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# المجلة الصحية لشرق المتوسط

# EMHJ

## Eastern Mediterranean Health Journal

## La Revue de Santé de la Méditerranée orientale

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Volume 18 / No. 11
November / Novembre

2012

المجلد الثامن عشر / عدد ١١
تشرين الثاني / نوفمبر

## 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.

### EASTERN MEDITERRANEAN HEALTH JOURNAL

IS the official health journal published by the Eastern Mediterranean Regional Office of the World Health Organization. It is a forum for the presentation and promotion of new policies and initiatives in health services; and for the exchange of ideas, concepts, epidemiological data, research findings and other information, with special reference to the Eastern Mediterranean Region. It addresses all members of the health profession, medical and other health educational institutes, interested NGOs, WHO Collaborating Centres and individuals within and outside the Region.

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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. 11 • 2012 • المجلد الثامن عشر عدد ١١

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المجلة الصحية لشرق المتوسط

# EMHJ

## Letter from the Editor

The threat to global health and security from the emergence of new viruses and from the potential of viruses to cross the species barrier is very real as has been demonstrated by the relatively recent experiences with severe acute respiratory syndrome (SARS) in 2003, HINI in 2009 and avian influenza reported since 1997. Thus the occurrence in June and September this year of 2 cases of severe respiratory illness linked to a new human coronavirus caused widespread concern. The cases originated from Saudi Arabia and Qatar and we present in this issue an editorial discussing the incident, the implications and what needs to be done in our Region to be prepared for such events and contribute to the global strategies in order to safeguard public health.

As well as the emergence of new viruses, another major threat to global health and safety is the increasing antimicrobial resistance across the world. At the same time, there is a dearth of new antimicrobial medicines being developed and coming onto the market. The most alarming potential consequence of these two realities is a world without effective medicines to combat infectious diseases, a return to a pre-antibiotic era. The impact on global health and all other aspects of life can be imagined. While there is a need for concerted research efforts to develop new antimicrobial medicines, at the same time we need to extend as long as possible the shelf life of the medicines that are currently available. This requires not only the rational prescribing of medicines but also surveillance on trends in emerging resistance in microorganisms, and strong government commitment to both these strategies is vital. A paper from Saudi Arabia examined the drug prescribing performance of primary health care centres in Eastern province using the WHO/International Network of Rational Use of Drugs core drug prescribing indicators. The study reports that the percentage of encounters with an antibiotic prescribed was 32.2%; this is marginally higher than the optimal value recommended (≥ 30%). Another study in Morocco determined the causes of invasive bacterial diseases in children and the antibiotic susceptibility of the organisms. While antibiotic resistance rates were not very high, the authors concluded that efforts were still needed to control the increase in the rates and recommended the need for a policy on judicious antibiotic use in Morocco.

## رسالة من المحرر

إن ظهور فيروسات جديدة، واحتمال اجتياز هذه الفيروسات للحواجز الفاصلة بين مختلف أنواع الأحياء، يمثل تهديداً حقيقياً للصحة والأمن العالميين، على نحو ما أظهرته التجارب الأخيرة نسبياً والتي تمثلت في المتلازمة التنفسية الحادة الوخيمة (سارس)، التي ظهرت عام 2003، وجائحة الإنفلونزا H1N1 عام 2009، وإنفلونزا الطيور التي ما برحت التقارير ترد حول الإصابة بها منذ عام 1997. لذلك، فإن وقوع حالتين لمرض تنفسي وخيم مرتبط بفيروس بشري جديد من الفيروسات التاجية (الكورونا)، في شهري حزيران/ يونيو، وأيلول/ سبتمبر الماضيين، قد أثار قلقاً واسع النطاق. وقد ظهرت هاتان الحالتان في المملكة العربية السعودية، وقطر. وتبحث افتتاحية هذا العدد في هذه الواقعة، وتداعياتها، وما ينبغي عمله في هذا الإقليم من حيث الاستعداد لأحداث من هذا القبيل، ومن ثَم الإسهام في الاستراتيجيات العالمية للمحافظة على الصحة العمومية.

وبالإضافة إلى ظهور الفيروسات الجديدة، فإن المقاومة المتزايدة لمضادات المكروبات في أنحاء العالم المختلفة، تشكل هي الأخرى تهديداً كبيراً للصحة والسلامة على الصعيد العالمي. وفي الوقت ذاته، فإن هناك شُحّاً في الأدوية المضادة للمكروبات التي يجري تطويرها وطرحها في الأسواق. وإن أشد ما يبعث على القلق بشأن النتيجة المحتملة لهاتين الحقيقتين أن نجد أنفسنا في عالمٍ خالٍ من أدوية ناجعة نكافح بها الأمراض المعدية، الأمر الذي يمثل ردة إلى عصر ما قبل المضادات الحيوية. ويمكننا، عندئذ، أن نتخيل تأثير ذلك على الصحة العالمية، وعلى غيرها من مناحي الحياة. وفي حين تدعو الحاجة إلى تضافر الجهود في مجال البحث لتطوير مضادات حيوية جديدة، فإن الحاجة تدعو، في ذات الوقت، إلى مد فترة صلاحية الأدوية المتوافرة حالياً لأطول وقت ممكن. وهذا الأمر لا يستوجب فقط وصف الأدوية على نحو رشيد، بل يتطلب كذلك مراقبة اتجاهات المقاومة الناشئة للكائنات الدقيقة، كما يُعد الالتزام القوي من جانب الحكومات بهاتين الاستراتيجيتين أمراً حاسماً في هذا المجال. وفي هذا العدد ورقة من المملكة العربية السعودية حول بحث أداء مراكز الرعاية الصحية الأولية في المنطقة الشرقية بالمملكة، في ما يختص بوصف الأدوية، استخدمت فيه المؤشرات الأساسية لوصف الأدوية، الخاصة بمنظمة الصحة العالمية/ الشبكة الدولية لاستعمال الأدوية على نحو رشيد. وتشير الدراسة إلى أن نسبة ما صودف من حالات وصف فيها مضاد حيوي بلغت 32.2٪، وهي نسبة تتجاوز بقليل القيمة المثلى الموصى بها (≤ 30٪). كما أجريت دراسة أخرى في المغرب، تم التعرف فيها على أسباب أمراض الجراثيم الغزوية لدى الأطفال وحساسية المكروب للمضادات الحيوية. ورغم أن معدلات المقاومة للمضادات الحيوية لم تكن مرتفعة جداً، إلا أن الباحثين خلصوا إلى ضرورة مواصلة الجهود لمكافحة الزيادة في هذه المعدلات وأوصوا بالحاجة إلى توخي الحصافة لدى استعمال المضادات الحيوية.

*Editorial*

# Emergence of novel human coronavirus: public health implications in the Eastern Mediterranean Region

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Two cases of severe respiratory illness associated with a new human coronavirus have recently raised a global health alert. The first case of infection with the new virus was a Saudi Arabian national who died in June 2012 [1]. The second case was a patient from Qatar, a previously healthy adult, who was transferred to a hospital in the United Kingdom in early September this year [2] and is currently receiving intensive care there.

In light of the severity of illness in these two confirmed cases, the discovery of this new virus triggered unprecedented global attention as it brought back memories of the global pandemic caused by severe acute respiratory syndrome (SARS) which led to 8 422 cases and 916 deaths worldwide in 2003 [3]. SARS was also caused by a new virus (SARS-CoV) which belongs to the same family *Coronoviridae* as that of this recently discovered strain of human coronavirus. Clinical symptoms caused by this new human coronavirus also match the clinical picture of acute primary viral pneumonia that was seen in many patients suffering from SARS. Human coronaviruses (hCoV) were first detected in the late 1960s and four strains are known to be distributed globally and infect humans causing the common cold. Up to a third of mild upper respiratory tract infections in adults are known to be caused by hCoV. In addition, hCoV has been associated with more severe lower respiratory tract conditions, especially in frail patients [4]. The SARS-CoV was the fifth hCoV that was in circulation for a limited time during 2002 and 2003. The SARS-CoV was zoonotic in origin and its emergence was a stark reminder that any newly emerging zoonotic coronaviruses has the potential to transmit from person to person, especially in healthcare settings, and to cause severe human illnesses.

The genetic sequence data now indicate that this new virus is a beta-coronavirus similar to bat coronaviruses, but not similar to any other coronavirus previously described in humans, including the coronavirus that caused SARS in 2003 [5]. However, concerns remain as zoonotic transmission is highly suspected for this new coronavirus infection as well. As the two confirmed cases with this coronavirus infection occurred about three months apart and as there is currently no evidence of a direct epidemiological link between the two cases, the global health risk associated with this new virus is gradually easing. Available data to date also do not support any human-to-human transmission of this new coronavirus. In the second case of this coronavirus infection, none of the 64 close contacts developed severe disease; 13 (20%) reported mild respiratory symptoms, but the virus was not detected in the 10 who were tested [2].

Both these two cases with novel human coronavirus infection were reported from countries in the Eastern Mediterranean Region of the World Health Organization (WHO). The public health implication of emergence of this new respiratory virus from the Region, suspected to be zoonotic in origin as well, needs to be studied carefully. As only two cases have so far been reported from anywhere in the world, the epidemiological and clinical picture of this infection and understanding of the exposure risks remain fairly limited. The current situation needs to be monitored carefully as the emergence of this new virus comes at a time when around 3 million people around the world are arriving in Saudi Arabia for Hajj, the annual Islamic pilgrimage to Mecca. As the new coronavirus infection originated in Saudi Arabia where all these Muslim pilgrims are assembling, the concern over the possibility of an outbreak during Hajj should not be taken lightly, particularly as nothing is yet known about the severity and transmissibility of this virus in mass gatherings situations. As the infection caused by this virus is likely to spread by aerosol droplets like any other hCoV, the behaviour of the virus in overcrowded and congregated settings cannot be clearly predicted. Appropriate strategies for detection of any suspected case of novel coronavirus infection need to be rapidly added to the public health surveillance

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plan for the Hajj pilgrims in Saudi Arabia as well as in all other countries in the Region for the returning pilgrims.

There has been a rapid international response following the news of this new virus. An interim case definition was developed rapidly by WHO [6] to ensure that a systematic approach is followed for appropriate identification and investigation of patients who may be infected with the virus. The countries of the Region need to be vigilant and put in place enhanced surveillance for identifying cases with suspected signs and symptoms of novel human coronavirus infections using WHO's recommended case definition and investigation protocol [6].

The emergence of this new virus has once again brought the importance of surveillance for acute respiratory diseases to the global public health stage almost two years after the end of pandemic influenza. This situation calls for exploring sustainable ways to support strengthening of both epidemiological and virological surveillance in the Region for severe acute respiratory infections (SARI) that can detect cases of atypical severe pneumonia early. Unfortunately, the surveillance system for SARI is rudimentary in most countries of the Region and not continued round the year. As the seasonality of SARI in the Region is not known, surveillance should be carried out throughout the year. The current opportunities can also be used by the countries of the Region to build, strengthen and sustain diagnostic capacities for detection of all types of circulating respiratory pathogens causing mild to severe respiratory symptoms, including those causing atypical primary viral pneumonia. Constant, open and transparent exchange of information between WHO and Member States on unexpectedly high numbers of admissions to hospital of cases with atypical respiratory symptoms will allow further detection of any suspected case of this new coronavirus infection. Such collaboration and exchange of information will increase our understanding of a number of "unknowns" that currently limit our knowledge of the natural history of the disease caused by this new virus.

In today's globalized world, diseases can and do cross geopolitical boundaries. This reality can not only have an impact on human health but also on people's welfare by potentially affecting trade, tourism, and other economic sectors that are so important to the growth and stability of countries, including those of the Region. The discovery of this new virus in the Eastern Mediterranean Region once again requires the countries of the Region to demonstrate to rest of the world how vigilant and prepared they are to prevent the international spread of a new infection and protect both global health and the wellbeing of their own peoples.

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# WHO/INRUD patient care and facility-specific drug use indicators at primary health care centres in Eastern province, Saudi Arabia

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**وصف الأدوية وفقاً لمؤشرات الشبكة الدولية للاستخدام الرشيد للأدوية/ منظمة الصحة العالمية من أجل رعاية المرضى في مراكز الرعاية الصحية الأولية في المنطقة الشرقية، في المملكة العربية السعودية**

عَزَّة علي الـمَحَلّي، عُلاَ عبد المنعم عقل، سارة آل داوود، أمل آل نهاب، حوراء الكبيش، سكينة آل سعيد، أحمد عوض الكحكي، أحمد محمد سالم

**الخلاصة:** تهدف هذه الدراسة إلى قياس أداء مراكز الرعاية الصحية في المنطقة الشرقية من المملكة العربية السعودية، باستخدام مؤشرات الشبكة الدولية للاستخدام الرشيد للأدوية/ منظمة الصحة العالمية الخاصة باستخدام الأدوية من أجل رعاية المرضى وفي المرافق الصحية. وقد أجرى الباحثون دراسة مستعرضة شملت عشر مراكز صحية تم اختيارها بالاعتيان المنهجي العشوائي. وأجروا مقابلات مع ثلاث مئة مريض أثناء زياراتهم للمراكز الصحية في الفترة من كانون الثاني/ يناير إلى آذار/ مارس 2011، كما أجروا مقابلات مع عشرة صيادلة في تلك المراكز. وقد كان الزمن الوسطي للمشورة هو 7.3 دقائق (الأفضل 30 دقيقة)، والنسبة المئوية للأدوية التي وضعت عليها لصاقات 10٪ (الأفضل 100٪)، ومعارف المرضى عن الجرعات الصحيحة 79.3٪ (الأفضل 100٪). وكانت النسبة المئوية للأدوية الرئيسية في المخزن 59.2٪ (الأفضل 100٪). وقام الباحثون بحساب الـمَنْسب الإجمالي للاستخدام الرشيد للأدوية الخاصة بالمرفق، وطبقوه على طائفة من المراكز الصحية من أجل وضع نقاط فَيْصَليَّة محددة.

ABSTRACT This study aimed to measure the performance of primary health care centres in Eastern province, Saudi Arabia, using the WHO/International Network of Rational Use of Drugs patient care and facility-specific drug use indicators. In a cross-sectional study, 10 health centres were selected using systematic random sampling. A total of 300 patients were interviewed while visiting the centre from January to March 2011 and 10 pharmacists from the same centres were interviewed. Average consultation time was 7.3 min (optimal ≥ 30 min), percentage of drugs adequately labelled was 10% (optimal 100%) and patient's knowledge of correct dosage was 79.3% (optimal 100%). The percentage of key drugs in stock was only 59.2% (optimal 100%). An overall index of rational facility-specific drug use was calculated and applied to rank the health centres for benchmarking.

**Indicateurs OMS/INRUD pour les soins aux patients et l'utilisation des médicaments par les établissements dans des centres de soins de santé primaires de la province orientale de l'Arabie saoudite**

RÉSUMÉ La présente étude visait à mesurer les pratiques des centres de soins de santé primaires dans la province orientale de l'Arabie saoudite, à l'aide des indicateurs pour les soins aux patients et l'utilisation des médicaments par les établissements de santé mis au point par l'Organisation mondiale de la Santé et le Réseau international pour l'usage rationnel des médicaments (INRUD). Dans une étude transversale, dix centres de soins de santé ont été sélectionnés par échantillonnage aléatoire systématique. Au total, 300 patients ont été interrogés entre janvier et mars 2011 alors qu'ils consultaient dans un centre, ainsi que 10 pharmaciens dans les mêmes centres. La durée moyenne de consultation était de 7,3 minutes (valeur optimale supérieure ou égale à 30 minutes), le pourcentage des médicaments correctement étiquetés était de 10 % (valeur optimale 100 %) et le pourcentage des patients connaissant la bonne posologie était de 79,3 % (valeur optimale 100 %). Le pourcentage des principaux médicaments en stock était de 59,2 % (valeur optimale 100 %). Un indice global d'usage rationnel des médicaments par établissement a été calculé puis appliqué pour le classement des centres de soins de santé à des fins de comparaison.

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Received: 08/07/11; accepted: 11/01/12

## Introduction

Rational use of medicines for all medical conditions is fundamental to the provision of universal access to adequate health care, satisfaction of health-related human rights and attainment of health-related Millennium Development Goals [1–3]. Yet more than 50% of all medicines worldwide are prescribed, dispensed or sold inappropriately and 50% of patients fail to take them correctly [2]. About one-third of the world's population lacks access to essential medicines [1,4]. Irrational use of medicines can stimulate inappropriate patient demand, and lead to reduced access and attendance rates due to medicine stock-outs and loss of patient confidence in the health system [2,4]. The first step to correcting irrational use of medicines is to monitor it in terms of the types of irrational use of medicines (so that strategies can be targeted towards changing specific problems); the amount of irrational use (so that the size of the problem is known and the impact of the strategies can be monitored); and the reasons why medicines are used irrationally (so that appropriate, effective and feasible strategies can be chosen) [1].

