and public institutions in Afghanistan for their support. We also appreciate Ms Syeda Suha Tirmizi for her help in drafting and finalizing the manuscript.

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### *Legal frameworks for eHealth*

Given that privacy of the doctor–patient relationship is at the heart of good health care, and that the electronic health record (EHR) is at the heart of good eHealth practice, the question arises: Is privacy legislation at the heart of the EHR? The second global survey on eHealth conducted by the Global Observatory for eHealth (GOe) set out to answer that question by investigating the extent to which the legal frameworks in the Member States of the World Health Organization (WHO) address the need to protect patient privacy in EHRs as health care systems move towards leveraging the power of EHRs to deliver safer, more efficient, and more accessible health care.

The abovementioned report, *Legal Frameworks for eHealth*, presents an analysis of the survey. It also provides an overview of the ethical and legal roots of privacy protection. Focusing on the ethical concepts of autonomy, beneficence, and justice, the report reminds the reader of the early recognition of the duty of privacy in the Hippocratic Oath and goes on to consider how that is reflected in international binding legislation such as the United Nations Declaration on Human Rights and the European Union Data Protection Directive, as well as non-binding international codes of practice.

The ability to make wide use of EHRs and other eHealth tools will become increasingly important in both developed and developing countries. In the former, EHRs and related eHealth tools will play a key role of providing health care to ageing populations in which social care and health care need to be much more closely connected and where capacity demands will require that care is delivered outside traditional settings such as hospitals. The protection of privacy will also be a significant issue in supporting the changing nature of health care in developing countries, in which mobile eHealth solutions are emerging as an integral part of the health care infrastructure, as demonstrated in the publication mHealth: new horizons for health through mobile technologies.

Further information about this and other WHO publications is available at: http://apps.who.int/bookorders/anglais/home1.jsp

# آراء طلاّب السّنة السّادسة في كلّية الطّبّ البشري جامعة دمشق حول المهارات السّريرية المكتسبة قبل التخرّج

زينب العرفي[1]، عبير قدسي[2]، ريما السّيد حسن[1]

**Views of final-year medical students at Damascus University about clinical skills acquired before graduation**

ABSTRACT Medical education in Syrian universities is facing many challenges that may affect the quality of the education and the standard of graduates. We therefore conducted a cross-sectional study using a self-administrated questionnaire with 76 items to investigate the perceptions of 290 final-year medical students regarding the confidence of performing some core clinical skills. A total of 271 responded (response rate 93.4%). Student responses differed. While confidence was highest for skills that do not require practice in the clinical skills laboratory, it was low for skills that need training in emergency and intensive care units, or when students were participating in patient care with partial responsibility. Our findings confirm the need for effective clinical laboratory training, student participation in emergency room shifts, and that students to be allowed to take some degree of responsibility.

**الخلاصة:** يواجه التعليم الطبي في الجامعات السورية تحديات عديدة يمكنها أن تؤثر على جودة التعليم ومعايير التخرج. ولذلك أجرت الباحثات دراسة مقطعية باستخدام استبيان ذاتي يحتوي على 76 بنداً بغرض استقصاء إحساس 290 طالباً وطالبة في السنة النهائية في كلية الطب بالثقة في أداء بعض المهارات السريرية الأساسية. كان معدل الاستجابة 93.4٪ على الاستبيان، وتباينت إجابات الطلبة. ومع أن الثقة بلغت أعلى مستوى لها في المهارات التي لا تتطلب مختبراً للمهارات السريرية، كانت الثقة منخفضة في المهارات التي تتطلب تدريباً في وحدات الطوارئ والرعاية المشددة، أو عندما يشارك الطالب في رعاية المرضى ويتحمل جزءاً من المسؤولية. وتؤكد نتائج هذا البحث على الحاجة إلى مختبر للتدريب السريري الفعّال، ومشاركة الطلبة في مناوبات العمل في غرف الطوارئ، والسماح للطلبة بتحمل بعض درجات المسؤولية. ومن المهم الحد من عدد الطلبة في مجموعات حلقات العمل، وتوفير المساواة بين الطلاب من حيث نوعية الحالات المرضية، وظروف التدريب.

**Avis des étudiants en dernière année de médecine de l'Université de Damas sur les compétences cliniques acquises avant l'obtention du diplôme**

RÉSUMÉ L'enseignement de la médecine dans les universités syriennes est confronté à de nombreuses difficultés qui pourraient influer sur la qualité de l'enseignement et le niveau des diplômés. Par conséquent, nous avons mené une étude transversale au moyen d'un autoquestionnaire composé de 76 items afin de connaître la confiance exprimée par 290 étudiants en dernière année de médecine lors de l'utilisation de certaines compétences cliniques essentielles. Au total, 271 étudiants ont rempli le questionnaire (taux de réponse de 93,4 %). Les réponses des étudiants étaient variées. Alors que le niveau de confiance était maximal pour les compétences ne requérant pas de pratique en laboratoire, il était faible pour les compétences dont l'acquisition nécessite une formation aux services des urgences et des soins intensifs. Les étudiants exprimaient également un niveau de confiance faible à l'égard de la prise de responsabilités partielles dans l'exécution des soins. Nos résultats confirment la nécessité de dispenser une formation clinique en laboratoire efficace, de faire participer les étudiants au service des urgences, et de leur accorder l'autorisation de prendre certaines responsabilités.