There have been studies of prescribing patterns in health car facilities in other parts of the Eastern Mediterranean region. In Bahrain, for example, there was polypharmacy, over-prescribing of antibiotics and under-prescribing of drugs by generic name [5]. In Yemen, the rate of prescribing drugs by generic name was low (39.2%), the proportion of prescriptions for antibiotics was high (66.2%) and availability of an essential drugs list (EDL) was only 78.9% [6]. In a previous paper we reported a survey of rational drug prescribing in 10 primary health care centres (PHCCs) in Eastern province of Saudi Arabia [7]. The study reported here also used the WHO/International Network of Rational Use of Drugs (INRUD) criteria to assess the performance of the same PHCCs in terms of patient care and facility-specific drug use indicators. We measured some features of health care facilities that impact on rational drug prescribing and some aspects of patient care that reflect the time given for diagnosis and ensuring patients are well informed about the prescribed drugs. These would be used to identify whether a facility was exceeding or under-performing these defined norms of practice and to obtain baseline information for continuous monitoring.

## Methods

### Study design and setting

This was a cross-sectional study carried out in 10 PHCCs from the Eastern province, selected based on systematic random sampling to represent the 13 districts of the province.

### Sample

For the patient care indicators a sample of 30 patients per PHCC who attended for diagnosis and treatment of general illnesses during the period January to March 2011 were included. They represented a mix of health problems and ages. Patients selected in the study were spread throughout the clinic day. Therefore a total of 300 patients were included. For the facility-specific indicators a pharmacist from each PHCC was interviewed during the survey visit. Therefore 10 pharmacists were interviewed.

### Data collection

Formal approval from the Ministry of Health in Saudi Arabia was taken before conducting the research. Confidentiality of the data collected was maintained throughout.

Patients were observed and interviewed during the survey visit to obtain the required variables and pharmacists were interviewed and their dispensing practices observed.

A standard patient care and facility indicators form was used to collect the required variables [8,9]. Data collectors at all PHCCs followed the WHO guidelines and methods to ensure reliability of data collection. A pilot study was conducted in which 15 patients from 2 different centres were interviewed to ensure availability of the required data, to estimate the time required to collect the variables from each patient and to edit the data collection tool as needed. The following WHO/INRUD patient care and facility-specific drug use indicators were used and were calculated using standard methods [8,9]:

***Patient care indicators***

- Average consultation time with patients by physicians. Optimal level: ≥ 30 min [10].
- Average dispensing time taken with patients. Optimal level: ≥ 60 s.
- Percentage of prescribed drugs actually dispensed at health facility. Optimal level: 100%.
- Percentage of drug packages actually labelled with at least 2 items (out of patient name, drug dose and drug regimen). Optimal level: 100%.
- Percentage of patients knowledgeable about the correct dosage schedule for all drugs dispensed. Optimal level: 100%.

***Facility-specific indicators***

- Availability of copy of national essential drug list (EDL) or local formulary at health facility (yes/no). Optimal level: 100% (yes = 100%; no = 0%).
- Percentage of key drugs to treat important conditions actually in stock at health facility. Optimal level: 100%.

### Data analysis

As described in our other paper on the subject [7], indices were calculated for each patient care indicator by dividing the optimal values by the actual values obtained. All the indicators had the same optimal index of 1: the closer to 1, the more rational a drug use indicator. Then a total rational facility-specific drug use (IRFSDU) was calculated for

each health centre by adding the indices. This enabled them to be ranked in order to identify the PHCC with the highest score to be used for benchmarking.

Data entry and analysis were conducted using *SPSS*, version 19. Descriptive statistics were used in the form of mean, median and standard deviation (SD). Differences between PHCCs were measured using ANOVA. The statistical significance was determined by a *P*-value < 0.05.

## Results

### Patient care indicators

The mean consultation time for the 10 PHCCs was 7.3 (SD 5.7) min, range 4.6–12.6 min, and the mean dispensing time was 100 (SD 146) s, range 58–180 s (Table 1). The mean percentage of drugs actually dispensed was 99.6% (SD 3.7%), ranging from 98.8%–100%, but the proportion of drugs adequately labelled was only 10.0% (SD 30.1%) and ranged widely across the 10 PHCCs from 0–100%. The percentage of patients with knowledge of the correct dosage ranged from 53.3%–93.3%, with a mean of 79.3% (SD 40.6%). The difference between the PHCCs was significant for all patient care indicators, except the percentage of drugs dispensed (Table 1).

Among the PHCCs, centre number 4 had the highest rank for IRPCDU for patient care indicators (Table 2).

### Facility-specific indicators

All but 1 PHCC centre had a copy of the EDL, i.e. scored 100% or this variable (Table 1), and therefore the overall mean availability was 90% over the 10 centres (scoring available = 100% and not available = 0%). The percentage of key drugs in stock was ranged from 33.3%–75.0%, with a mean of 59.2% (SD 12.0%).

Among PHCCs, centres number 4 and 10 were jointly ranked the highest rank for IRFSDU for facility-specific indicators (Table 2).

**Table 1 WHO/INRUD patient care and facility-specific drug use indicators in the 10 selected primary health care centres of Eastern province, Saudi Arabia, 2011**

| Health centre | Patient care indicators | | | | | | | | Facility indicators | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average consultation time (min) | | Average dispensing time (s) | | % drugs dispensed | | % drugs labelled | | % patients knowledgeable | | % copy of EDL | | % key drugs in the stock | |
| | Optimal: ≥ 30 min | | Optimal: ≥ 60 s | | Optimal: 100% | | Optimal: 100% | | Optimal: 100% | | Optimal: 100% | | Optimal: 100% | |
| | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median | Mean | Median | Mean | Median |
| All | 7.3 (5.7) | 6 | 100 (146) | 60.5 | 99.6 (3.7) | 100 | 10 (30.1) | 0 | 79.3 (40.6) | 100 | 90 | 100 | 59.2 | 58.3 |
| 1 | 5.2 (3.7) | 5 | 180 (370) | 58.0 | 98.8 (6.8) | 100 | 0 (0) | 0 | 90.0 (30.5) | 100 | 100 | 100 | 58.3 | 58.3 |
| 2 | 9.2 (5.3) | 9 | 94 (82) | 56.0 | 100.0 (0) | 100 | 0 (0) | 0 | 70.0 (46.6) | 100 | 100 | 100 | 58.3 | 58.3 |
| 3 | 7.0 (2.9) | 6 | 67 (46) | 56.5 | 98.9 (6) | 100 | 0 (0) | 0 | 86.7 (34.6) | 100 | 100 | 100 | 58.3 | 58.3 |
| 4 | 7.5 (5.0) | 6.5 | 116 (64) | 118.0 | 100.0 (0) | 100 | 100 (0) | 100 | 83.3 (37.9) | 100 | 100 | 100 | 75.0 | 75.0 |
| 5 | 5.9 (4.6) | 5 | 86 (92) | 56.5 | 99.2 (4.6) | 100 | 0 (0) | 0 | 86.7 (34.6) | 100 | 100 | 100 | 66.7 | 66.7 |
| 6 | 9.4 (6.3) | 8 | 145 (141) | 97.5 | 100.0 (0) | 100 | 0 (0) | 0 | 93.3 (25.4) | 100 | 100 | 100 | 33.3 | 33.3 |
| 7 | 4.6 (1.9) | 5 | 70 (88) | 44.0 | 100.0 (0) | 100 | 0 (0) | 0 | 70.0 (46.6) | 100 | 100 | 100 | 58.3 | 58.3 |
| 8 | 6.0 (3.2) | 5 | 95 (126) | 65.5 | 100.0 (0) | 100 | 0 (0) | 0 | 90.0 (30.5) | 100 | 100 | 100 | 58.3 | 58.3 |
| 9 | 5.0 (2.8) | 5 | 75 (49) | 63.5 | 100.0 (0) | 100 | 0 (0) | 0 | 70.0 (46.6) | 100 | 0 | 0 | 50.0 | 50.0 |
| 10 | 12.6 (10.8) | 10 | 58 (43) | 50.0 | 98.9 (6.1) | 100 | 0 (0) | 0 | 53.3 (50.7) | 100 | 100 | 100 | 75.0 | 75.0 |
| (ANOVA) | *P* < 0.001 | | *P* = 0.032 | | *P* = 0.731 | | *P* < 0.001 | | *P* < 0.001 | | *P* = 0.689 | | *P* = 0.855 | |

*WHO/INRUD = World Health Organization/International Network of Rational Use of Drugs; SD = standard deviation; EDL = essential drugs list; ANOVA = analysis of variance.*

**Table 2 Index of rational patient care and facility-specific drug use (IRPCDU) in the 10 selected primary health care centres of Eastern province, Saudi Arabia, 2011**

| Health centre | Patient care indicators | | | | | | Facility indicators | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consultation time index[a] | Dispensing time index[a] | Dispensing drugs index[a] | Labelled drugs index[a] | Patients' knowledge index[a] | IRPCDU[b] | Index of EDL[a] | Index of key drugs in stock[a] | IRFSDU[c] |
| 1 | 0.17 | 1 | 0.99 | 0 | 0.90 | 3.06 | 1 | 0.58 | 1.58 |
| 2 | 0.31 | 1 | 1 | 0 | 0.70 | 3.01 | 1 | 0.58 | 1.58 |
| 3 | 0.23 | 1 | 0.99 | 0 | 0.87 | 3.09 | 1 | 0.58 | 1.58 |
| 4 | 0.25 | 1 | 1 | 1 | 0.83 | 4.08 | 1 | 0.75 | 1.75 |
| 5 | 0.20 | 1 | 0.99 | 0 | 0.87 | 3.06 | 1 | 0.67 | 1.67 |
| 6 | 0.31 | 1 | 1 | 0 | 0.93 | 3.24 | 1 | 0.33 | 1.33 |
| 7 | 0.15 | 1 | 1 | 0 | 0.70 | 2.85 | 1 | 0.58 | 1.58 |
| 8 | 0.20 | 1 | 1 | 0 | 0.90 | 3.10 | 1 | 0.58 | 1.58 |
| 9 | 0.17 | 1 | 1 | 0 | 0.70 | 2.87 | 0 | 0.50 | 0.50 |
| 10 | 0.42 | 0.97 | 0.99 | 0 | 0.53 | 2.91 | 1 | 0.75 | 1.75 |

*[a]Optimal index = 1; [b]Maximum IRDP = 5; [c]Maximum IRDP = 2.*
*EDL = essential drugs list.*

## Discussion

### Patient care indicators

Irrational use of drugs occurs in all countries and causes harm to people [11]. The results of the present study demonstrated that the average consultation time was short, at 7.3 min. The difference between PHCCs regarding average consultation time was significant. The average consultation times reported from other developing countries are even lower, ranging from 2.8–7 min [12–15]. In a study conducted in 21 PHCCs of Jordan, it was 3.9 min [16] and in Kuwait it was 2.8 min [17]. These times and ours are well below the optimal consultation time of ≥ 30 minutes recommended for conducting proper history-taking, complete physical examination, appropriate health education instructions and prescribing therapy. The short times reported at PHCCs in this study could be due to a high workload of patients per physician and this requires further investigation.

The average dispensing time reported in this study (99.6 s) was longer than the optimal dispensing time of ≥ 60 s. There was a wide range of average dispensing times from 58–180 s and the difference between PHCCs was significant. This average time was also longer than that reported in studies conducted at PHC facilities in Jordan (28.8 s) [16] and in Kuwait (54.6 s) [17]. A dispensing time < 60 s is insufficient by WHO criteria to explain the dosage regimen, adverse effects of drugs, all precautions and actually label and dispense a drug. Patient compliance directly depends on his/her knowledge about the drug [2] and therefore an adequate dispensing time is a necessary step towards improving patient care. The long dispensing time at this study can be attributed to the fact that most dispensary personnel checked the prescriptions against patient's complaints before dispensing drugs and in suspected cases they rechecked with the physician regarding the drug type and its dose.

The percentage of prescribed drugs actually dispensed was high (99.6%), close to the optimal value of 100%. This value is approximately similar to that in Kuwait 97.9% [17]. An inadequate drug supply has implications for patients' health status, is inconvenient for patients and jeopardizes their trust in the health system [2].

WHO recommends that each drug label should contain the dose regimen, patient name and drug dose [8]. In this study, drug labelling practice (2 out of 3 items) was very poor, only 10%, compared with an optimal value of 100%. The percentage of drugs labelled ranged from 0% to 100% across the 10 PHCCs and there was a statistically significant difference between them. This can be attributed to the lack of a labelling system where dispensary personnel only write the frequency of administration of each drug on the pillbox or medicines bag. Only PHCC number 4 practised good labelling. The poor labelling reported in this study is comparable with the results of the study in Kuwait where 66.9% were adequately labelled. [17].

Patient's knowledge of the correct dosage was low (79.3%) compared with the optimal value of 100%. The difference between health centres was not significant. This result was approximately similar to that of Jordan where the mean patient knowledge of prescribed drug dose was 77.7% [16]. However, it was comparable to that conducted in Kuwait where only 26.9% of patients demonstrated adequate knowledge of all drugs dispensed for them [17]. Patient's knowledge of the correct dosage is highly beneficial to avoid drug

overuse and abuse and prevent adverse effects that harm patients' health status.

PHCC number 4 had the highest IRPCDU for patient care indicators, so could be considered as benchmarking for the remaining centres.

### Facility indicators

The results for the facility indicators showed that only 1 PHCC had no EDL/formulary available, and therefore the average availability over the 10 centres was 90%. In Yemen, a study reported that the EDL was only available in 78.9% of health facilities at different levels [6]. However, in Gaza Strip a copy of the EDL was only available in 28.3% of clinics [18]. WHO recommends adherence of physicians to the drug listed in the EDL/formulary when prescribing medications in order to ensure effective health care for all [9].

The mean percentage of key drugs in stock was very low (59.2%) compared with the optimal value of 100%. However, it was lower than that in Gaza Strip, where the availability of key drugs was 82.6% [18]. A shortage of supplies of essential drugs that treat common health problems is harmful to the health status of patients [10].

PHCCs numbers 4 and 10 jointly had the highest IRFSDU for facility indicators and can be considered as benchmarking for the remaining centres.

## Conclusion and Recommendations

This study measured the performance of PHCCs in Eastern province of Saudi Arabia using the WHO/INRUD patient care and facility-specific drug use indicators. Concerning patient care indicators, the results were far from the optimal values, especially for average consultation time, drug labelling and patients' knowledge of correct dose. With regards to facility-specific indicators the results were especially disappointing for the proportion of key drugs in stock.

We recommend that consultation times need to be longer and reasons for the short times need to be investigated. Drug labelling systems need to be improved to include drug regimen, patient name and drug dose, and the availability of key drugs in the PHCCs' stocks needs to be improved. Consideration should be given to using the highest ranked health centres as benchmarks for other PHCCs in the region.

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# WHO/INRUD drug prescribing indicators at primary health care centres in Eastern province, Saudi Arabia

*A.A. El Mahalli*[1]

**مؤشرات وصف الأدوية للشبكة الدولية للاستخدام الرشيد للأدوية/ منظمة الصحة العالمية في مراكز الرعاية الصحية الأولية في المنطقة الشرقية، في المملكة العربية السعودية**

عَزَّة علي الـمَحَلي

**الخلاصـة:** يُعدُّ الاستخدام الرشيد للأدوية عنصراً أساسياً في تحقيق الإتاحة الشاملة للرعاية الصحية الجيِّدة، وتهدف هذه الدراسة إلى قياس أداء مراكز الرعاية الصحية في المنطقة الشرقية من المملكة العربية السعودية، باستخدام مؤشرات الشبكة الدولية للاستخدام الرشيد للأدوية/ منظمة الصحة العالمية الخاصة باستخدام الأدوية من أجل رعاية المرضى وفي المرافق الصحية. وقد أجرت الباحثة دراسة مستعرضة شملت عشر مراكز صحية تم اختيارها بالاعتيان المنهجي العشوائي. وقامت الباحثة بإجراء استقصاء لألف مقابلة لتوصيف الأدوية خلال الفترة من كانون الثاني/ يناير إلى كانون الأول/ ديسمبر 2010، وكانت القِيَم التي حصلت عليها كما يلي: عدد الأدوية في كل مقابلة 2.4 (الأفضل 3)، وعدد الأدوية التي وصفت بأسمائها الـجَنِيسَة 61.2٪ (الأفضل 100٪)، وعدد المقابلات التي انتهت بوصف المضادات الحيوية 32.2٪ (الأفضل 30٪)، وعدد المقابلات التي انتهت بوصف الحقن 2٪ (الأفضل 10٪)، وعدد الأدوية التي وصفت من القائمة الوطنية للأدوية الأساسية أو كتيب الوصفات في المرفق الصحي 99.2٪ (الأفضل 100٪). ثم قامت الباحثة بحساب المشعر الإجمالي للوصف الرشيد للأدوية على الصعيد الوطني وطبقته على طائفة من المرافق الصحية من أجل وضع نقاط فَيْصليَّة محددة.

ABSTRACT Appropriate use of drugs is an essential element in achieving quality of health and medical care for patients and the community as a whole. This study aimed to measure the drug prescribing performance of primary health care centres in Eastern province, Saudi Arabia, using the WHO/International Network of Rational Use of Drugs core drug prescribing indicators. In a retrospective cohort study 10 health centres were selected using systematic random sampling. A total of 1000 prescribing encounters were investigated from January to December 2010. Mean values were: number of drugs per encounter 2.4 (optimal ≤ 3), drugs prescribed by generic name 61.2% (optimal 100%), encounters with antibiotic prescribed 32.2% (optimal ≤ 30%), encounters with injection prescribed 2% (optimal ≤ 10%) and drugs prescribed from the national essential drugs list or facility formulary 99.2% (optimal 100%). An overall index of rational drug prescribing was calculated and applied to rank the health centres for benchmarking.

**Indicateurs OMS/INRUD pour la prescription médicamenteuse dans des centres de soins de santé primaires de la province orientale de l'Arabie saoudite**

RÉSUMÉ Une utilisation appropriée des médicaments est un élément essentiel pour atteindre une qualité des soins médicaux pour les patients et la communauté dans son ensemble. La présente étude visait à mesurer les pratiques de prescription médicamenteuse des centres de soins de santé primaires dans la province orientale de l'Arabie saoudite, à l'aide des indicateurs fondamentaux de prescription médicamenteuse mis au point par l'Organisation mondiale de la Santé et le Réseau international pour l'usage rationnel des médicaments (INRUD). Dans une étude de cohorte rétrospective, dix centres de soins de santé ont été sélectionnés par échantillonnage aléatoire systématique. Au total, 1000 consultations ayant donné lieu à des prescriptions entre janvier et décembre 2010 ont été examinées. Les valeurs moyennes étaient les suivantes : nombre de médicaments prescrits par consultation 2,4 (valeur optimale inférieure ou égale à 3), médicaments prescrits par nom générique 61,2 % (valeur optimale 100 %), consultations ayant donné lieu à la prescription d'antibiotiques 32,2 % (valeur optimale inférieure ou égale à 30 %), consultations ayant donné lieu à la prescription d'une injection 2 % (valeur optimale inférieure ou égale à 10 %) et prescriptions médicamenteuses à partir de la liste nationale des médicaments essentiels ou de la liste des médicaments utilisés par l'établissement 99,2 % (valeur optimale 100 %). Un indice global de prescription rationnelle des médicaments a été calculé puis appliqué pour le classement des centres de soins de santé à des fins de comparaison.

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Received: 08/07/11; accepted: 11/01/12

## Introduction

Appropriate use of drugs is an essential element in achieving quality of health and medical care for patients and the community as a whole [1]. The World Health Organization (WHO) defined rational use of drugs as patients receiving medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community [2–5]. Irrational use of medicines includes the use of too many medicines (polypharmacy); use of antibiotics for non-bacterial infections; inadequate dosages of antibiotics; use of injections when oral medication is more appropriate; prescribing medicines that contravene clinical guidelines; and patient self-medication [1].The irrational use of medicines is a serious problem worldwide [2,6–8]. It can result in adverse drug reactions, increased morbidity and mortality rates, wasted resources and higher out-of-pocket costs to patients. Inappropriate and over-use of antibiotics is a risk for development of antibiotic resistant strains of bacteria [7] and bloodborne infections such as hepatitis and HIV/AIDS can be transmitted by non-sterile injections.

WHO and the International Network of Rational Use of Drugs (INRUD) have developed a set of drug prescribing indicators to be used as measures of prescribing performance in primary care [1]. To the authors' knowledge, at the time of this study, few studies had been performed in primary care in Saudi Arabia measuring prescribing patterns [9,10]. Measured values could be used as benchmarking among health care facilities and as a baseline for ongoing monitoring of the quality of drug prescribing. In an accompanying paper we reported on patient care and facility-specific drug use indicators in 10 primary health care centres (PHCCs) in Eastern province of Saudi Arabia [11]. The objectives of the current study were to use the WHO/INRUD prescribing indicators to assess rational drug prescribing in the same PHCCs. These would be used to identify whether a facility was exceeding or under-performing these defined norms of practice and to obtain baseline information for continuous monitoring.

## Methods

### Study design and setting

This was a retrospective, cohort study carried out in 10 PHCCs from the Eastern province, selected based on systematic random sampling to represent the 13 districts of the province.

### Sample

The sample was the medical records of patients attending the PHCCs and the prescription forms written for the period January to December 2010. A sample of 100 prescribing encounters was selected from each PHCC. Encounters were spread at regular intervals throughout the year using systematic random sampling to minimize bias due to seasonal variations or interruptions of drug supply cycle. Therefore a total of 1000 prescribing encounters were analysed.

### Data collection

Formal approval from the Ministry of Health in Saudi Arabia was taken before conducting the research. Confidentiality of the data collected from medical records was maintained throughout.

A standard prescribing indicators form was used to collect the required variables [1]. Data collectors at all PHCCs followed the WHO guidelines and methods to ensure reliability of data collection. A pilot study was conducted in which 50 prescriptions from 2 different centres were reviewed to ensure the availability of the required data, to estimate the time required to collect the variables and to edit the data collection tool as needed. The following WHO/INRUD prescribing indicators were used in this study and were calculated using standard methods [1]:

- Average number of drugs prescribed per encounter (whether the patient actually received the drugs or not). Optimal level: ≤ 3.
- Percentage of drugs prescribed by generic name. Optimal level: 100%.
- Percentage of patient encounters with an antibiotic prescribed. Optimal level: ≤ 30%.
- Percentage of patient encounters with an injection prescribed. Optimal level: ≤ 10%.
- Percentage of drugs prescribed from the national EDL or the facility's formulary. Optimal level: 100%.

### Data analysis

To assess rational drug prescribing performance, we used an index system based on the mathematical model developed by Zhang and Zhi for comprehensive appraisal of medical care. The index system has been validated for use in medical and health research [12]. Indices were calculated for each prescribing indicator by dividing the optimal values by the actual values obtained. All the indicators had the same optimal index of 1: the closer to 1, the more rational a drug use indicator. Then a total index of rational drug prescribing (IRDP) was calculated for each health centre by adding the indices, using the method of Dong et al. [13]. This enabled them to be ranked in order to identify the PHCC with the highest score to be used for benchmarking.

Data entry and analysis were conducted using *SPSS*, version 19. Descriptive statistics were used in the form of mean, median, and standard deviation (SD). Differences between PHCCs regarding prescribing indicators were tested using analysis of variance (ANOVA). The statistical significance was determined by a $P$-value < 0.05.

## Results

The average number of drugs per encounter ranged from 2.0–2.9 across the different PHCCs, with a mean of 2.4 (SD 1.2) for the 10 PHCCs (Table 1).

The percentage of drugs prescribed by generic name varied widely across the PHCCs, from 6.0%–99.9% (Table 1), with a mean of 61.2% (SD 45.6%). The percentage of encounters with an antibiotic prescribed ranged from 23.0%–41.0%, with a mean of 32.2% (SD 46.7%), while the rate of injection prescribing covered a smaller range (0%–5.0%) and the mean was only 2.0% (SD 14.0%) (Table 1).

The percentage of drugs prescribed from the EDL or formulary ranged from 96.8%–100%, with a mean of 99.2% (SD 7.6%) (Table 1).

The difference between the PHCCs was statistically significant for the average number of drugs/encounter, percentage of drugs prescribed by generic name and percentage of drugs prescribed from the EDL or formulary (Table 1).

Among the PHCCs, centre number 10 was ranked the highest for IRDP, meeting the index level in all cases (Table 2).

## Discussion

Irrational use of drugs occurs in all countries and causes harm to people [2,14]. The results of the present study revealed that the average number of drugs prescribed per encounter was 2.4 and that there were statistically significant differences among the 10 PHCCs (averages ranging from 2.0–2.9). Although this value was within the acceptable limit proposed in this study (≤ 3 drugs prescribed per patient encounter) and none of the PHCCs were above the cutoff value, data from some other developing countries reported a lower average number of

**Table 1 WHO/INRUD prescribing indicators in the 10 selected primary health care centres of Eastern province, Saudi Arabia, 2010**

| Health centre | Average no. drugs/encounter Optimal: ≤ 3 | | % drugs by generic name Optimal: 100% | | % encounters with antibiotic Optimal: ≤ 30% | | % encounters with injection Optimal: ≤ 10% | | % drugs from EDL/ formulary Optimal: 100% | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median | Mean (SD) | Median |
| All | 2.4 (1.2) | 2 | 61.2 (45.6) | 100 | 32.2 (46.7) | 0 | 2.0 (14) | 0 | 99.2 (7.6) | 100 |
| 1 | 2.3 (1.6) | 2 | 58.8 (42.7) | 66.7 | 37.0 (48.5) | 0 | 2.0 (14.1) | 0 | 96.8 (15.8) | 100 |
| 2 | 2.1 (0.7) | 2 | 18.3 (37.1) | 0 | 30.0 (46.1) | 0 | 5.0 (21.9) | 0 | 96.9 (15.3) | 100 |
| 3 | 2.9 (1.0) | 3 | 35.9 (42.0) | 0 | 30.0 (46.1) | 0 | 3.0 (17.1) | 0 | 100.0 (0.0) | 100 |
| 4 | 2.9 (1.3) | 2 | 87.5 (24.8) | 100 | 34.0 (47.6) | 0 | 1.0 (10.0) | 0 | 100.0 (0.0) | 100 |
| 5 | 2.5 (1.7) | 2 | 99.5 (5.0) | 100 | 34.0 (47.6) | 0 | 0.0 (0.0) | 0 | 100.0 (0.0) | 100 |
| 6 | 2.4 (1.2) | 2 | 91.1 (17.8) | 100 | 24.0 (42.9) | 0 | 3.0 (17.1) | 0 | 100.0 (0.0) | 100 |
| 7 | 2.4 (1.0) | 2 | 6.0 (16.4) | 0 | 41.0 (49.4) | 0 | 2.0 (14.1) | 0 | 98.3 (9.0) | 100 |
| 8 | 2.2 (1.4) | 2 | 37.3 (48.4) | 0 | 33.0 (47.3) | 0 | 1.0 (10.0) | 0 | 100.0 (0.0) | 100 |
| 9 | 2.0 (0.9) | 2 | 77.8 (38.0) | 100 | 36.0 (48.2) | 0 | 0.0 (0.0) | 0 | 100.0 (0.0) | 100 |
| 10 | 2.5 (1.2) | 2.5 | 99.9 (1.4) | 100 | 23.0 (42.3) | 0 | 3.0 (17.1) | 0 | 100.0 (0.0) | 100 |
| (ANOVA) | $P < 0.001$ | | $P < 0.001$ | | $P = 0.163$ | | $P = 0.261$ | | $P < 0.001$ | |

*WHO/INRUD = World Health Organization/International Network of Rational Use of Drugs; EDL = essential drugs list; SD = standard deviation. ANOVA = analysis of variance.*

**Table 2 Index of rational drug prescribing (IRDP) in the 10 selected primary health care centres of Eastern province, Saudi Arabia, 2010**

| Health centre | Index[a] | | | | | IRDP[b] |
|---|---|---|---|---|---|---|
| | Polypharmacy | Generic name prescribing | Antibiotic prescribing | Safe injection prescribing | EDL prescribing | |
| 1 | 1 | 0.59 | 0.81 | 1 | 0.97 | 4.37 |
| 2 | 1 | 0.18 | 1 | 1 | 0.97 | 4.15 |
| 3 | 1 | 0.36 | 1 | 1 | 1 | 4.36 |
| 4 | 1 | 0.88 | 0.88 | 1 | 1 | 4.76 |
| 5 | 1 | 1 | 0.88 | 1 | 1 | 4.88 |
| 6 | 1 | 0.91 | 1 | 1 | 1 | 4.91 |
| 7 | 1 | 0.06 | 0.73 | 1 | 0.98 | 3.77 |
| 8 | 1 | 0.37 | 0.90 | 1 | 1 | 4.27 |
| 9 | 1 | 0.78 | 0.83 | 1 | 1 | 4.61 |
| 10 | 1 | 1 | 1 | 1 | 1 | 5.00 |

*[a]Optimal index = 1; [b]Maximum IRDP = 5.*
*EDL = essential drugs list.*

drugs per encounter, ranging from 1.3–2.2 [15–18]. In a study conducted in Gaza Strip, the mean number of drugs per prescription was 1.92 [19]. However, in a study carried out in 50 PHCCs across 5 governorates of Kuwait, the mean number of drugs prescribed per prescription was 2.9 [20] and in 4 PHCCs of Bahrain, the average number of drugs per encounter was 2.6 [21]. Rational prescribing is advocated to avoid wastage of medicines and to avoid possible adverse effects to patients. Moreover, prescribing unnecessary medications to patients has cost implications for national health systems.

WHO highly recommends prescribing medications by generic name as a safety precaution for patients because it identifies the drug clearly, enables better information exchange and allows better communication between health care providers [22]. The mean percentage of drugs prescribed by generic name was low (61.2%) compared with the optimal value (100%). The difference between PHCCs was statistically significant. This low rate of prescribing by generic name might be due to the high number of expatriate physicians in Eastern province with background experience with different brand-name drugs. This makes information exchange and communication between health care providers more difficult. In other developing countries the rate of generic prescribing was above 59% [13–16]. However, in PHCC in Gaza Strip, it was only 5.5% [19] and in Bahrain, the rate of generic prescribing was 14.3% [21].

The percentage of encounters with an antibiotic prescribed was 32.2%, slightly higher than the optimal value proposed (≤ 30%). However, it is difficult to judge whether antibiotics were inappropriately prescribed as this was not part of the study design. In other developing countries, the rate of antibiotic prescribing ranged from 29%–43% [15–18] and in 50 PHCCs across 5 governorates of Kuwait, 39.1% of prescriptions involved an antibiotic [20]. A study conducted in Egypt comparing the effect of adopting the Integrated Management of Childhood Illness programme on children under 5 years reported that the average percentage of antibiotics prescribed was 45.3% [23]. The overuse and misuse of antibiotics is threatening the health of populations worldwide [24–27]. Irrational prescribing of antibiotics can lead to adverse reactions and hospital admission for individuals [24] and on a population level there is a risk of emergence of antibiotic-resistant strains of bacteria [27].

Injections were prescribed in 2.0% of encounters on average, which was well within the acceptable limit proposed (≤ 10%). The rate of prescribing injections was considerably lower than in Kuwait (9.1%) [20] and Bahrain (8.3%) [21]. Use of injections when oral formulations are more appropriate is an irrational use of medicines because the cost of injections is always higher than that of oral therapy. Moreover, it increases the risk of bloodborne diseases such as hepatitis and HIV/AIDS being transmitted through the use of non-sterile injections [2].

The mean percentage of drugs prescribed from the national EDL or facility formulary was 99.2%, and the difference between PHCCs was significant. This is similar to studies in Bahrain (99.8%) [21] and Gaza Strip (97.9%) [19]. Generally in other developing countries values higher than 80% have been reported [15–18]. It is expected that 100% of drugs will be prescribed from the EDL or formulary. Prescribing drugs from the EDL issued by WHO provides a framework for rational prescribing; drugs on the list are well-established drugs, already tested in practice, with established clinical use and lower cost than newer drugs [28].

PHCC number 10 had the highest IRDP and ranked 1st among the sampled PHCCs. This centre should be considered as benchmarking for the remaining centres in Eastern province.

The study was limited in that it was not designed to reveal the reasons leading to irrational prescribing of drugs. Future studies are required to investigate these factors. Nevertheless the study had a number of strengths. It was the first study to be conducted in the Eastern province of Saudi Arabia measuring drug prescribing performance at PHCCs. Also data were collected from 10 PHCCs representing the 13 districts of Eastern province and the sample size, 1000 prescriptions, was large. Use of WHO/INRUD core drug prescribing indicators adds strength to the study. Finally, developing the IRDP to measure the degree of rational/irrational drug use would be beneficial for future studies.