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الاستلام: 11/04/26، القبول: 11/06/26

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## المقدمة

إنّ التدريب السريري والعملي هو الدّعامة الأساسية في تعليم طلاّب الطب، وقد تطورت طرائقه وأدواته بشكل كبير في العالم من خلال وجود مختبرات المهارات السريرية، والتعلّم المعتمد على المحاكاة، والمرضى الافتراضيين. وعلى الرغم من التطور الهائل في التقنيات التشخيصية، يبقى أخذ القصة السريرية والفحص الفيزيائي الأساس في الوصول للتشخيص في معظم الحالات، وهما حجر الزاوية في الطب السريري [1]. وتبقى مقاربة المريض والتواصل معه الأهم في تأهيل وتدريب الطلاّب لاكتساب مختلف المهارات والكفاءات الأساسية والضرورية لممارسة آمنة وفعّالة في المستقبل.

إن جامعة دمشق كغيرها من جامعات العالم تواكب التغيرات الهامة الحاصلة عالمياً في مجال التعليم الطبي، وخلال سعينا إلى وضع أسس لقياس جودة التعليم العالي [2] لتخريج طبيب كفء قادر على تقديم الرعاية الصحية المطلوبة في الزمان والمكان المناسبين، وفي كافة الظروف المجتمعية، واجهتنا بعض التحدّيات منها الأعداد الكبيرة للطلاّب نسبة لأعضاء الهيئة التدريسية خاصّة في المرحلة السريرية، حيث بلغت النّسبة في إحصائيات عام 2010 في كلية الطب – جامعة دمشق: أستاذ لكل 8–9 طلاب [3]. تخرّج هذه الجامعة نحو 550 طبيباً سنوياً وفق إحصائيات المكتب المركزي للإحصاء [4]. من التحديات الهامّة أيضاً غياب الدلائل الإرشادية للكلّية التي تحدّد الحد الأدنى من الكفاءات المطلوبة في الطبيب الخريج، وغياب الأهداف التعليمية المعتمدة لكل مقرر تدريبي سريري، وكذلك عدم وجود سجل أداء logbook.

ولّدت كل هذه التحديات قلقاً على نوعية التدريب السريري الذي يتلقاه طلاّبنا، مثلنا مثل العديد من جامعات العالم التي لديها المخاوف ذاتها بشأن النقص في المهارات السريرية والعمليّة لدى خريجها، ممّا دفعها للعمل على تطوير مناهجها [5, 6]. ففي التقرير الصادر عن "رابطة كلّيات الطب الأمريكية" عام 2004 إشارة إلى العديد من التقارير المنشورة خلال العقد الماضي عن التعليم الطبي التي أظهرت نقص فعّالية المدارس الطّبية في إعداد خريجيها للممارسة، والتشديد على الحاجة إلى إيجاد السُّبل الجديدة لتدريب الطلاّب وإيصالهم إلى المستوى المنشود [7].

كان من الأمور الهامّة في العقد الماضي تطبيق مبادئ الطب المسند بالبيّنات على التعليم الطبّي، وظهور ما يسمّى التعليم الطّبي المسند بالبيّنات للوصول لأفضل الاستراتيجيات التعليمية لإنتاج أكفأ الأطباء [8]. لذلك فإنّ تقييم جودة التعليم الطّبي لا يتطلب فقط إجراء الدراسات ذات الموثوقية والمعّولية لتقييم مختلف المحصلات فحسب، وإنّما يتطلّب أيضاً دراسات تُقيّم إدراك ووجهة نظر الطلاّب في فعّالية برامجهم التدريبية [9].

أشارت دراسة بريطانية إلى أن 4.3٪ فقط من الطلاّب يوافقون بشدّة على أن تدريبهم في كليّة الطب قد أهّلهم بشكل جيد لشغل الوظائف التي أُنيطت بهم لاحقاً، وكان أكثر من ربع المشاركين (29.7٪) لا يوافق على أنّ تدريبهم كان ملائماً [10]. نتائج مشابهة أظهرتها دراسة دانماركية، من خلال تقييم ذاتي، حيث تبين أن لا أحد من المشاركين لديه الحد الأدنى من المهارات المطلوبة وهناك 8٪ فقط يملكون 90٪ من هذه المهارات [11].

إنّ مدة الدّراسة في كليّة الطب بجامعة دمشق هي ست سنوات. تبدأ المرحلة السريرية في السنة الرابعة، يتدرب فيها الطلاّب من خلال مقررات تدريبية دوّارة مختلفة الطول في مختلف التخصصات. والتدريب جانب سرير المريض هو الطريقة الأساسية المعتمدة في تنمية وصقل المهارات السريرية لطلاّبنا في السنة الأخيرة، حيث يشاركون في الجولات السريرية على المرضى مع الأستاذ المشرف. أما في السنة الرابعة والخامسة فإنّ التدريب يكون في القاعات التدريسيّة الموجودة في المشفى والتي يُحضر المريض إليها، حيث يقوم الطلاّب بمشاهدته وفحصه سريرياً بحضور المشرف.

ورغبة منا في المساهمة في توفير البيّنات والدلائل على ضرورة تطوير المنظومة التعليمية الحاليّة، جاء هذا البحث لاستطلاع آراء طلاّب السنة الأخيرة في كلية الطب في جامعة دمشق والذي يهدف إلى تقييم وعيهم الذّاتي بامتلاكهم الكفاءات اللازمة، ودرجة ثقتهم في قدراتهم على إجراء بعض المهارات السريرية والعملية الأساسية، التي تمّ اكتسابها.

## المواد والطرائق

دراسة مقطعية عرضية أجريت على طلاّب السنة السادسة للعام الدراسي 2009–2010 في كلّية الطب في جامعة دمشق في الفترة الواقعة بين أيار وحزيران 2010، والتي يفترض فيها أن يكون جميع طلاّب السنة السادسة لذلك العام الدراسي قد أتمّوا تدريبهم السريري ليصبحوا جاهزين للامتحان النهائي والتخرّج.

كان الاعتيان نظامياً استخدم فيه إطار اعتيان من خلال قوائم أسماء طلاّب السنة السادسة للعام المذكور. بلغ عدد المشاركين 290 طالباً وطالبة (أي 42.03٪ من إجمالي عدد طلاب السّنة السادسة في ذلك العام). تمّ استطلاع وجهات نظرهم من خلال استبيان صممّ بناءً على استبيانات استخدمت في أبحاث مشابهة أُديرت في جامعات ذات منهاج دراسي مماثل لمنهاجنا، مع الاستعانة ببعض دلائل الأهداف التعليمية لكلية الطب البشري في سوريا وبعض جامعات العالم [12–15].

شمل الاستبيان المعلومات الديموغرافية والعامة التالية (العمر، الجنس، الحالة العائلية، معدّل السنوات السابقة، العمل خارج أوقات الدراسة إن وجد). وتضمّن 76 بنداً غطّت مجالاً واسعاً من المهارات السريرية والعمليّة توزّعت كما يلي: قياس العلامات الحيوية، ومهارات التأمل في الفحص الفيزيائي، وإجراءات تحتاج للتدريب في مختبر المهارات السريرية، ومهارات تتطلب الدّوام في الإسعاف والعناية المشددّة، ومهارات متفرقة، ومهارات القدرة على الربط بين الموجودات ووضع التشخيص. صُنفت آراء الطلاب بما يتعلق بالقدرة على القيام بالمهارات السابقة وفقاً لمستويات خمسة: (1) أستطيع القيام بالإجراء بكل ثقة. (2) أستطيع القيام بالإجراء وحدي لكن دون ثقة بنفسي. (3) ممكن أن أقوم بالإجراء لكنني أحتاج لإشراف. (4) راقبت إجراء المهارة دون التطبيق عملياً. (5) لم أتعلمه.

ولسبر الرأي العام للطلاّب طُرحت في النهاية ثلاثة أسئلة هي: (1) بشكل عام أنا راضٍ عن نوعية التعليم الطبي الذي تلقيته. (2) أشعر أنّ تدريبي السريري يؤهلني للعمل بشكل مستقل كممارس عام. (3) أشرف الأساتذة على تعلّمي هذه المهارات. قدّرت الإجابات باستخدام سلّم ليكرت Likert scale بحيث: 1= أوافق

بشدة، و5= لا أوافق بشدة. تُرك للطالب في نهاية الاستبيان فرصة لكتابة ملاحظاته واقتراحاته.

قمنا قبل إدارة الاستبيان بإجراء دراسة ارتيادية على 15 طالباً لتحرّي الوضوح في الأسئلة والمتغيرات المقاسة، وبعدها تمّ توزيعه على عينة الدراسة من الطلاّب بعد أن شُرح لهم الغرض من القيام بهذا البحث. وقد حصل هذا البحث على موافقة مجلس الدراسات والأبحاث في جامعة دمشق.

**معالجة البيانات وتحليلها:** أدخلت البيانات إلى برنامج Excel (الإصدار رقم 10) بعد أن أعطي كل مشارك رمزاً، ومن ثمّ تمّ تدقيق الإدخال من قبل مساعد بحثي للتوثق من صحتها وغياب الخطأ. واُستخدم برنامج SPSS (الإصدار الثامن عشر) لإجراء الاختبارات الإحصائية الوصفية للمتغيرات الديموغرافية وجميع المتغيّرات الخاصّة بالمهارات المدروسة.

## النتائج

بلغ معدّل الاستجابة للاستبيان الموزّع على طلاّب السّنة النهائية 93.44٪ (271 / 290)، وتراوحت نسب الإجابة على المهارات فرادى بين 98.2 – 100٪.

بلغ عدد المشاركين من الذكور 164 (60.5٪)، وكان متوسط أعمار المشاركين 24.36 ± 1.24 سنة. ذكر 221 طالباً وطالبة معدّلاتهم خلال السنوات الخمس السابقة لتتراوح بين 59٪ و87.6٪ (المتوسط 71.48 ± 5.44). وتجدر الإشارة إلى أن هناك سبعة طلاب (2.58٪) كانوا يعملون إلى جانب دراستهم، وشكّل المتزوجون 2.95٪ (8 / 271)، منهم ست إناث.

## نتائج عامة

كان 30.6٪ من الطلاّب غير راضين بشدة عن نوعية التعلّيم الذي تلقوه، ويرى نحو نصفهم (50.2٪)، أنهم غير قادرين على ممارسة الطّب بشكل مستقل بعد التخرج، بينما كان ربع الطلاّب (24٪) لا يوافقون بشدة على أن هناك دوراً للأساتذة في تدريبهم.

### أولاً- قياس العلامات الحيوية

يثق عدد كبير من الطلاّب بقدراتهم في قياس العلامات الحيوية (النبض:82.7٪، الضغط الشرياني: 81.2٪، عدد مرات التنفس: 78.2٪، قياس الحرارة: 64.6٪)، ونسبة قليلة جداً كانت بحاجة لإشراف عند القيام بها (1.8٪، 3.7٪، 3٪، 3.7٪ مع احترام الترتيب) (المخطط 1).