## Conclusion and Recommendations

This study measured the drug prescribing performance of PHCCs in Eastern province of Saudi Arabia using the WHO/INRUD core drug prescribing indicators. The results showed that the average number of drugs prescribed per encounter and the percentage of encounters with injections prescribed were within the optimal values proposed in this study. However, the percentage of drugs prescribed by generic name was far from the optimal value. Also, the percentage of encounters with antibiotics prescribed was slightly higher than the optimal and the percentage of drugs prescribed from the EDL or formulary was less than optimal. We recommend that physicians working at PHCCs need continuous education about rational prescribing of antibiotics and motivation to prescribe drugs by generic name and from the EDL/formulary list. Future studies are needed to investigate the reasons behind the irrational use of drugs. Consideration should be given to using the highest ranked health centre as a benchmark for other PHCCs in the region.

## Acknowledgements

This project could not have been realized without the support of the data collectors.

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# Epidemiological profile of invasive bacterial diseases in children in Casablanca, Morocco: antimicrobial susceptibilities and serotype distribution

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**المرتسم الوبائي للأمراض الجرثومية الغَزَوِيَّة لدى الأطفال في الدار البيضاء، المغرب: الاستجابة للمضادات الحيوية وتوزُّع الأنماط المصلية**

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**الخلاصة:** كان هدف هذه الدراسة التي أجريت في المغرب هو استقصاء أسباب الأمراض الجرثومية الغزوية (التي تغزو الجسم) لدى الأطفال من أجل توفير المعلومات اللازمة لاتّخاذ اختيارات المعالجة بالمضادات الحيوية وباللقاحات. وقد شملت الدراسة 238 طفلاً تقل أعمارهم عن خمس سنوات أدخلوا مستشفى الأطفال في الدار البيضاء بسبب إصابتهم بأمراض غزوية خلال 12 شهراً، وقد شخص 185 منهم بإصابته بعدوى جرثومية، إذ كان لدى 76 منهم التهاب رئوي مؤكّد بالصورة الشعاعية للصدر، ولدى 59 منهم التهاب سحايا، ولدى 50 منهم إنتان. وكان أكثر العوامل المسببة للعدوى التي تم كشفها هو العقديات الرئوية (لدى 24 مريضاً)، يتلوها النيسيريات السحائية (لدى 18 مريضاً، كلُّها من الزمرة B المجموعة بي)، والمستدميات النـزلية (لدى 11 مريضاً). وكانت نسبة عدم الاستجابة للبنسيلين 62.5٪ بين مستفرَدات العقديات الرئوية، و11.1٪ بين مستفرَدات النيسيريات السحائية، وكان جميع المستفرَدات حسَّاسة للسفترياكسون. ومن بين 11 مستفرَدة من المستدميات النـزلية كانت مستفرَدة واحدة فقط منتجة للبيتا لاكتاماز. أما الأنماط المصلية الخمسة الغالبة من العقديات الرئوية فكانت 19A، 68، 23F، 14، 19F، وكانت التغطية النظرية للقاحات المقترنة السباعية التكافؤ 60٪، ولذات 10 تكافؤات 78٪، ولذات 13 تكافؤاً 91٪.

ABSTRACT The aim of this prospective study in Morocco was to investigate the causes of invasive bacterial diseases in children in order to inform antibiotic therapy and vaccine choices. Of 238 children aged ≤ 5 years admitted to the Children's Hospital of Casablanca for invasive diseases over a 12-month period, 185 were diagnosed with bacterial infection: 76 had chest-X-ray-confirmed pneumonia, 59 had meningitis and 50 had sepsis. *Streptococcus pneumoniae* was the most common pathogen identified (*n* = 24), followed by *Neisseria meningitidis* (*n* = 18, all group B) and *Haemophilus influenzae* (*n* = 11). The rate of penicillin non-susceptibility was 62.5% among *Str. pneumoniae* isolates and 11.1% among *N. meningitidis* and all isolates were ceftriaxone-susceptible. Of the 11 *H. influenzae* isolates, only 1 produced a beta-lactamase. The 5 predominant *Str. pneumoniae* serotypes were 19F, 14, 23F, 6B and 19A and the theoretical coverage of the 7, 10 and 13-valent pneumococcal conjugate vaccines was 60%, 78% and 91% respectively.

**Profil épidémiologique des maladies bactériennes invasives chez des enfants à Casablanca (Maroc) : sensibilités antimicrobiennes et distribution des sérotypes**

RÉSUMÉ La présente étude prospective menée au Maroc visait à rechercher les causes des maladies bactériennes invasives chez des enfants permettant d'orienter le choix des traitements antibiotiques et des vaccins. Sur 238 enfants âgés de 5 ans ou moins admis à l'Hôpital des enfants de Casablanca pour des maladies invasives sur une période de 12 mois, 185 ont reçu le diagnostic d'infection bactérienne : 76 souffraient de pneumonie confirmée par une radiographie des poumons, 59 étaient atteints d'une méningite et 50 de septicémie. *Streptococcus pneumoniae* était l'agent pathogène le plus fréquemment identifié (*n* = 24), suivi par *Neisseria meningitidis* (*n* = 18, ensemble du groupe B) puis par *Haemophilus influenzae* (*n* = 11). Le taux de non-sensibilité à la pénicilline était de 62,5 % pour les isolats de *Str. pneumoniae* et de 11,1 % pour les isolats de *N. meningitidis* alors que tous les isolats étaient sensibles à la ceftriaxone. Sur les 11 isolats d'*H. influenzae*, un seul produisait une bêta-lactamase. Les cinq sérotypes prédominants de *Str. pneumoniae* étaient 19F, 14, 23F, 6B et 19A et la couverture théorique des vaccins antipneumococciques conjugués à 7, 10 et 13 valences était de 60 %, 78 % et 91 % respectivement.

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Received: 08/07/11; accepted: 11/01/12

## Introduction

*Streptococcus pneumoniae, Haemophilus influenzae* and *Neisseria meningitidis* infections are important cause of morbidity and mortality in children worldwide [1]. Strategies for prevention of the diseases and the deaths and the complications that they cause include good case management with appropriate antibiotic therapy and immunization against the predominant serotypes. Given the regular increase of antibiotic resistance to *Str. pneumoniae* over the last 3 decades, with marked geographic variations [2], it is important to have current, local data on the pattern of drug resistance in order to formulate appropriate recommendations for therapy. Furthermore, given the geographical and temporal variation of serotype distribution of *N. meningitidis* and *Str. pneumoniae*, reliable epidemiological data are required to support evidence-based decision-making for the introduction of new vaccines to national immunization programmes.

To address this need, the World Health Organization (WHO) has developed a global framework for immunization monitoring and surveillance which outlines the need for surveillance of the vaccine-preventable diseases [3]. The WHO Regional Office for the Eastern Mediterranean (EMRO) coordinates the Vaccine-Preventable Invasive Bacterial Diseases Surveillance Network, which is based on sentinel surveillance and is still ongoing, to help provide data that would inform vaccine introduction decisions [4,5]. The Ibn Rochd University Hospital Centre at the Children's Hospital of Casablanca participated as the only sentinel site in Morocco for meningitis, pneumonia and sepsis surveillance, in order to generate supplementary data on the epidemiological profile of causative pathogens of invasive bacterial diseases among hospitalized children aged under 5 years. In this study we report on the results of this 1-year laboratory-based surveillance.

## Methods

The study was conducted between September 2007 and August 2008 at the Ibn Roch Centre University Hospital in Casablanca, Morocco. All children aged ≤ 5 years hospitalized in the Children's Hospital who met the WHO criteria of case definition of meningitis, chest-X-ray-(CXR)-confirmed pneumonia or sepsis [6] were included . Blood, cerebrospinal fluid (CSF) and pleural fluid, if indicated, were collected as part of the routine clinical practice of patient care according to standardized operating procedures, and were processed in the microbiology laboratory following standard bacteriological methods [7].

For all CSF samples, appearance, white blood cells count, Gram stain, culture on supplemented chocolate agar and Mueller–Hinton agar plus 5% sheep blood (MHS kit, bioMérieux) and latex agglutination test (Slidex meningite kit 5, bioMérieux) were performed. Blood cultures were incubated and monitored in the BACTEC 9000 automated system (Becton Dickinson). The primary organisms of interest were identified by recommended techniques: morphology on Gram stain, alpha haemolysis, optochin and bile solubility tests for *Str. pneumoniae*, oxidase and carbohydrate utilization test (API NH, bioMérieux) for *N. meningitidis* and X & V factor test for *H. influenzae*.

Antibiotic susceptibility testing was done following Clinical Laboratory Standard Institute (CLSI) guidelines [8] on Mueller–Hinton agar supplemented with 5% sheep blood (bioMérieux) for *Str. pneumoniae* and *N. meningitidis* and on haemophilus test medium (Oxoid) for *H. influenzae*. Resistance of strains to erythromycin, chloramphenicol, trimethoprim/sulfamethoxazole and rifampicin were tested by the disk diffusion method (BioRad). Minimal inhibitory concentrations (MIC) for penicillin G, amoxicillin/ampicillin and ceftriaxone were determined by E-tests (AB Biodisk). *H. influenzae* beta-lactamase detection was performed with nitrocefin-impregnated disks (Cefinase, Becton-Dickinson).

Routine internal quality control was performed by testing the American Type Culture Collection (ATCC) strains of *Str. pneumoniae* (ATCC 49619), *Escherichia coli* (ATCC 25922) and *H. influenzae* (ATCC 49247). The cutoffs used for interpretation were those recommended by the CLSI in 2005.

Serotyping of *H. influenzae* and *N. meningitidis* were performed by latex agglutination (Slidex meningitis kit, bioMérieux). *Str. pneumoniae* isolates were serotyped by latex agglutination and capsular swelling procedure (Quellung reaction) with latex and type specific antipneumococcal pool, group or type and factor sera (Staten Serum Institute).

### Data analysis

The data were entered into a Microsoft *Access* database developed by the data management coordinator of Vaccine Preventable Diseases and Immunization (VPI) at WHO-EMRO and then analysed by *Epi Info*, version 6.02.

## Results

From September 2007 to August 2008, 238 children aged ≤ 5 years with clinical symptoms of invasive diseases were hospitalized at the Children's Hospital. Of them 185 were diagnosed with bacterial invasive infection, tuberculosis excluded: 76 with CXR-confirmed pneumonia, 59 with meningitis and 50 with sepsis, according to WHO case definitions.

### Causative organisms

The main causative organisms identified were *Str. pneumoniae* ($n$ = 24), *N. meningitidis* ($n$ = 18) and *H. influenzae* ($n$ = 11). In 31 out of the 59 (52.5%) cases of meningitis, CSF and/or blood

**Table 1 Etiological agents of 185 paediatric invasive bacterial infections according to diagnosis, age and specimen sources in Casablanca, Morocco**

| Diagnosis | Total | At least 1 specimen positive | | Age groups (years) | | | Specimen source | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0–1 | 1–2 | 2–5 | CSF | Blood | Pleural fluid |
| | No. | No. | % | No. | No. | No. | No. | No. | No. |
| ***All probable/definite meningitis*** | 59 | 31 | 52.5 | 29 | 10 | 20 | 29 | 16 | – |
| *Streptococcus pneumoniae* | 11 | 11 | | 10 | 1 | 0 | 10 | 7 | – |
| *Neisseria meningitidis*[a] | 14 | 14 | | 3 | 3 | 8 | 13 | 4 | – |
| *Haemophilus influenzae* type B | 6 | 6 | | 3 | 2 | 1 | 6 | 5 | – |
| ***CXR-confirmed pneumonia*** | 76 | 11 | 14.5 | 23 | 24 | 29 | – | 10 | 3 |
| *Str. pneumoniae* | 8 | 8 | | 5 | 2 | 1 | – | 7 | 2 |
| *H. influenzae* | 2 | 2 | | 2 | 0 | 0 | – | 2 | 0 |
| *Staphylococcus aureus* | 1 | 1 | | 1 | 0 | 0 | – | 1 | 1 |
| ***Septicaemia/sepsis*** | 50 | 18 | 36.0 | 26 | 15 | 9 | 0 | 18 | 0 |
| *Str. pneumoniae* | 5 | 5 | | 2 | 3 | 0 | 0 | 5 | 0 |
| *N. meningitidis*[a] | 4 | 4 | | 1 | 3 | 0 | 0 | 4 | 0 |
| *H. influenzae* | 3 | 3 | | 1 | 2 | 0 | 0 | 3 | 0 |
| Other[b] | 6 | 6 | | 5 | 1 | 0 | 0 | 6 | 0 |
| ***Total identified organisms*** | 60 | 60 | 32.4 | 33 | 17 | 10 | 29 | 44 | 3 |

[a]*All group B;* [b]*Other = Escherichia coli (n = 3) , Streptococcus pyogenes (n = 1), Salmonella typhimurium (n = 1), Shigella flexneri (n = 1).*
*CXR = chest X-ray; CSF = cerebrospinal fluid.*

culture results confirmed the etiology (Table 1). *N. meningitidis* was the most frequently identified organism in meningitis (*n* = 14), followed by *Str. pneumoniae* (*n* = 11) and *H. influenzae* (*n* = 6). Of the 11 cases of pneumococcal meningitis, 10 (90.9%) occurred among children aged < 12 months. Laboratory results confirmed the etiology in 11 (14.5%) cases of CXR-confirmed pneumonia by blood and/or pleural fluid culture and in 18 (36%) cases of sepsis. During the study period 4 deaths occurred: 3 cases of meningitis (2 *Str. pneumoniae* and 1 *H. influenzae*) and 1 case of meningococcaemia.

## Antibiotic susceptibility

All the 24 *Str. pneumoniae* isolates were susceptible to ceftriaxone and 15 (62.5%) were penicillin non-susceptible with an MIC ≥ 2 μg/mL in 2 cases (Table 2). The rates of non-susceptibility to amoxicillin, erythromycin and trimethoprim–sulfamethoxazole were 4.2%, 16.6% and 33.3% respectively. All the 18 *N. meningitidis* isolates were susceptible to ampicillin, ceftriaxone, chloramphenicol and rifampicin, and 2 (11.1%) were penicillin non-susceptible (MICs = 0.12 and 0.25 μg/mL). Only 10/11 *H. influenzae* isolates were tested for antibiotic susceptibility (1 case was confirmed by latex agglutination on CSF). Of the 10 *H. influenzae* isolates tested, only 1 produced a beta-lactamase and was ampicillin non-susceptible (MIC = 4 mg/L).

## Serotyping

Among the 23 *Str. pneumoniae* isolates serotyped 9 different serotypes were recognized; serotype 19F (17.4%) was the most frequent, followed by serotypes 23F, 14, 6B and 19A (13.0% each). The other pneumococcal serotypes found were 1 (8.7%), 3, 5 and 18C (4.3% each) and 2 pneumococcal isolates (8.7%) were non-vaccine serotypes. Of the 23 *Str. pneumoniae* isolates serotyped, 14 (60.9%), 17 (73.9%) and 21 (91.3%) were included in the 7, 10 or 13-valent pneumococcal conjugate vaccine (PCV) respectively. All of the 18 *N. meningitidis* isolates belonged to group B. Of the 11 *H. influenzae* isolates 10 were of serotype B and 1 was non-capsulated.