### ثانياً- التأمل

اخترنا عشرة من مهارات التأمل. كانت النسبة الأكبر للذين يتوقعون القيام بهذه المهارات بثقة دون إشراف، وسجّل أعلاها لتأمل الصدر (78.6٪)، تلاها وجود الكدمات (66.4٪)، ثمّ الشحوب (64.9٪)، وبعدها اليرقان (63.8٪)، ومن ثمّ وجود الفرفريات (57٪)، والتصبغات الجلدية (55.7٪)، والنمشات (53.5٪)، وكان في آخر القائمة تأمل الكفين والأظافر (48.3٪) والفم والأغشية المخاطية (43.9٪)، وأخيراً تأمل الدوران الجانبي والدوالي (41٪). بالمقابل كان هناك عدد قليل من الطلاّب بحاجة لوجود المشرف للقيام بهذه المهارات، وهي موضّحة في الجدول (1).

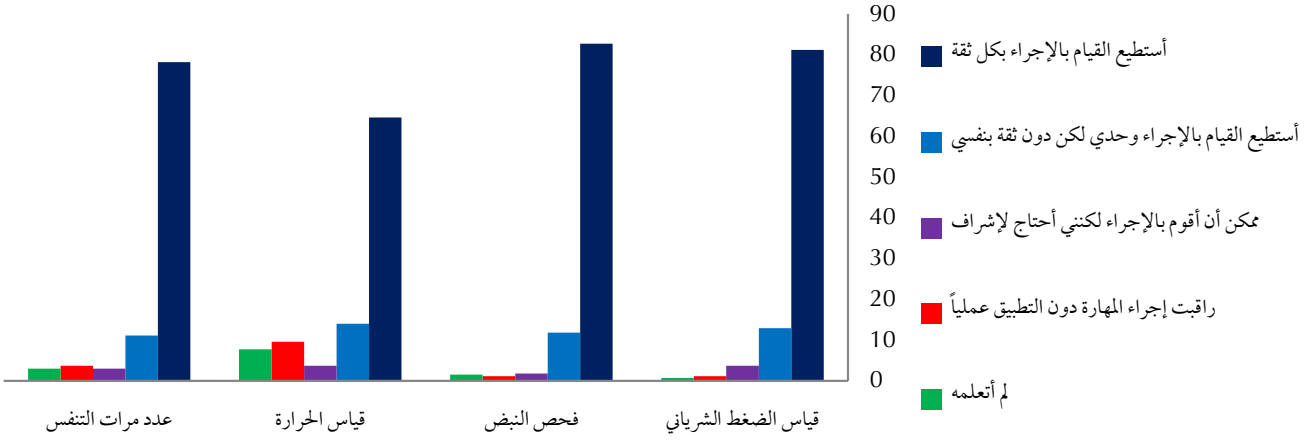
### ثالثاً- مهارات تحتاج لوجود مختبر المهارات السريرية

اخترنا بعض المهارات السريرية التي يصعب تطبيقها على المرضى مباشرة دون المرور بمرحلة تعلّم إجرائها على الدمية البشرية (المانيكان). يعرض المخطط 2 النتائج. كانت نسب الطلاّب الذين لم يتعلّموا القيام بالإجراء أو الذين راقبوه فقط دون تطبيقه عملياً مرتفعة مقارنة مع النسب المنخفضة للذين يعتقدون أنهم يستطيعون القيام بهذه المهارات بثقة بمفردهم، كما يلي: فحص قعر العين (50.6٪ مقابل 3.3٪)، المس الشرجي (90.8٪ مقابل 2.2٪)، المس المهبلي (65.4٪ مقابل 5.9٪)، فحص الثدي (50.9٪ مقابل 14٪)، تركيب الأنبوب الأنفي المعدي (87.8٪ مقابل 1.1٪)، تركيب قثطرة بولية (85.2٪ مقابل 3.7٪).

### رابعاً- مهارات تتطلب الدوام في الإسعاف والعناية المشددة

اخترنا بعض المهارات التي يتطلب إتقانها الدوام في الإسعاف والعنايات المشدّدة وهي موضّحة في الجدول (2).

يلاحظ الانخفاض الشديد في نسب الطلاّب القادرين على القيام بالمهارة بثقة، وارتفاع نسب الطلاب الذين لم يتعلموا هذه المهارات أو اكتفوا بالمراقبة فقط. وكانت نسب الطلاّب الذين يعتقدون أنهم قادرون على القيام مثلاً بمهارة تقدير درجة الوعي، ووضع نتائج قياس




المخطط 1 نتائج قياس العلامات الحيوية

**الجدول1 مقارنة بين الطلاب الذين يستطيعون القيام ببعض مهارات التأمل والذين راقبوها فقط أو لم يتعلموها**

| | أستطيع القيام بالإجراء بكل ثقة العدد (٪) | أستطيع القيام بالإجراء وحدي لكن دون ثقة العدد (٪) | ممكن أن أقوم بالإجراء لكن أحتاج لإشراف العدد (٪) | راقبت الإجراء فقط دون التطبيق عملياً العدد (٪) | لم أتعلمه العدد (٪) |
|---|---|---|---|---|---|
| تأمل الصدر | (78.6) 213 | (11.4) 31 | (6.6) 18 | (1.8) 5 | (0.7) 2 |
| تحديد وجود الشحوب | (64.9) 176 | (24.7) 67 | (8.1) 22 | (1.5) 4 | - |
| تحديد وجود اليرقان | (63.8) 173 | (24.4) 66 | (8.5) 23 | (1.5) 4 | (1.1) 3 |
| فحص الفم والأغشية المخاطية | (43.9) 119 | (26.9) 73 | (14.8) 40 | (10.3) 28 | (3.7) 10 |
| فحص الكفين والأظافر | (48.3) 131 | (25.8) 70 | (13.7) 37 | (7.0) 19 | (3.3) 9 |
| وجود تصبغات جلدية | (55.7) 151 | (24.0) 65 | (10.7) 29 | (5.5) 15 | (3.7) 10 |
| وجود النمشات | (53.5) 145 | (21.0) 57 | (11.4) 31 | (8.5) 23 | (5.2) 14 |
| وجود الفرفريات | (57.0) 155 | (21.0) 57 | (10.7) 29 | (7.0) 21 | (3.0) 8 |
| وجود الكدمات | (66.4) 180 | (17.0) 46 | (7.4) 20 | (6.6) 18 | (1.8) 5 |
| وجود الدوران الجانبي والدوالي | (41.0) 111 | (24.7) 67 | (16.2) 44 | (11.8) 32 | (6.3) 17 |