# Discussion

During this 1-year study in Morocco *H. influenzae* was responsible for only 11 cases of invasive diseases among hospitalized children. In past years this bacteria was ranked first among the causative agents of invasive diseases in childhood with about 70 cases/year [9]. The results therefore suggest that in 2008, only a few months after the introduction of the *H. influenzae* type B (Hib) vaccine into the national programme of immunization, there may have been a change in the epidemiological profile of invasive infections in childhood, similar to what has occurred in several industrialized countries [10]. In our study *N. meningitidis* was the most common agent of bacterial meningitis in children (14/59, 23.7%), particularly those over 1 year old, while *Str. pneumoniae* ranked first in young infants during the first months of life (90.9% < 12 months). If we consider all invasive infections studied, *Str. pneumoniae* was the most common pathogen in childhood. This trend was observed in the 1990s in industrialized countries after the

**Table 2 Antibiotic resistance profiles of *Streptococcus pneumoniae, Neisseria meningitidis* and *Haemophilus influenzae* isolated from paediatric invasive diseases in Casablanca**

| Antibiotic | Non-susceptible isolates | | | | | |
|---|---|---|---|---|---|---|
| | *Str. pneumoniae* (*n* = 24) | | *N. meningitides* (*n* = 18) | | *H. influenzae* (*n* = 10) | |
| | No. | % | No. | % | No. | % |
| Beta lactamase +ve | – | – | – | – | 1 | 10.0 |
| Penicillin, 0.12 mg/L ≤ MIC ≤ 1 mg/L | 13 | 54.2 | 2 | 11.1 | – | – |
| Penicillin, MIC ≥ 2 mg/L | 2 | 8.3 | 0 | 0.0 | – | – |
| Amoxicillin, MIC ≥ 0.5 mg/L | 1 | 4.2 | 0 | 0.0 | – | – |
| Amoxicillin, MIC ≥ 2 mg/L | – | – | – | – | 1 | 10.0 |
| Ceftriaxone, MIC ≥ 0.5 mg/L | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Erythromycin | 4 | 16.6 | – | – | – | – |
| Chloramphenicol | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Trimethoprim–sulfamethoxazole | 8 | 33.3 | 13 | 72.2 | 1 | 10.0 |
| Rifampicin | – | – | 0 | 0.0 | 0 | 0.0 |

*Clinical Laboratory Standard Institute 2005 criteria [8].*
*MIC = minimum inhibitory concentration; – = not applicable (Str. pneumoniae) or not tested (N. meningitidis).*

introduction of the Hib vaccine, which resulted in a more than 98% decrease in the incidence of *H. influenzae* invasive disease [11] and the development of pneumococci as a cause of paediatric invasive diseases. Furthermore, in our study pneumococcal meningitis had a worse prognosis with a high case fatality rate (18.2%) and, despite the small size of the sample, the rate of penicillin non-susceptibility among paediatric invasive isolates was alarming (62.5%).

In Casablanca the surveillance of antibiotic resistance in *Str. pneumoniae* started in 1994 and showed a relatively favourable situation with about 10% of *Str. pneumoniae* penicillin-resistant [12]. Penicillin non-susceptibility rates increased significantly over the 4-year period 2006–08, particularly among paediatric isolates [13,14]. The rate of penicillin non-susceptibility observed in our study is comparable with that observed in the Mediterranean region [15,16]. Antibiotic resistance may be enhanced by the excessive availability or inappropriate use of antibiotics in these countries, especially due to self-treatment with readily available over-the-counter antibiotics. On the other hand, 16 (72.7%) of 23 *Str. pneumoniae* serotypes isolates belonged to 5 serotypes (19F, 23F, 14, 6B and 19A). This is the first time that a Moroccan study described the serotype distribution of *Str. pneumoniae* responsible for invasive infections in children ≤ 5 years and reported a major role for serotype 19A which ranked 2nd along with serotypes 6B, 14 and 23F (found in > 13% of the isolates). Thus the theoretical coverage of the 3 available PCV was 60.1% for the 7-valent, 78.3% for the 10-valent and 91.3% for the 13-valent. Comparable data have been reported in several industrialized countries in the years 2000, when the PCV-7 had just become available and was being introduced into vaccine schedules [17]. Its widespread used led to substantial reductions in the incidence of invasive pneumococcal disease by direct and herd effects, despite the serotype replacement reported [2].

Most of the penicillin non-susceptible isolates were identified among vaccine serotypes, suggesting that vaccine introduction might substantially reduce the developing of pneumococcal antibiotic resistance. In sub-Saharan Africa, where pneumococcal antibiotic resistance levels were relatively low, serotype coverage of PCV-7 was also relatively low [18]. In the East African region, the potential coverage of PCV-10 was estimated as ≥ 80% [17] and, in a recent Tunisian study, the calculated potential coverage of PCV-7 was 62.8% for paediatric invasive pneumococcal isolates [14].

There are large geographic and temporal variations in the epidemiologic profile of meningococcal diseases. This study confirms what was previously reported by Zerouali et al. [19]. In Morocco, serogroup B predominated in paediatric infections and the rate of penicillin decreased-susceptibility (MICs ≥ 0.06 μg/mL) was still low, in contrast to reports from in several countries of rates up to 38% [20–22]. Thus, since no broadly effective vaccine is available for diseases caused by serogroups B [23], no prevention programme based on vaccination can be adopted.

## Conclusions

The results of this study show that Morocco made the right choice with the implementation of new vaccines. However, efforts are still needed to control the increase in antibiotic resistance by adopting a policy for prudent antibiotic use. Continued surveillance is important to detect any changes and for the development of guidelines for therapy and prophylaxis.

## Acknowledgements

This study was supported by grants from the World Health Organization, Regional Office for the Eastern Mediterranean (projects TSA 07/20 and TSA 07/21).

We would like to thank Dr Nadia Teleb, Epidemiological Surveillance Officer and Mr Hossam El-Ashmony Data Management Coordinator, Vaccine Preventable Diseases and Immunization, WHO-EMRO.

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# Status and costs of smoking cessation in countries of the Eastern Mediterranean Region

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**أوضاع وتكاليف الإقلاع عن التدخين في بلدان إقليم شرق المتوسط**

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**الخلاصة:** تهدف هذه الدراسة المستعرضة إلى التعاطي مع أوضاع الرعاية الصحية التي تتعلق بجهود الإقلاع عن التدخين ونفقاته، من أجل وضع أساس للدراسات المستقبلية، ولتنفيذ برامج مكافحة التبغ في كامل إقليم شرق المتوسط في منظمة الصحة العالمية. وقد جمع الباحثون المعلومات التي تتضمن الطرق وتكاليف الخدمات للإقلاع عن التدخين من ستة عشر بلداً ساهم في الدراسة. ففي عشرة بلدان كانت برامج الإقلاع عن التدخين بإدارة أطباء رعاية أولية، وفي ثلاثة عشر بلداً، كانت علكة النيكوتين متاحة في الصيدليات، وفي أربعة عشر بلداً كانت لصقات النيكوتين متاحة في الصيدليات. وكان البوبروبيون متوافراً لدى الصيدليات (لقاء وصفة طبية مكتوبة) في ستة بلدان، كما كان الفارينيكلين متوافراً في سبعة بلدان. إلا أن التكلفة المتوسطة لكل خدمة كانت أعلى بمقدار يُعتدُّ به إحصائياً من سعر علبة السجائر. وفي البلدان التي تتوافر خدمات الدعم فيها للإقلاع عن التدخين، كان على مديري تلك البرامج تقديم الرعاية في مستوى المجتمع، مما يجعل التكاليف أقل والإتاحة أوسع.

ABSTRACT The aim of this cross-sectional observational study was to address the health care situation in regard to smoking cessation efforts and expenditure, and to provide a basis for future studies and for implementing tobacco control programmes throughout the Eastern Mediterranean Region of the World Health Organization. Information collected included methods and cost of services for tobacco cessation from all 16 participating countries. In 10 countries, cessation programmes were directed by primary physicians. In 13 countries, nicotine gum and in 14 countries nicotine patches were accessible in pharmacies. Bupropion was available at pharmacies (with a written prescription) in 6 countries and varenicline in 7 countries. However, the mean cost of each service was significantly higher than the price of a pack of cigarettes. In countries with support services for tobacco cessation, directors need to provide care at the society level that is considerably less costly and widely accessible.

**Situation et coûts du sevrage tabagique dans les pays de la Région de la Méditerranée orientale**

RÉSUMÉ La présente étude d'observation transversale visait à analyser la situation des soins de santé en termes d'efforts de sevrage tabagique et de dépenses dans ce domaine, et à fournir des données de référence pour les études ultérieures et pour la mise en œuvre de programmes de lutte antitabac dans l'ensemble de la Région de la Méditerranée orientale de l'Organisation mondiale de la Santé. Les informations recueillies portaient sur les méthodes et les coûts des services de sevrage tabagique dans les 16 pays participants. Dans dix pays, les programmes de sevrage tabagique étaient dirigés par des médecins de soins de santé primaires. Les gommes et les timbres à base de nicotine étaient disponibles en pharmacie dans 13 et 14 pays respectivement. Le Bupropion était disponible en pharmacie (sur ordonnance) dans six pays et la varénicline dans sept pays. Toutefois, le coût moyen de chaque service était significativement supérieur au prix d'un paquet de cigarettes. Dans les pays dotés de services d'aide au sevrage tabagique, les directeurs doivent fournir des soins au niveau de la société qui soient bien moins onéreux et largement accessibles.

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Received: 03/08/11; accepted: 04/10/11

## Introduction

Tobacco kills nearly 6 million people and causes hundreds of billions of dollars of economic damage worldwide each year [1]. More than 80% of the world's tobacco-related deaths will be in low and middle-income countries by 2030 [2].

Most smokers who are aware of the dangers of tobacco want to quit, but quitting without assistance is difficult because nicotine is highly addictive [1]. Unfortunately, for individuals who are addicted to any substance, quitting is difficult. Yet, support in quitting can substantially increase the likelihood of cessation and individuals can be aided to overcome their addiction.

Including tobacco cessation in primary health care as part of regular medical visits is a low-cost strategy that provides opportunity to increase awareness of tobacco harms and to encourage quitting. Repeated advice at each visit can emphasize the importance of tobacco cessation and increase the likelihood that patients will quit [2,3]. Additionally, counselling by health workers may increase quit rates [4]. Counselling by health workers other than physicians can be relatively inexpensive and can be made available to most individuals. These interventions presented by health professionals tend to have good credibility and to be accepted by tobacco consumers [5,6].

In addition to physician recommendations, effective treatment may also include medications. Available medications include nicotine replacement in the form of skin patches, lozenges, gum, nasal spray and prescription medications including bupropion, an antidepressant that helps by decreasing the craving, and varenicline, a medication which binds to nicotine receptors in the brain and prevents dopamine release, thus decreasing the pleasure of smoking [7]. These medications are frequently available at pharmacies with or without a prescription [4].

Medication is usually more costly than physician advice and phone counselling, but it can double or even triple success rates for quitting [8]. The cost for nicotine replacement can be less than the cost of the tobacco that would have been consumed during the same period of time. It was only over the 5 years from early 2000 onwards that New Zealand offered comprehensive cessation services; it is now one of the most advanced countries in the world in this respect [5].

Since countries in the World Health Organization (WHO) Eastern Mediterranean Region (EMR) including the Middle East and North Africa are mostly low- and middle-income countries, providing resources for tobacco cessation is challenging. This is especially unfortunate given the often high levels of cigarette consumption and aggressive promotion by tobacco companies. Under these circumstances the need for comprehensive tobacco cessation programmes at national and Regional levels becomes especially evident.

Up to now, there has been little information on comparative costs of smoking cessation and continuing smoking in low- and middle-income countries. The aim of this study was, therefore, to identify smoking cessation programmes and smoking status in the Region to provide the basis for future studies on tobacco cessation programmes in these countries.

## Methods

This cross-sectional observational study was planned following a meeting of a committee of the Intergovernmental Negotiating Body 3 (INB3) in July 2009 in Geneva, Switzerland. Representatives of all 16 participating countries in the EMR, all of whom were focal points or experts in tobacco control, were requested to respond to a questionnaire which collected data on the costs of smoking cessation services. The response rate was 100%.

Information was collected using a checklist which was developed by an expert group in the WHO-EMR collaborating centre on tobacco control. The checklist included items assessing methods for tobacco cessation and cost of services including counselling by primary physician or specialist, gum or nicotine patches, bupropion, varenicline, etc.

Other information collected included the price of cigarettes and accessibility of tobacco cessation programmes based on previously published country reports [9]. This information covered all 21 EMR countries studied.

The data were analysed using *SPSS*, version 9. Frequency and mean were determined as well as standard deviation (SD).

## Results

The information regarding the cost of smoking cessation programmes collected from 21 Eastern Mediterranean countries is shown in Table 1. In 10 countries tobacco cessation programmes and counselling were performed by general practitioners. Additionally, 8 countries provided these programmes through specialists. In 10 countries, however, no general practitioner counselling service was available.

In 13 countries, nicotine gum and in 14, nicotine patch were available at pharmacies. In 6 countries bupropion pills (150 mg) and in 7 countries Varenicline were available at pharmacies on prescription.

The representatives of the 16 EMR countries participating in the INBR3 meeting were also asked about the availability of a telephone help line for quitting smoking; the only country which

**Table 1 Cost of various types of smoking cessation programmes in the Eastern Mediterranean Region, 2009 (price of a pack of imported and domestic cigarettes included for comparison)**

| Country | Cost (US$) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Counselling[a] | | Nicotine replacement | | Bupropion[b] | Varenicline[c] | Pack of cigarettes | |
| | GP[d] | Specialist | Gum[e] | Patch[f] | | | Marlboro | Domestic |
| Afghanistan | – | – | – | – | – | – | 0.4 | 0.4 |
| Bahrain | – | 12 | 1.5 | 4 | 2.6 | 2 | 1.4 | – |
| Djibouti | – | – | 2 | 8 | 2 | 3 | – | – |
| Egypt | 15 | 20 | 2.5 | 1.5 | 2 | 7 | 1.3 | 1.2 |
| Iran (IR) | 3 | 10 | 3 | 7 | 2 | 3 | 1.8 | 0.4 |
| Iraq | – | – | 2 | 5 | – | – | 1.5 | 1 |
| Jordan | – | – | 2.5 | 6 | – | – | 2.1 | 0.7 |
| Kuwait | 4 | 15 | 4 | 8 | – | – | 1.6 | 3 |
| Lebanon | 5 | 10 | 2 | 6 | 2 | 3 | 1.4 | 1.6 |
| Libya | – | – | – | – | – | – | 1.7 | 1.4 |
| Morocco | 5 | 10 | 3 | 6 | 2.5 | 2.5 | 3.9 | 1.8 |
| Oman | – | – | 3 | 6 | – | – | 1.8 | 1.5 |
| Pakistan | – | – | – | – | – | – | 1.1 | 0.8 |
| Qatar | 5 | – | 2 | 7 | – | – | 1.3 | 1.3 |
| Saudi Arabia | – | – | – | – | – | – | 1.5 | 3 |
| Somalia | – | – | – | – | – | – | – | – |
| Sudan | 7 | 25 | – | – | – | – | 2.4 | 0.9 |
| Syrian Arab Republic | 4 | – | – | 2.3 | – | 2.5 | 1.5 | 0.6 |
| Tunisia | 3 | 10 | 2 | 5 | – | – | 2.5 | 0.8 |
| UAE | – | – | 3 | 8 | – | – | 1.6 | 1.4 |
| Yemen | 5 | – | – | – | – | – | 0.8 | 0.8 |

*[a]One visit and counselling session. [b]Two pills of 150 mg each for daily use. [c]Two pills of 1 mg for daily use. [d]Primary care physician. [e]Use of 8 gums a day. [f]One patch for daily use.*
*– = data not available at the time of the study.*
*GP = general practitioner; UAE = United Arab Emirates.*

mentioned having a quit line was the Islamic Republic of Iran.

The mean cost of a consultation provided in 1 specialist visit (US$ 14.6; SD 5.6) was about 7 times higher than the mean daily cost of bupropion (US$ 2.1; SD 0.2) treatment and treatment with nicotine gum (US$ 2.5; SD 0.6) (Table 2). It is clear that the cost of various cessation methods substantially exceeds the cost of a pack of cigarettes (Table 2).

## Discussion

Programmes for tobacco cessation are considered critical for tobacco control in society [10]. The World Health Organization recommendation bringing in MPOWER emphasized providing cessation programmes in the countries [11]. As stated in Article 14 of the World Health Organization Framework Convention on Tobacco Control, which was adopted at the Conference of the Parties to the Framework, countries are responsible for the provision of smoking cessation services at the national level [12].

In the EMR countries as well as in the countries of the WHO Africa Region and the South-East Asia Region, the proportion of smoking cessation services was limited in comparison with countries in the other WHO Regions. The Eastern Mediterranean Region countries, which have large smoking populations and a high prevalence of tobacco consumption promoted by tobacco industry marketing, do not have readily-available and affordable cessation services and medications commensurate with the scope of the problem [11]. As evident in our results, about half of the countries we studied do not have counselling services by physicians. This number is substantially lower than in other WHO Regions, including the European Region (90%), the Region of the Americas 80%, South-East Asia Region and Western Pacific Region 70% [11]. Increased attention and resources are needed to

**Table 2 Comparison of costs for different methods of tobacco cessation and a single pack of cigarettes in the Eastern Mediterranean Region, 2009**

| Variable | Availability[a] | Cost (US$) | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Mean (SD) |
| ***Measure*** | | | | |
| GP visit | 11 | 3 | 15 | 5.8 (3.4) |
| Specialist visit | 9 | 10 | 25 | 14.6 (5.6) |
| Daily nicotine gum | 13 | 1.5 | 4 | 2.5 (0.6) |
| Daily nicotine patch | 14 | 1.5 | 8 | 5.7 (2.0) |
| Daily bupropion | 6 | 2 | 2.6 | 2.1 (0.2) |
| Daily varenicline | 7 | 2 | 7 | 3.2 (1.6) |
| ***Cigarettes (pack)*** | | | | |
| Marlboro | 19 | 0.40 | 3.9 | 1.6 (0.7) |
| Domestic | 18 | 0.40 | 3.0 | 1.2 (0.7) |

[a]*Number of countries in which these services are available.*
*GP = general practitioner.*
*SD = standard deviation.*

address this lack of services in the EMR. The same is true regarding access to nicotine-containing medication. These medications are accessible in most European, American, South-East Asian and Western Pacific countries [13] but it was not available in one-third of the EMR countries.