العلامات الحيوية، وتقدير درجة التجفاف عند الطفل، والإنعاش القلبي الرئوي عند البالغين بثقة بالترتيب: 14.8٪، 7٪، 7.7٪، 2.6٪ مقابل الذين راقبوا القيام بالمهارة فقط أو لم يتعلموها بالترتيب نفسه: 46.8٪، 78.2٪، 58.6٪، 85.6٪.

### خامساً- مهارات متفرقة

اخترنا مهارات متفرقة تشتمل كتابة الوصفة الطبّية وكتابة التقرير الطبي وكتابة تقرير الوفاة والتشخيص السريري للموت ومعايير عزل المريض. فكانت نسبة الواثقين من أنفسهم في اتقانها منخفضة جداً مقارنة مع الذين لم يتعلموها، فكتابة الوصفة الطبّية (8.1٪ مقابل 29.9٪)، وكتابة التقرير الطبي (2.2٪ مقابل 71.2٪)، وكتابة تقرير الوفاة (0.7٪ مقابل 86٪)، والتشخيص السريري للموت (3٪ مقابل 70.1٪)، ومعايير عزل المريض ( 1.8٪ مقابل 71.6٪) (المخطط 3).

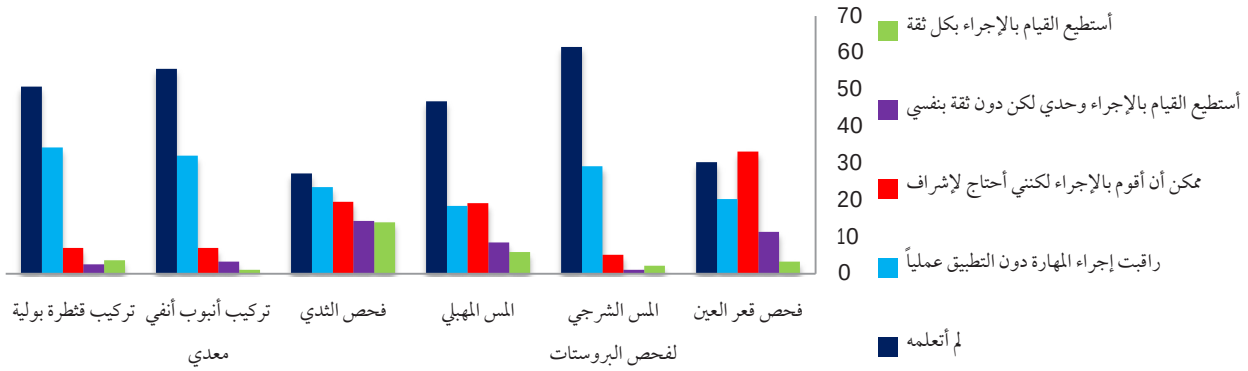
### سادساً- مهارات الربط بين الموجودات السريرية والقدرة على وضع التشخيص

اخترنا مهارات تشخيص الأمراض الصدرية بحيث تشمل مهارات الفحص السريرية للموجودات فرادى (تأمل الصدر، وإصغاء الأصوات التنفسية، وجس الاهتزازات الصوتية، والقرع) فكانت نسبة الطلاب الذين يعتقدون أنهم يستطيعون القيام بالمهارة بثقة هي بالترتيب: 78.6٪، 40.2٪، 48.3٪، 49.8٪. أما الذين يحتاجون لوجود المشرف فكانت نسبهم على التوالي: 0.7٪، 19.9٪، 15.5٪، 15.9٪.

كما اخترنا مهارات جمع الموجودات مع بعضها للتشخيص، فكانت نسبة الذين يعتقدون أنهم يستطيعون بثقة تشخيص تناذر الانصباب الجنبي 28.4٪ مقابل 26.9٪ من الطلاب يحتاجون لإشراف. أما نسبة الذين يعتقدون أنهم يستطيعون تشخيص ذات الرئة بثقة فكانت 12.2٪ مقابل 29.9٪ منهم يحتاج لإشراف. وبلغت نسبة الذين يعتقدون أنهم يستطيعون تشخيص الريح الصدرية بثقة 21٪ مقابل 28.8٪ بحاجة لإشراف (المخطط 4).

مثّلت عيّنة هذه الدراسة 42.03٪ من طلاّب السنة السادسة للعام الدراسي 2009-2010 وقد تمّ انتقاؤهم عشوائياً مما يمكن معه القول أنّ العيّنة كانت ممثلة فعلاً لطلاّب العام المدروس.

تقدّم موجودات هذا البحث معلومات هامة حول آراء طلاّب الطبّ وهم على وشك التّخرّج




**المخطط 2 نتائج إجراءات تحتاج إلى مختبر مهارات سريرية**

الجدول 2 مقارنة بين الطلاب الذين يستطيعون القيام ببعض الإجراءات الإسعافية والذين راقبوها فقط أو لم يتعلموها

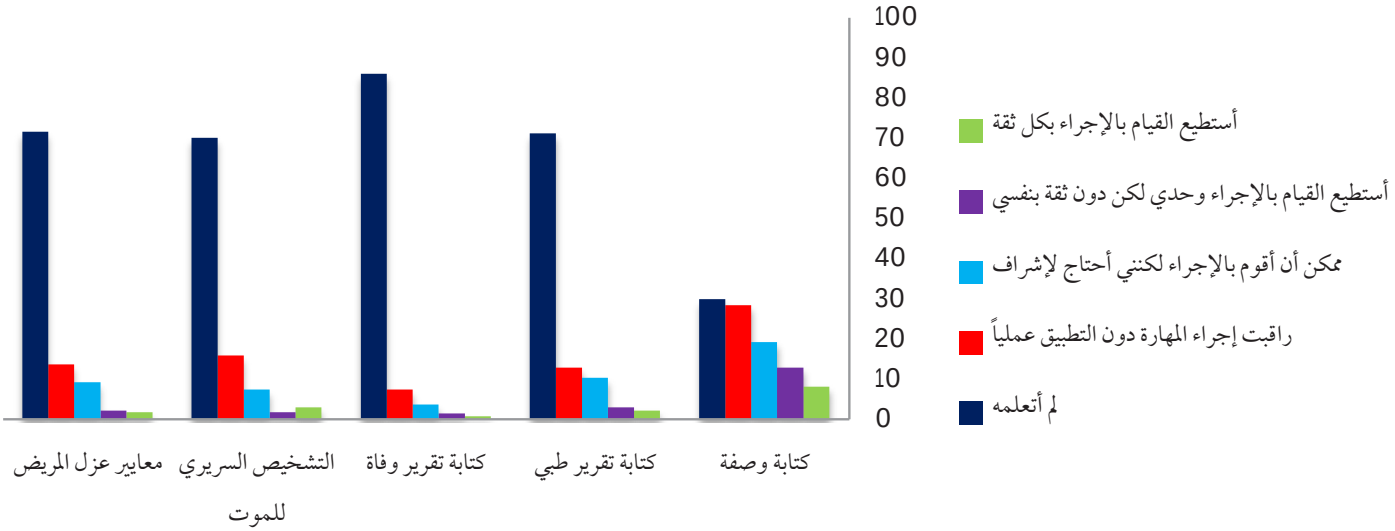
| مهارات الإسعاف والعنايات المشددة | أستطيع القيام بالإجراء بكل ثقة العدد (٪) | أستطيع القيام بالإجراء وحدي لكن دون ثقة العدد (٪) | ممكن أن أقوم بالإجراء لكن أحتاج لإشراف العدد (٪) | راقبت الإجراء فقط دون التطبيق عملياً العدد (٪) | لم أتعلمه العدد (٪) |
|---|---|---|---|---|---|
| تقدير درجة الوعي | (14.8) 40 | (16.2) 44 | (20.7) 56 | (17.3) 47 | (29.5) 80 |
| وضع نتائج قياس العلامات الحيوية على مخطط المراقبة | (7) 19 | (5.9) 16 | (7.4) 20 | (4.8) 13 | (73.4) 199 |
| تقدير التجفاف عند الطفل | (7.7) 21 | (14.4) 39 | (18.5) 50 | (23.2) 63 | (35.4) 96 |
| تقدير العوز الغذائي | (7.7) 17 | (8.9) 24 | (14.8) 40 | (20.7) 56 | (48.3) 131 |
| تمييز حالة البطن الجراحي | (12.2) 33 | (14.4) 39 | (17.3) 47 | (17) 46 | (37.3) 101 |
| الإنعاش القلبي الرئوي عند البالغين | (2.6) 7 | (3.3) 9 | (7.7) 21 | (28.4) 77 | (57.2) 155 |
| الإنعاش القلبي الرئوي عند الأطفال | (1.1) 3 | (3) 8 | (4.4) 12 | (23.6) 64 | (66.1) 179 |
| ولادة طبيعية | (1.5) 4 | (2.2) 6 | (9.2) 25 | (56.1) 152 | (30.3) 82 |

في المهارات التي اكتسبوها خلال سنوات تدريبهم السريري.