Additionally, accessibility of non-nicotine-containing medications, including bupropion and varenicline, is extremely low. This is in contrast to the far greater access to these medications in some other WHO Regions, e.g. North America [4]. Again, more attention is needed to improve access to cessation programmes, including medications, in the EMR Region.

Unfortunately, the high cost of cessation services relative to the cost of continued smoking (quitting costs are 2–9 times greater than daily cigarette consumption) may discourage the use of these services and have an adverse impact on quit rates. In countries where the cost of cigarettes is considerably higher there may be more comparability between the price of cigarettes and the cost of cessation services [4,8]. Research is needed on the impact of cost on accessing cessation services.

Furthermore, in addition to limitations imposed by cost, the availability of cessation programmes in the countries of the Region is limited. It should be noted that prices vary across brands and can also vary within a country. Therefore these comparisons are not absolute, but they do provide an indication of the overall low price of cigarettes compared with the cost of cessation services.

Recall bias could be considered a threat to the internal validity of a study given that data are often self-reported. In order to avoid or minimize this bias in our study we considered the tobacco control focal points (individuals who are active in this field) in each country as the source for reporting data.

## Conclusions

In EMR countries where cessation services are provided, these services should be made affordable and accessible at the community level. Countries that have not participated in these efforts should consider plans for disseminating effective and affordable cessation treatment. Also much more needs to be done to ensure services for tobacco cessation at the country level are low cost and widely accessible. In countries where no such services exist, it is imperative that initiatives to provide these services begin as soon as possible.

## Acknowledgements

The authors are grateful to all representatives of the countries present at the INB3 meeting for the protocol on tobacco smuggling as part of the Framework Convention on Tobacco Control and to colleagues at the Framework Convention Alliance for the provision of information reported in this article.

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# Lid surgery for trachomatous trichiasis is negatively associated with visual disabilities and visual impairment in Oman

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**جراحة الأجفان لمعالجة الشعرة التراخومية تقلِّل من الإعاقة البصرية وخلل الإبصار في عُمان**

ر.ب. خانديكار، س.س. الحربي، ي.ب. فورا

**الخلاصة:** تقف عُمان على عتبة استئصال التراخوما المسببة للعمى، وقد أجرى الباحثون مسحاً مجتمعياً في عامَيْ 2009 و2010 لدراسة الترابط بين الشعرة التراخومية وبين حدَّة البصر والعمى في السكان العُمانيين الذين تزيد أعمارهم على أربعين عاماً. وبلغ عدد العيون المدروسة 8191 عيناً خضعت للفحص، مع تجميع المعطيات الديمغرافية للمشاركين في الدارسة. ووجد الباحثون أن الشعرة التراخومية كانت غائبة لدى 890 7 عيناً، ولو أن 227 عيناً من هذه العيون قد خضعت لجراحة على الجفن في الماضي لمعالجة الشعرة التراخومية. وكشف الباحثون الشعرة التراخومية لدى 301 عيناً، منها 154 عيناً للمرَّة الأولى، وتلو جراحة على الجفن لدى 147 عيناً. واتضح للباحثين أن معدل الإصابة بالعمى أخفض بمقدار يُعتدُّ به إحصائياً في العيون التي خضعت لجراحة على الجفن في الماضي (OR=0.54). وكانت العوامل المنبئة بالعمى في التحليل التحوُّفي هي عمر المشارك في الدراسة (معدل الأرجحية المصحّح = 1.0)، والجنس (معدل الأرجحية OR=2.01) وقصة إجراء جراحة على الجفن (OR=3.09)، والسكن في منطقة تعاني من وباء مفرط بالتراخوما (OR=10.6). واستنتج الباحثون أن الترويج لجراحة الشعرة قد يكون مفيداً في خفض معدلات العمى.

ABSTRACT Oman is at the threshold of eliminating blinding trachoma. We conducted a community-based survey in 2009–10 to study the association of trachomatous trichiasis (TT) status with visual acuity and blindness among the Omani population aged 40+ years. A total of 8191 eyes were examined and participants' demographic data were collected. TT was absent in 7890 eyes but 227 of these eyes had had lid surgery for TT in the past. TT was detected in 301 eyes, for the first time in 154 eyes and following lid surgery in 147 eyes. The rate of blindness was significantly lower in eyes that had undergone lid surgery in the past (OR = 0.54). In regression analysis the predictors of blindness were participant's age (adjusted OR = 1.01), sex (aOR = 2.01), history of lid surgery (aOR = 3.09) and residence in a hyperendemic trachoma area (aOR = 10.6). Promotion of TT surgery might be beneficial in reducing blindness.

**Association négative de la chirurgie des paupières pour le trichiasis trachomateux aux déficiences visuelles et à la malvoyance à Oman**

RÉSUMÉ Oman est sur le point d'éliminer le trachome cécitant. Nous avons mené une enquête dans la communauté entre 2009 et 2010 pour étudier l'association du trichiasis trachomateux avec l'acuité visuelle et la cécité dans la population d'Omanais de plus de 40 ans. Au total, 8191 yeux ont été examinés et les données démographiques des participants ont été recueillies. La recherche du trichiasis trachomateux s'est révélée négative pour 7890 yeux mais 227 d'entre eux avaient des antécédents de chirurgie des paupières. La maladie a été détectée dans 301 yeux, pour la première fois dans 154 yeux et après une chirurgie des paupières dans 147 yeux. Le taux de cécité était significativement inférieur pour les yeux ayant des antécédents de chirurgie des paupières (OR = 0,54). À l'analyse de régression, les facteurs prédictifs de la cécité étaient l'âge du patient (OR ajusté = 1,01), le sexe (ORa = 2,01), les antécédents de chirurgie des paupières (ORa = 3,09) et le lieu de résidence dans une zone où le trachome est hyperendémique (ORa = 10,6). La promotion de la chirurgie du trichiasis trachomateux pourrait contribuer à limiter les cas de cécité.

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Received: 08/03/11; accepted: 24/11/11

## Introduction

Trachoma is a priority health problem, and the World Health Organization (WHO) has expressed its commitment to the elimination of blinding trachoma by the year 2020 [1]. In a concerted approach, named the Global Alliance for Elimination of Blinding Trachoma, the representatives of Member States adopted the guidelines to reach this objective and stipulated indicators to review the progress [2].

The surgery component of the SAFE strategy [S (surgery), A (antibiotic), F (facial cleanliness), E (environmental improvement)] is an indirect indicator of blindness due to trachoma. By linking the presence or absence of trachomatous trichiasis (TT) to visual status we can assess the association of a particular strategy—namely lid surgery for TT—with the reduction in blindness.

Previous researchers have associated visual acuity and blindness status to TT in countries with high trachoma prevalence [3–6]. It would be interesting to study this association in a country that is at the threshold of eliminating blinding trachoma [7]. We therefore conducted a community-based survey in 2009–10 to study the association of trachomatous trichiasis (TT) status with visual acuity and blindness among the Omani population aged 40+ years.

## Methods

This paper reports a review of the data collected through a cross-sectional study in the community. The National Blinding Trachoma Certification Committee received approval to undertake this survey from the research and ethics committee of the Ministry of Health, Oman. The study was conducted in trachoma endemic areas during the last 2 months of 2009 and the first 2 months of 2010.

### Sample

During the last survey in 1996, 22 *wilayat* of 3 governorates of Oman were found to be trachoma endemic. The study population was Omani people aged 40+ years in these endemic areas who were identified from on the catchment area population of primary health (PHC) centres. By using a random selection method 2 PHCs of each *wilaya* were selected and 1 randomly selected village for each selected PHC was visited for the survey. We identified a central mosque as the starting point. The first house in the eastwards direction was selected as the starting house and all Omani residents aged 40+ years in these houses were enrolled. The visits were continued until the required 100 persons (200 eyes) from the village were obtained. Further details are given in our earlier publication [8].

### Data collection

The data was collected on a pre-tested form. The field investigators were qualified optometrists with experience of trachoma screening. They used an ophthalmic loupe (Keeler UK 2.5X) to detect TT. The methods of assessing visual acuity and TT are given in more detail in our earlier publication [8]. To minimize misclassification of senile entropion cases as TT, we excluded eyes with lower lid trichiasis alone and those without severe trachomatous scarring.

Distant visual acuity was assessed using a Snellen distant vision chart at 6 m distance from the participant. If a person was using spectacles for viewing distant objects, his/her vision was tested with the spectacles. Distant visual acuity was further divided into moderate visual impairment (vision 6/18–6/60) and severe visual impairment (vision < 6/60–3/60). If vision was < 3/60 the vision was tested again using a pinhole. Blindness was defined as the best corrected visual acuity of < 3/60. We used a pinhole to ensure the best corrected vision in eyes with vision < 3/60. Due to poor cooperation of a few participants, data on visual acuity of their eyes was missing but their blindness status (based on recognizing single optotype 'E' at 3 m distance) using a pinhole was documented.

History of lid surgery for TT in the past was inquired about from the participant and relatives. Lid surgery for senile entropion was not included. Information about other ocular surgery (e.g. cataract, glaucoma, pterygium, keratoplasty, retinal surgery, laser surgery for diabetes, surgery for correcting refractive error and eye removal) was compiled through both interview and eye examination. History of surgery was confirmed from the patient's health records.

Demographic information (age, sex and the area of residence) were also collected. If the residence was in Dhakhiliya, North Sharqiya or South Batinah regions of Oman, the area was defined as a trachoma hyperendemic area. If the area of residence was in North Batinah, South Sharqiya, Dhahira or Buraimi regions, the person was considered to be from a mesoendemic area of trachoma.

The eyes were grouped into 4 groups: TT absent at the time of examination and no history of lid surgery for TT (never had TT), TT absent but evidence/history of lid surgery for TT (successfully managed cases); TT present during eye examination but no history of lid surgery (new cases); and TT present and evidence/history of lid surgery for TT (recurrent cases).

### Data analysis

*Epi-data*, version 3.1, software was used for data entry [9]. The spreadsheet was converted using *SPSS*, version 11.5. We used parametric univariate analysis to calculate frequencies and percentage proportions and binominal logistic regression analysis to identify predictors and to review the interaction of different variables associated to the blindness.

The adjusted odds ratios (OR), 95% confidence interval (CI) and *P*-values were calculated. Variables known to influence the presence of TT were included in the regression model and the stepwise method was used to study the interaction.

## Results

### Trachomatous trichiasis status

We enrolled 8616 eyes of 4308 people in this study; data were omitted from analysis for people absent during the survey (378 eyes) and those refusing to participate (47 eyes). We therefore examined 8191 (95.1%) eyes. The TT status of eyes by the demographic profile of participants is shown in Table 1. TT was not present at the time of examination in 7890 eyes and, of these, evidence of past lid surgery was noted for 227 eyes. TT was detected in 301 eyes at examination, of which 147 eyes had evidence of lid surgery in the past to treat TT (recurrent cases), while in 154 eyes TT was noted for the first time (new cases).

### Trachomatous trichiasis status by blindness status

The TT status and blindness status of eyes was analysed (Table 2). The rate of blindness was not significantly different between the surgery positive and negative groups when TT was absent (OR = 1.64; 95% CI: 0.89–3.00) or when TT was present (OR = 2.19; 95% CI: 0.74–6.45).

### Blindness status by history of lid surgery

We analysed the blindness rate in relation to history of lid surgery by combing groups and comparing eyes that had never had TT surgery with eyes that had had TT surgery (Table 3). Eyes that had undergone lid surgery had a significantly lower rate of blindness compared with eyes that had not undergone lid surgery in the past (OR = 0.54; 95% CI: 0.32–0.89). However, comparing lid surgery for TT in the past and blindness between males and females showed that sex was a confounding factor in this association (OR = 0.39; 95% CI: 0.12–0.99 for males and OR = 0.76; 95% CI: 0.40–1.33 for females) (Table 3).

We also reviewed the influence of residence in trachoma-endemic areas on the association of lid surgery for TT and blindness (Table 3). The association of lid surgery for TT in the past and blindness was significant in the eyes of people residing in hyperendemic (OR = 1.03; 95% CI: 0.6–1.8) and mesoendemic areas (OR = 0.57; 95% CI: 0.6–1.8).

### Associations between variables

Regression analysis enabled us to study the interaction of different variables with blindness status. Presence of blindness in an eye could be predicted by knowing the person's age (adjusted OR = 1.01; 95% CI: 1.00–1.02), sex (adjusted OR = 2.01; 95% CI: 1.68–2.41), history of lid surgery (adjusted OR = 3.09; 95% CI: 2.32–4.11 and trachoma endemicity of residential area (adjusted OR = 10.6; 95% CI: 8.85–12.7) (Table 4).

Visual acuity (with correction by spectacles for distance) was studied in relation to TT status (Figure 1). Excellent quality of vision (6/6–6/18)

**Table 1 Demographic profile of participants, by presence of trachomatous trichiasis (TT) in eyes at examination and history of lid surgery for TT (*n* = 8191 eyes)**

| Variable | TT absent (*n* = 7890) | | | | TT present (*n* = 301) | | | |
|---|---|---|---|---|---|---|---|---|
| | Surgery history –ve (never had TT) | | Surgery history +ve (successfully managed) | | Surgery history –ve (new cases) | | Surgery history +ve (recurrence) | |
| | No. | % | No. | % | No. | % | No. | % |
| ***Sex*** | | | | | | | | |
| Male | 2925 | 38.2 | 52 | 22.9 | 45 | 29.2 | 30 | 20.4 |
| Female | 4738 | 61.8 | 175 | 77.1 | 109 | 70.8 | 117 | 79.6 |
| ***Age (years)*** | | | | | | | | |
| 40–49 | 3477 | 45.4 | 17 | 7.5 | 11 | 7.1 | 8 | 5.4 |
| 50–59 | 1699 | 22.2 | 65 | 28.6 | 33 | 21.4 | 27 | 18.4 |
| 60–69 | 1433 | 18.7 | 74 | 32.6 | 67 | 43.5 | 57 | 38.8 |
| 70–79 | 707 | 9.2 | 36 | 15.9 | 26 | 16.9 | 36 | 24.5 |
| 80+ | 335 | 4.4 | 35 | 15.4 | 17 | 11.0 | 19 | 12.9 |
| ***Region[a]*** | | | | | | | | |
| Hyperendemic | 6526 | 85.2 | 219 | 96.5 | 135 | 59.5 | 145 | 98.6 |
| Mesoendemic | 1137 | 14.8 | 8 | 3.5 | 19 | 8.4 | 2 | 1.4 |
| Total | 7074 | 100.0 | 216 | 100.0 | 143 | 100.0 | 142 | 100.0 |

*Data presented are numbers and % of eyes examined.*
*[a]Rate of TT among population aged 40+ years in 1996–97 and 2005 surveys: hyperendemic regions > 5%, mesoendemic regions < 5%.*

**Table 2 Trachomatous trichiasis (TT) status of participants' eyes at examination and history of lid surgery for TT, by blindness status (*n* = 8191 eyes)**

| Variable | Blind (vision < 3/60) | | Not blind (vision ≥ 3/60) | | OR (95% CI) |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| ***TT absent*** | | | | | |
| Surgery history –ve (never had TT) | 589 | 7.7 | 7074 | 92.3 | 1.64 (0.89–3.00) |
| Surgery history +ve (successfully managed) | 11 | 4.8 | 216 | 95.2 | |
| Subtotal[a] | 600 | 7.6 | 7290 | 92.4 | |
| ***TT present*** | | | | | |
| Surgery history –ve (new cases) | 11 | 7.1 | 143 | 92.9 | 2.19 (0.74–6.45) |
| Surgery history +ve (recurrence) | 5 | 3.4 | 142 | 96.6 | |
| Subtotal[a] | 16 | 5.3 | 285 | 94.7 | |
| ***Eyes examined for TT*** | 616 | 7.5 | 7575 | 92.5 | |

*Data presented are numbers and % of eyes examined.*
*[a]Odds of having blindness among eyes with TT now compared to eyes without TT at present: OR = 1.47, 95% CI: 0.88–2.44.*
*OR = odds ratio; CI = confidence interval.*

was found in a higher proportion of eyes that had never had TT compared with new cases. Poor quality of vision (< 3/60) was noted in a higher proportion of eyes with recurrence of TT.