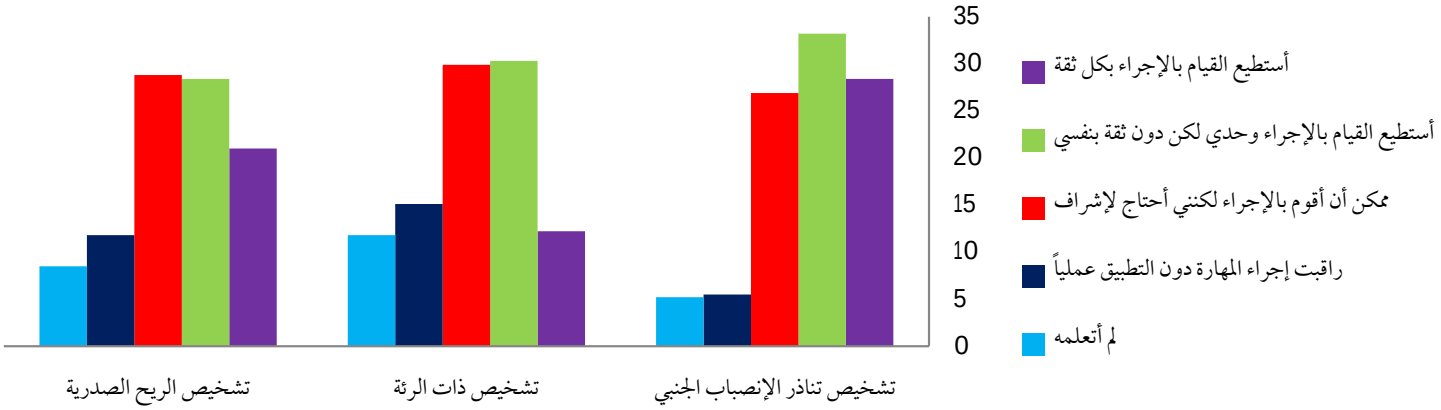
جاءت نسبة الطلاّب المشاركين في الدّراسة والذين لم يكونوا راضين بشدّة عن نوعيّة التعلّيم الذي تلقوه مماثلة لنسبة الطلاّب غير الراضين بشدّة أيضاً عن تعليمهم السريري في الدّراسة الإيرانية للمؤلف Jalili وزملائه وهي 30٪ [13]، وربما هذا ما جعل نحو نصف الطلاّب يشعر بأنه غير قادر على ممارسة الطّب بشكل مستقل بعد التخرج مباشرة. هذه النسب العالية تبقى مقلقة رغم ما بيّنته دراسة Mario Sičaja وزملائه في كرواتيا، من أنّ الطلاّب يقيّمون أنفسهم ومهاراتهم بدرجة أقل بالمقارنة مع تقييم أساتذتهم [16]. وفي تحليلنا للنتائج التي حصلنا عليها وجدنا تفسيراً منطقياً قد يكون وراءها.

أولاً: يشكّل عدم وجود مختبر للمهارات السريرية ليقوم الطلاّب بالتدرّب واكتساب المهارات اللازمة قبل البدء بتطبيقها على المرضى، أحد أهم الأسباب في شعور الطالب بالنقص في الثقة بقدراته، وبالتالي عدم رضاه عن تعليمه السريري. يتّضح ذلك من مقارنة نتائج المهارات التي لا تحتاج لوجود المختبر والتي يمكن للطلاب بوجود المشرف تعلّمها وإجراؤها على بعضهم مثل فحص النبض، وقياس الضغط الشرياني، وعدد مرات التنفس حيث كانت نسبة الثقة عالية جداً (82.7٪، 81.2٪، 78.2٪ على التوالي)، ومن اللافت للنظر أن قياس الحرارة على الرغم من سهولته، وعدم الحاجة لإجرائه في مختبر المهارات السريرية فإن النسبة الأقل من الطلاب (64.6٪) هي التي تستطيع إجراءه بكل ثقة، بدون أي تبرير منطقي لذلك.

أما الإجراءات التي تحتاج فعلاً لوجود مختبر المهارات السريرية ومنها: فحص قعر العين، والمس الشرجي، والمس المهبلي، وفحص الثدي، وتركيب الأنبوب الأنفي المعدي، وتركيب قثطرة بولية، فقد تفاوتت النسب كثيراً بين الطلاّب الذين راقبوا إجراء هذه المهارات دون القيام بها عملياً أو لم يتعلموها، فأكثر من نصفهم (50.6٪) لا يعرف تشخيص وذمة حليمة العصب البصري، مقابل فقط 3.3٪ يعتقد أنه يستطيع القيام بذلك، كما أنّ معظمهم (90.8٪) لا يعرف كيف يضع قثطرة بولية، مقابل فقط 3.7٪ يعتقد أنه يستطيع القيام بذلك. ومن هنا ضرورة التأكيد على أهمية




المخطط 3 نتائج المهارات المتفرقة




**المخطط 4 نتائج القدرة على وضع التشخيص**

ودور وجود مختبر مهارات فعّال كامل التجهيز متاح للطلاّب طيلة مراحل الدراسة [17].

ينطبق ما سبق أيضاً على مهارات التأمل والتي يمكن القيام بها جانب سرير المريض أو في قاعة الدرس حيث يكون الدرس على المريض بوجود المشرف، فقد وجدنا أنّ أكثر من 60٪ من الطلاب يثقون في قدرتهم على القيام بإجراءات تأمّل أساسيّة ولا سيّما الصدر والكدمات والشحوب واليرقان ولكنّ نسبة الواثقين من أنفسهم انخفضت في تأمّل الفرفريات والتصبّغات الجلدية والنمشات ليشير 41٪ منهم للثقة في إجراء تأمل الدوران الجانبي والدوالي رغم أهميته. وتفسير ذلك واضح لأنّ التعلّم في مشافينا الجامعية جانب سرير المريض أو في قاعة الدرس يحكمه توفّر الحالات المرضيّة فلا يمكن توفير نفس الحالات لكل الطلاّب، فضلاً عن عدد الطلاّب الكبير الذي يجعل توفير نفس الحالات للجميع من الصعوبة بمكان.