## Other surgeries

Among the group with no TT and no history of TT surgery, 111 (1.6%) eyes

**Table 3 History of lid surgery for trachomatous trichiasis (TT) of participants' eyes in different demographic groups, by blindness status (*n* = 8191 eyes)**

| Variable | Blind (vision < 3/60) | | Not blind (vision ≥ 3/60) | | OR (95% CI) |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| ***Total group*** | | | | | |
| Surgery history –ve | 600 | 97.4 | 7217 | 95.3 | 0.54 (0.32–0.89) |
| Surgery history +ve | 16 | 2.6 | 358 | 4.7 | |
| Total | 616 | 100.0 | 7575 | 100.0 | |
| ***Males*** | | | | | |
| Surgery history –ve | 342 | 98.8 | 2628 | 97.1 | 0.39 (0.12–0.99) |
| Surgery history +ve | 4 | 1.2 | 78 | 2.9 | |
| Subtotal | 346 | 100.0 | 2706 | 100.0 | |
| ***Females*** | | | | | |
| Surgery history –ve | 258 | 95.6 | 4589 | 94.2 | 0.76 (0.40–1.33) |
| Surgery history +ve | 12 | 4.4 | 280 | 5.8 | |
| Subtotal | 270 | 100.0 | 4869 | 100.0 | |
| ***Hyperendemic area*** | | | | | |
| Surgery history –ve | 248 | 93.9 | 6413 | 94.8 | 1.03 (0.60–1.80) |
| Surgery history +ve | 14 | 5.3 | 350 | 5.2 | |
| Subtotal | 364 | 100.0 | 6661 | 100.0 | |
| ***Mesoendemic area*** | | | | | |
| Surgery history –ve | 352 | 99.4 | 804 | 99.0 | 0.57 (0.12–2.70) |
| Surgery history +ve | 2 | 0.6 | 8 | 1.0 | |
| Subtotal | 354 | 100.0 | 812 | 100.0 | |

*Data presented are numbers and % of eyes examined.*
*OR = odds ratio; CI = confidence interval.*

**Table 4 Regression analysis of trachomatous trichiasis (TT) and blindness status of participants' eyes**

| Variable | Adjusted OR (95% CI) | *P*-value |
|---|---|---|
| ***Age*** | 1.01 (1.00–1.02) | < 0.001 |
| ***Sex*** | | |
| Male | 2.01 (1.68–2.41) | < 0.001 |
| Female | 1 | |
| ***Study area*** | | |
| Hyperendemic | 10.6 (8.85–12.7) | < 0.001 |
| Mesoendemic | 1 | |
| ***Type of TT*** | | |
| TT recurrence | 0.92 (0.52–1.57) | 0.7 |
| No TT recurrence | 1 | |
| ***History of lid surgery*** | | |
| Yes | 3.09 (2.32–4.11) | < 0.001 |
| No | 1 | |

*Intercept = –7.174.*
*OR = odds ratio; CI = confidence interval.*

of persons with a mean age of 52.9 years had undergone cataract surgery in the past. Aphakia or pseudophakia was noted in 216 (18.5%) eyes of those who had been successfully managed for TT (mean age 63.3 years). In the group of new cases of TT, 11 out of 143 (7.7%) eyes of persons (mean age 63.1 years) were operated for cataract. Finally, in the recurrent cases, 31 (21.8%) of 142 eyes of persons with TT recurrence (mean age 64.9 years) had undergone cataract surgery.

## Discussion

In the current study in Oman the risk of severe visual impairment in eyes that had not undergone TT surgery was significantly higher than eyes operated for TT in the past. However, there was no statistically significant difference in the rate of blindness and severe visual impairment among those with TT and without TT. Woreta et al. in Ethiopia noted that bilamellar tarsal rotation surgery was associated with improvement in visual acuity compared with no surgery (OR = 1.68) [3]. In Vietnam, ophthalmologists used a modified Cuneod Nataf procedure for lid surgery to manage TT cases and noted that the poor visual acuity was associated with recurrence at 1 year follow-up [10]. A controlled trial in Oman in the late 1980s by Reacher et al. suggested that surgery for major trichiasis produced a significant improvement in visual acuity in operated versus non-operated fellow eyes [11]. In these countries, blindness was mainly due to infectious and age-related blinding eye diseases, and local eye care facilities were limited [12]. Hence the observed decline in visual disabilities following lid surgery could be attributed to proactive TT intervention campaigns. In contrast, the present study in Oman was carried out 10 years after implementing VISION 2020 strategies and at a time when high-quality eye care services for refractive error, cataract, glaucoma and diabetic retinopathy were accessible and affordable to all.

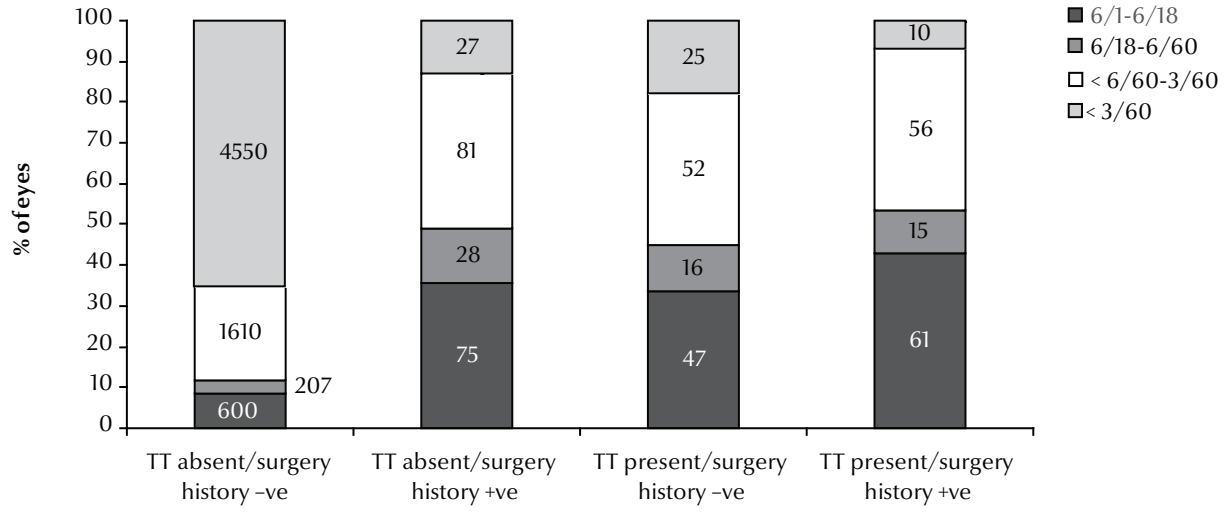


**Figure 1 Visual acuity (with correction by spectacles for distance), by presence of trachomatous trichiasis (TT) in eyes at examination and history of lid surgery for TT (data are number of eyes)**

We noted that female sex was associated with visual impairment and lid surgery for TT in our study. A previous study in Oman also found that females had a higher risk of trichiasis, which was attributed to barriers for trichiasis surgery [13]. In Sudan too women have been reported to live longer and suffer a longer duration of disabling trichiasis and visual disabilities compared with males [14]. Despite the decline in blinding trachoma in a country such as Oman, the gender gap might still be important and approaches need to be modified to bridge the gender gap.

Age was a significant confounder for the association of TT and visual impairment in our study. A similar observation was noted in rural Myanmar, where the risk of trachoma increased by 5.3% for each 1 year increase in age. The rate of visual disabilities also increased with age [15]. The prevalence of age-related blinding eye diseases such as cataract, glaucoma and age-related macular degeneration were higher in older age groups. This could also be the reason for higher rates of visual impairment in older age groups.

The risk of blindness among eyes with trichiasis was higher among residents of mesoendemic areas than hyperendemic areas in our study. Frequent screening campaigns and management of other blinding eye diseases among the target population of hyperendemic areas could explain this variation. In other studies too the residential area of participants has been documented to influence both blindness and TT. In desert areas of Australia, for example, the risk of TT and blindness was higher compared with coastal areas [6,16].

The rates of blindness and severe visual impairment were higher among individuals with TT and recurrence of TT compared with those without TT in our study. A linear correlation of visual status and TT status was also noted in Ethiopia and southern Sudan [4].

The outcomes of keratoplasty, which is the main mode of management for trachomatous corneal opacity, are not very encouraging and therefore the prevention of trachomatous corneal opacity is very important [17]. Thus, lid surgery to prevent the development of advanced corneal opacities and dry eye due to trachoma is recommended in countries with a high prevalence of blinding trachoma.

Corneal blindness due to the sequelae of trachoma is still the main reason for visual disability among the adult population in many countries where active trachoma is no longer a public health problem [18]. The goal of the GET2020 initiative of eliminating avoidable blindness due to trachoma could be achieved in these countries only if surgery for treating TT were able to reduce corneal blindness. By implementing the SAFE strategy for trachoma control, it has been shown that rates of active trachoma and blinding trachoma can be reduced [2]. But indicators devised to monitor the progress of a country do not include the indicator which points to the decline in corneal blindness and visual disabilities due to trachoma. Hence indirect evidence to suggest that TT intervention is associated with fewer visual disabilities will be a useful tool to promote TT surgery.

In the past, we studied visual acuity and lid surgery as cross-sectional data. This was a limitation in interpreting the association of lid surgery and visual impairment. In a cohort study in India, Monga et al. demonstrated that lenticular and retinal causes rather than entropion were the main responsible causes of blindness [19]. In the present study, the age-related blinding eye diseases such as cataract were managed in a higher proportion in the group of eyes having TT than in the group of eyes without TT. Hence blindness and visual impairment in persons with and without TT might not be affected by different rates of cataract-related blindness.

Senile entropion/trichiasis is known to have fewer corneal complications compared with TT [20]. Thus, misclassification of trichiasis/entropion of a senile nature and TT could influence the association of visual impairment and TT intervention. The exclusion criteria used in the present study enabled us to minimize the effect of this bias and its impact on the results. In a previous survey in Oman more than half of the eyes of persons aged 40+ years and residing in hyperendemic areas of trachoma had severe trachomatous scarring [21].

Persons undergoing lid surgery for TT had a lower rate of visual disability compared with those without TT. Perhaps frequent attention by eye care personnel might have brought the attention of patients and their relatives to the blinding eye disease and its management. It is also be possible that by undergoing lid surgery, an eye with TT could also show improvement in visual acuity. The eyes that had a recurrence of TT had a higher risk of visual disabilities compared with eyes without TT. This is natural as frequent injury to the cornea by eyelashes could result in severe corneal opacity and secondary infection leading to blindness. Further longitudinal studies are recommended to confirm the observed association in our study.

In conclusion, TT surgery seems to have a beneficial effect in reducing visual disabilities. Countries and organizations should promote TT surgery and focus more on reducing TT recurrence.

## Acknowledgements

We thank the National Eye Health Care Committee and regional health administrators of Oman for their support in this survey. The community support group volunteers assisted the investigators especially for increasing the response rate. The field staff visited the villages and worked beyond the call of duty in order to conclude the survey in time. We sincerely appreciate their efforts. The residents of the selected villages were very cooperative in this health survey. We thank all of them.

The article was presented at a trachoma scientist's meeting at the World Health Organization on 15 April 2011.

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# Status of mismatch repair genes *hMSH2* and *hMSH6* in colorectal cancer in Saudi patients: an immunohistochemical analysis

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**حالة من خلل التوافق في جينين ترميميَّيْن hMSH2 وhMSH6 في سرطان المستقيم والقولون لدى المرضى السعوديين: تحليل مناعي نسيجي كيميائي**

هشام الخالدي، هالة كفوري

**الخلاصة:** تهدف هذه الدراسة إلى التعرف على حالة واسمَيْن رئيسيَّيْن من واسمات عدم الاستقرار في السَّوَاتل المجهرية (وهما جينان ترميميَّان hMSH2 وhMSH6) لدى مرضى سرطان المستقيم والقولون في مستشفى الملك خالد الجامعي، في الرياض، في المملكة العربية السعودية، في الفترة بين 2007 و2009. وأجرى الباحثان تحليلاً مناعياً نسيجياً كيميائياً لمدى عدم الاستقرار في السَّوَاتل المجهرية باستخدام أضداد للجينين hMSH2 وhMSH6. وذلك بتحليل 32 كتلة من مرضى تتراوح أعمارهم بين 16 و83 عاماً (وسطياً 56 عاماً)، أخذت 14 كتلة منها (43.8٪) من عمليات استئصال، وأخذت 18 كتلة منها (56.2٪) من خزعات. ووجد الباحثون مكوِّناً من الأورام الغدية في أربع كُتَل (12.5٪). وقد أبدى كلٌّ من سرطانة القولون والأورام الغدية والنسج السليمة تفاعلاً نووياً قوياً للجينَيْن hMSH2 وhMSH6 في 96.9٪ من الحالات. وبلغ معدل فقدان التعبير 3.1٪. وكان معدل الطفرة في المجموعة المدروسة الصغيرة منخفضاً، وتَوَافَقَ مع المعدل الوارد في البحوث المنشورة في بلدان صناعية. وتمس الحاجة لمزيد من الدراسات لتأكيد استخدام هذين الواسِمَيْن في تشخيص سرطان المستقيم والقولون.

ABSTRACT This study aimed to identify the status of 2 major microsatellite instability markers (repair genes *hMSH2* and *hMSH6*) in colorectal cancer cases operated at King Khalid University Hospital, Riyadh, Saudi Arabia between 2007 and 2009. Immunohistochemical study of microsatellite instability was done with antibodies to *hMSH2* and *hMSH6*. A total of 32 blocks were analysed from patients aged 16–83 years (median 56 years); 14 blocks (43.8%) were from resections and 18 (56.2%) were from biopsies. An adenomatous component was present in 4 (12.5%) blocks. The colonic carcinoma, the adenomas and the normal tissue showed strong nuclear reactivity to *hMSH2* and *hMSH6* in 96.9% of the cases. The rate of loss of expression was 3.1%. The rate of mutation in our sampled population was low and matched the rate reported in the literature from industrialized countries. Further studies are needed to confirm the use of these markers in the diagnosis of colorectal cancer.

**Statut des gènes d'appariement et de réparation *hMSH2* et *hMSH6* chez des patients saoudiens atteints d'un cancer colorectal : analyse immunohistochimique**

RÉSUMÉ La présente étude visait à identifier le statut de deux marqueurs principaux de l'instabilité des microsatellites (gènes de réparation *hMSH2* et *hMSH6*) dans des cas de cancers colorectaux opérés à l'hôpital universitaire King Khalid de Riyad (Arabie saoudite) entre 2007 et 2009. L'étude immunohistochimique de l'instabilité des microsatellites a été conduite avec des anticorps des gènes *hMSH2* et *hMSH6*. Au total, 32 blocs ont été analysés chez des patients âgés de 16 à 83 ans (âge médian 56 ans) ; 14 blocs (43,8 %) provenaient de résections et 18 (56,2 %) de biopsies. Une composante adénomateuse était présente dans 4 blocs (12,5 %). Le carcinome du colon, les adénomes et les tissus normaux présentaient une forte réactivité nucléaire aux gènes *hMSH2* et *hMSH6* dans 96,9 % des cas. Le taux de perte d'expression était de 3,1 %. Le taux de mutation dans la population de notre échantillon était faible et correspondait au taux connu dans la littérature des pays industrialisés. Des études supplémentaires sont nécessaires pour confirmer l'utilisation de ces marqueurs dans le diagnostic du cancer colorectal.

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Received: 15/09/11; accepted: 07/12/11

## Introduction

Colorectal cancer, the third most common cancer in the world [1], is rare before the age of 40 years and shows a significant age-specific increase in incidence beyond 50 years [2]. Genetics may play a role in up to 30% of cases [3]. Most hereditary colorectal cancers are attributable to 2 recognized syndromes: familial adenomatous polyposis and hereditary non-polyposis colorectal cancer syndrome (HNPCC). HNPCC accounts for the bulk of familial colorectal cancers [4,5] and is known to arise due to mutations in DNA mismatch repair genes [6].

Mismatch repair proteins correct the insertion and deletion mutations that occur when DNA is copied before cell division. Inactivation of one of the mismatch repair genes (*hMLH1*, *hMSH2*, *hPMS1*, *hPMS2*, *GTBP/hMSH6*) is responsible for the microsatellite instability or replication error seen in more than 90% of HNPCC cases and 15% of sporadic colorectal cancers [7]. The Bethesda guidelines recommend screening for microsatellite instability or mismatch repair protein immunohistochemistry in patients aged less than 50 years who are genetically predisposed to colorectal cancer [8]. If mismatch repair defects are found, these patients can then be appropriately counselled and further tested for specific gene mutations [6].