ثانياً: يأتي في مقدمة الأسباب الأخرى (التي نعلم أنّ عدم وجودها في المنهاج يجعل نسبة قليلة من الطلاّب يشعرون أنهم يملكون الثقة بأنفسهم في أدائها) غياب الدّوام الإلزامي لطلاّب ما قبل التخرّج في الإسعاف والعناية المشدّدة. فبينما لوحظ الانخفاض الشديد في نسب الطلاّب القادرين على القيام بثقة ببعض المهارات مثل تقدير درجة الوعي (14.8٪)، ووضع نتائج قياس العلامات الحيوية (7٪)، وتقدير درجة التجفاف عند الطفل (7.7٪)، والإنعاش القلبي الرئوي عند البالغين (2.6٪) وكلها مهارات تتطلب الدوّام في الإسعاف والعنايات المشدّدة، لوحظ ارتفاع نسب الطلاّب الذين لم يتعلموا هذه المهارات أو اكتفوا بالمراقبة فقط (الترتيب نفسه للمهارات السابقة الذكر: 46.8٪، 78.2٪، 58.6٪، 85.6٪). ويبدو أن ذلك مذكور في دراسات أخرى فعلى سبيل المثال يرى أكثر من ثلث طلاّب دراسة أُجريت في المملكة المتحدة أنهم غير قادرين على إجراء الإنعاش القلبي الرئوي بدون إشراف [18].

نعتقد أنّه يجب أن تتعزز ثقة الطلاّب في أداء مثل هذه المهارات بعد فرض مقرر تدريبي للإسعاف والعناية المشددة، وهذا ما أشارت إليه دراسة لاي Lai وزملائه من تحسن في أداء هذه المهارات عند طلاب السنة الأخيرة بعد دوامهم في وحدة العناية المشددة [19].

ثالثاً: أظهرت دراسة أجريت على طلاب متخرجين حديثاً أن معظمهم قد صُدم عندما عرف أنّ عليه فجأة وضع التشخيص الصحيح وكتابة وصفة العلاج المناسب [20]، مما يشير إلى ضرورة وجود تكامل ما بين العلوم الأساسية والعلوم السريرية، وكذلك إلى ضرورة تحميل طالب السنة السادسة مسؤولية جزئية بإشراف جيد عن المرضى في المستشفى وذلك بعد أن أنهى المقررات التدريبية الدوارة في كافة الأقسام في السنين السابقة، وهذا كفيل بتحسين مهارات التشخيص والربط بين الموجودات ووضع تشخيص تفريقي إن لم يكن هناك تشخيص نهائي (مثلاً من نتائجنا: الثقة في تشخيص تناذر الانصباب الجنبي 28.4٪، وذات الرئة 12.2٪، والريح الصدرية 21٪)، وكذلك سيرفع من نسبة من يستطيع كتابة وصفة طبية بثقة أو تقرير طبي أو حتى تقرير وفاة فالنتائج الحالية منخفضة وهي بالترتيب: (8.1٪)، (2.2٪)، (0.7٪)، (3٪).

وأخيراً: إن الاكتفاء بالمراقبة أثناء الدرس السريري والطالب جالس على الكرسي في قاعة التدريس أو واقف بجوار الأستاذ في الجولة السريرية، لا تنتج طبيباً، ويبدو أن هذا شعور الطلاب أيضاً فربع الطلاب لا يوافق بشدة على وجود أي دور للأستاذ المشرف في تعليمهم، ويبدو أنّ نقص الإشراف الفعّال مشكلة عالمية، ووصلت لمعدلات مماثلة لنا أو تفوقها، وفي بعضها يذكر الطلاّب أن في 50 – 80٪ من الحالات لم يكن هناك إشراف عند إجراء الفحص الفيزيائي [13, 21].

إن الالتزام والإشراف والتواصل الجيد من قبل الأستاذ، يخلق بينه وبين الطالب علاقة تعدُّ جوهرية لجودة التدريب السريري [22].

ومهما كانت أعداد الطلاّب كبيرة في كليّتنا يجب في رأينا ألاّ تقف حجر عثرة في تأمين تدريب سريري أفضل لهم، فأعداد الأساتذة والمشرفين كبيرة أيضاً، وتتوفر للطلاّب سبع مشافي تعليمية تضم مختلف التخصصات الطبية، وذات طاقة استيعابية كبيرة. لكنّنا بحاجة لإعادة النظر في توزيع الطلاّب إلى فئات صغيرة لتوفير الإشراف الجيد، وكذلك لتأمين أماكن أكثر كي تكفي الأعداد المتزايدة للفئات بعد تقليل عدد الطلاّب في كل منها.

نعتقد أنّ القيام بما سبق بالإضافة إلى توسيع نطاق التدريب ليشمل أقسام الإسعاف والعنايات المشددّة المختلفة، وتفعّيل التدّريب في مختبر المهارات السريرية سيؤدي إلى تحسن

واضح في مستوى التدريب السريري [23]. من الجدير بالذكر أن هذه الأفكار جاءت متطابقة مع مقترحات الطلاّب وملاحظاتهم.

يضاف إلى ما سبق أن تزويد الطالب بدليل بالأهداف التعليمية المطلوب انجازها في نهاية مرحلة التدريب السريري، وتحميله بعض المسؤوليات كجزء من تأهيله، وتعديل نظام التقييم والامتحانات ليصبح تقييماً معتمداً على الكفاءات competency based assessment، واستخدام طرائق كالامتحان السريري الموضوعي المُبنّى objective structured clinical examinations، كل هذا سيكون كفيلاً بتخريج الطبيب الكفء والمؤهَّل بالشكل الأفضل لتحمّل أعباء مهنته على أكمل وجه، وللسمو أكثر في مستوى كلّية الطّب في جامعة دمشق العريقة.

## كلمة شكر

نتوجه بجزيل الشكر لعمادة كلية الطب ورئاسة جامعة دمشق على الموافقة لإجراء هذه الدراسة ونثمن غالياً استجابة الطلاب لملء الاستبيان. ونشكر الأستاذة الدكتورة هيام بشور لبعض الملاحظات التي قدمتها أثناء تنفيذ وصياغة هذا البحث.

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e-ISSN 1687-1634
e-ISBN 9789290219217