In Saudi Arabia, 2 studies found varying percentages from 7% to 37% of patients with colorectal cancer were younger than 50 years of age [9,10] and showed a more aggressive course in comparison with data from an industrialized country population (New Zealand) [11]. Furthermore, another 2 studies from Saudi Arabia explored microsatellite instability using immunohistochemical stains for *hMSH2* and *hMLH1* and showed a high prevalence of mismatch gene expression loss among Saudis in comparison with that in more developed countries [12,13]. As there may be a hidden familial risk for colorectal cancer, there is a case to be made for a mass screening programme, preferably for individuals aged less than 50 years old. This study was therefore conducted to identify the status of 2 major microsatellite instability markers (repair genes *hMSH2* and *hMSH6*) in colorectal cancer cases operated at our institution over a 3-year period.

## Methods

Tissue blocks of 32 different patients with colorectal cancer operated at the King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia between 2007 and 2009 were retrieved and analysed. Patients' demographic characteristics including age and sex, the site/s and the type of colorectal cancer were recorded.

Immunohistochemical study of the microsatellite instability was done with antibodies to *hMSH2* and *hMSH6*. Immunohistochemical staining was performed using 4-mm sections of formalin-fixed, paraffin-embedded tissue, which were mounted on capillary gap microscope slides (DAKO ChemMate, A/S BioTek Solutions) and dried at room temperature overnight followed by 1–2 h at 60 °C. The tissue sections were deparaffinized and rehydrated. Antigen retrieval was achieved by microwave treatment in 1 mM EDTA, pH 9.0, at 900 W for 8 minutes followed by 15 min at 350 W. The slides were then allowed to cool for at least 20 min in the EDTA solution. Primary antibodies were mouse monoclonal IgG antibodies to *hMSH2* (clone 25D12, dilution 1:50, Novocastra/Leica) and *hMSH6* (clone 44, dilution 1:10, ABCAM).

Staining was performed in an automated immunostainer (Bondmax, Leica/ Novocastra), according to the manufacturer's instructions. DAKO ChemMate kit peroxidase/3, 30-diaminobenzidine was used for *hMSH2* and DAKO Envision TM/HRP rabbit/mouse for *hMSH6*, with rabbit anti-mouse IgG, dilution 1:400, as a link to amplify between the primary antibody and the Envision step. Diaminobenzidine was used as a chromogen. The sections were counterstained with haematoxylin, dehydrated in ascending concentrations of alcohol to xylene and mounted. The Bond polymer refine detection kit was used (catalogue no. DS9800).

Loss of expression of the respective mismatch repair genes protein was defined as absence of nuclear staining in the tumour cells, and normal nuclear staining in lymphocytes and normal epithelial or stromal cells was required serving as internal control. The expression was classified by 2 pathologists as present, absent or non-evaluable without grading of the staining intensity.

## Results

The median age of the patients was 56 years (range 16–83 years); 20 (62.5%) were males and 12 (37.5%) were females (male to female ratio 1.67:1). Of the 32 blocks 14 (43.8%) were from resection specimens and 18 (56.2%) were from tissue biopsies. The site of samples was 13 (40.6%) from the rectum, 10 (32.3%) from the sigmoid, 2 (6.3%) from the rectosigmoid, 2 (6.3%) from the hepatic flexure, 2 (6.3%) from the caecum, 1 (3.1%) from the ascending colon, 1 (3.1%) from the transverse colon and 1 (3.1%) from the descending colon. Normal colonic tissue was present in all the blocks except in 2 cases. An adenomatous component was present in 4 (12.5%) blocks (Table 1).

The colonic carcinoma, the adenomas, and the normal tissue showed strong nuclear reactivity to *hMSH2* and *hMSH6* in all the cases, except in 1 case where expression was lost in the

**Table 1 Immunohistochemistry of 32 tissue blocks from patients with colorectal cancer**

| Source/location | No. | Strong nuclear reactivity to : | | | | | |
|---|---|---|---|---|---|---|---|
| | | *hMSH2* | | | *hMSH6* | | |
| | | Normal tissue | Adenoma | Colorectal cancer | Normal tissue | Adenoma | Colorectal cancer |
| Rectum | 13 | 13 (100) | 2 (100) | 12 (92.3) | 13 (100) | 2 (100) | 12 (92.3) |
| Sigmoid | 10 | 10 (100) | 2 (100) | 10 (100) | 10 (100) | 2 (100) | 10 (100) |
| Cecum | 2 | 2 (100) | – (–) | 2 (100) | 2 (100) | – (–) | 2 (100) |
| Hepatic flexure | 2 | 2 (100) | – (–) | 2 (100) | 2 (100) | – (–) | 2 (100) |
| Rectosigmoid | 2 | 2 (100) | – (–) | 2 (100) | 2 (100) | – (–) | 2 (100) |
| Ascending colon | 1 | 1 (100) | – (–) | 1 (100) | 1 (100) | – (–) | 1 (100) |
| Descending colon | 1 | 1 (100) | – (–) | 1 (100) | 1 (100) | – (–) | 1 (100) |
| Transverse colon | 1 | 1 (100) | – (–) | 1 (100) | 1 (100) | – (–) | 1 (100) |
| Total | 32 | 32 (100) | 4 (100) | 31 (96.9) | 32 (100) | 4 (100) | 31 (96.9) |

*Values are numbers (percentages).*

carcinoma but was present in the normal adjacent tissue (Figure 1). The rate of loss was 3.1% (1/32).

## Discussion

In our study, 31 out of 32 of the cases were normal for *hMSH2* and *hMSH6* and in 1 case expression was lost in the carcinoma and was seen in the normal adjacent tissue. This finding is different from the 2 previous studies on Saudi patients published in 2005 and 2007, which showed an increased rate of mutation in these repair genes [12,13].

Our study showed a low prevalence of mismatch repair genes using the above mentioned 2 markers. There was a strong nuclear reactivity to both *hMSH2* and *hMSH6* (92.3% to 100%) in all biopsied areas, which is similar to the findings in developed country populations [14,15]. This may be attributed to the fact that since this is a general community hospital, it accepts all types of patients with colorectal carcinoma, thus eliminating selection bias. Furthermore, 80%–90% of mutations in *hMSH2* are specific for Lynch syndrome patients; however around 10% of *hMSH2* are not, and these are found in families with atypical HP-NCC or extracolonic carcinomas [16]. *hMLH1* function is context-dependent in low-stress colorectal cancers, and its effect on cell numbers is limited [15]. Most low-level microsatellite instability in colorectal cancers can be explained without requiring an elevated loss of expression during

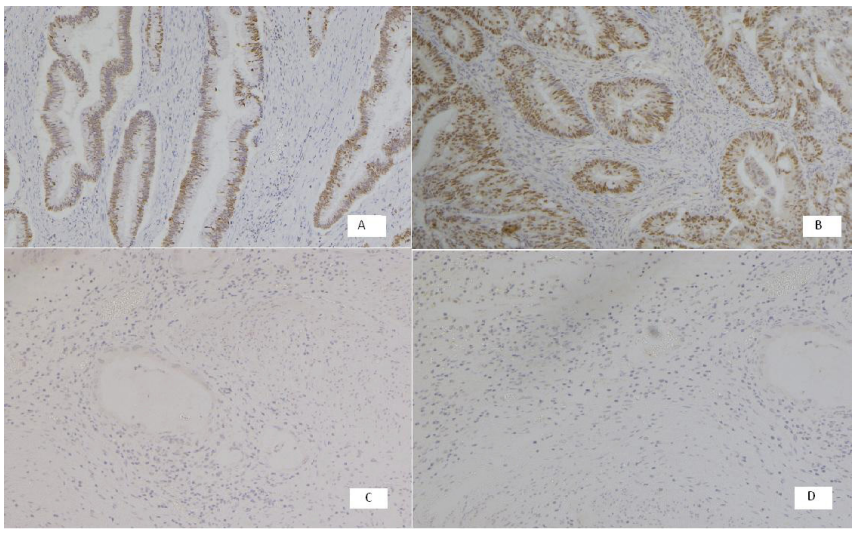


**Figure 1 Immunostain of mismatch repair genes: *hMSH2* positive (A), *hMSH6* positive (B), *hMSH2* negative (C), *hMSH6* negative (D) foci of colorectal cancer (× 100)**

neoplastic development, and hence there is little evidence for a discrete microsatellite instability group of cancers [17]. Nevertheless, our results remain inconclusive because we had only 32 patients. The differences between our findings and previous studies, particularly those conducted among Saudi Arabians, should be further investigated using all 4 markers on a larger sample. Genetic testing on a similar sample is needed.

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# Prevalence and risk factors for spousal violence among women attending health care centres in Alexandria, Egypt

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**معدّل انتشار وعوامل اختطار عنف الأزواج لدى النساء المراجعات لمراكز الرعاية الصحية في الإسكندرية، مصر**

هبه ممدوح، هناء إسماعيل، إبراهيم خربوش، مي توفيق، أمينه الشرقاوي، محمد عبد الباقي، حسن سلام

**الخلاصة:** أجرى الباحثون مسحاً مستعرضاً للتعرف على معدلات انتشار عنف الأزواج والعوامل التي تؤثر عليه، لدى 3271 إمرأة سبق لهن الزواج، ممن يراجعن 12 مركزاً من مراكز رعاية صحة الأسرة تم اختيارها عشوائياً في محافظة الإسكندرية. وقد أبلغ أكثر من ثلاثة أرباع المشاركات في الدراسة (77٪) عن معاناتهن من عنف الأزواج خلال حياتهن الزوجية. وقد كان العنف العاطفي هو النمط الأكثر شيوعاً (71٪)، تلاه العنف الجسدي (50.3٪) ثم العنف الجنسي (37.1٪)، والعنف الاقتصادي (40.8٪). وتؤكد الدراسة المعدل المرتفع لانتشار عنف الأزواج في جميع الطبقات الاقتصادية والاجتماعية. ويشير التحليل التحوُّفي اللوجستي إلى ترابط عنف الأزواج مع حجم العائلة الكبير، والطلاق أو الانفصال، وانخفاض مستوى التحصيل التعليمي المنخفض للزوج، واعتياد التدخين لدى الزوج وتعاطيه لمواد الإدمان، والوضع النفسي للزوج، وسابقة التعرُّض لعنف جسدي أثناء المراهقة. وهذا المعدل المرتفع لعنف الأزواج يوضِّح الحاجة الملحَّة لتصدِّي الحكومة والمجتمع المدني لهذه القضية التي تعرقل إحراز التقدُّم نحو المرامي الإنمائية في مصر.

ABSTRACT We conducted a cross-sectional survey to determine the prevalence of, and factors affecting, spousal violence among 3271 ever-married women attending 12 randomly selected family health centres in Alexandria Governorate. More than three-quarters of the participants (77%) reported experiencing spousal violence during their marital life. Emotional violence was the most common type reported (71.0%), followed by physical (50.3%), economic (40.8%) and sexual (37.1%) violence. The study confirms the high prevalence of spousal violence across all socioeconomic strata. Logistic regression analysis indicated large family size, divorce or separation, low educational attainment of husband, smoking habit and drug use in husband, husband's psychological status and history of exposure to physical violence during adolescence were associated with spousal violence. This high rate of spousal violence highlights the urgent need for government and civil society to address the issue, which hinders progress toward Egypt's development goals.

**Prévalence et facteurs de risque de la violence conjugale chez des femmes consultant dans des centres de soins de santé à Alexandrie (Égypte)**

RÉSUMÉ Nous avons mené une enquête transversale afin de déterminer la prévalence de la violence conjugale et des facteurs associés chez 3271 femmes ayant déjà été mariées et consultant dans 12 centres de santé familiaux sélectionnés aléatoirement dans le Gouvernorat d'Alexandrie. Plus des trois quarts des participantes (77 %) ont indiqué avoir souffert de violence conjugale au cours de leur vie maritale. La violence psychologique était la plus fréquente (71,0 %), suivie par la violence physique (50,3 %), puis la violence économique (40,8 %) et enfin la violence sexuelle (37,1 %). L'étude confirme la prévalence élevée de la violence conjugale dans toutes les strates socioéconomiques. Une analyse de régression logistique a révélé que la violence conjugale était associée à l'appartenance à une famille nombreuse, à un divorce ou une séparation, à un faible niveau d'études du mari, à des habitudes de tabagisme et de consommation de drogues du mari, à l'état psychologique du mari, et à des antécédents d'exposition à la violence physique pendant l'adolescence. Ce taux élevé de violence conjugale souligne l'urgente nécessité pour le gouvernement et la société civile de s'attaquer au problème, qui freine la progression de l'Égypte vers ses objectifs de développement.

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Received: 09/08/11; accepted: 04/10/11

## Introduction

Violence against women is a major public health problem worldwide; it kills, tortures and maims women, affecting them not only physically, but also psychologically, sexually and economically [1]. Violence against women is present in every country, cutting across boundaries of culture, class, education, income, ethnicity and age. Violence against women is one of the most pervasive human rights violations, denying women's and girls' equality, security, dignity and self-worth and their right to enjoy fundamental freedoms [1].

The terms "domestic violence" and "spousal violence" are often used interchangeably and refer to husbands as the perpetrators, the most common case [2]. Domestic violence, a more general term, can also include abuse of other family members such as children [3]. Domestic violence is now widely recognized as a serious human rights and public health problem that concerns all sectors of society [4]. The global dimensions of this violence are alarming, as highlighted by studies on its incidence and prevalence [1]. A World Health Organization (WHO) multi-country study on violence against women indicated that 15%–71% of ever-married women world-wide are victims of domestic violence at least once in their marital lives [5].

Until now, patriarchal norms continue to relegate many Egyptian women to a subordinate position relative to men. Women are particularly at risk of spousal abuse in societies where there are marked inequalities between men and women, and rigid gender roles and cultural norms [6].

Certain characteristics of women and their husbands reinforce the subordinate position of women in the family, and therefore put some women at greater risk of experiencing marital violence [6]. Research has indicated several related factors that could contribute to, or protect from, violence against women [3,7]. These include individual, household, community and societal factors. Individual factors include woman's level of education and/or employment, delayed marriage, her control of economic resources and her involvement in household decision-making. Positive household factors include high household wealth, compatibility between husband and wife in education and economic resources and having fewer children. Community factors include urban versus rural domicile, poverty and community norms and practices regarding gender relations and equality. Societal factors refer to the norms and policies in the society at large that could contribute to, or protect from, violence against women.

A high prevalence of domestic violence among ever-married females presenting to outpatient clinics in Cairo, Egypt was described by Bakr and Ismail in 2005 [8]. This study highlighted a much higher prevalence (88.4%) of domestic violence in women attending health care facilities in Egypt than that reported by the Egypt Demographic and Health Survey of 2005 (47.4%) [9]. The high rate of domestic violence reported in health facilities compared to that reported in the household surveys [9,10] gave the justification for conducting a study on violence against women in Alexandria, targeting women attending health facilities. Therefore, the present study among women attending family health centres in Alexandria, Egypt aimed to provide new data on the prevalence of all forms of spousal violence by current or previous husband, and to identify factors that may either protect women or put them at risk of spousal violence.

## Methods

This survey was conducted, using a cross-sectional design, in the period October 2009–June 2010.

### Target population

The sample consisted of ever-married women attending publicly funded family health centres distributed in the 7 districts of Alexandria.

### Sampling and sample size

With a precision of 2.5%, a 95% confidence interval, a design effect of 2 and a 28% prevalence of violence against women [9], the minimum estimated sample size was calculated, using *OpenEpi*, version 2, at 3100 women. A total A total of 3500 ever-married women were approached to compensate for missing data; 3271 women agreed to participate and were interviewed, i.e. 6.6% refused to participate.

The sample design for the survey included 12 family health centres representing both urban and rural residence. The centres were selected randomly from a list of centres working under the newly introduced Family Health Model. These family health centres provide low-cost services for families, including women from different socioeconomic strata, in many disciplines, including preventive and curative services. The sample was distributed according to the total population of each district.

Participants eligible for the study were ever-married women who completed visits in physician-led clinics for any reason and who were not accompanied by their husbands (to ensure safe disclosure of the spousal abuse experience). Women were selected by choosing every fourth woman as they were leaving the clinic. Interviews took place in the clinic. Data collection was done daily, until the desired sample size was reached at each centre.

### Data collection

After reviewing the available national and international literature, a structured interview questionnaire was developed. Questions on all types of spousal abuse were modified and reviewed to be

culturally relevant. Arabic translation of the instrument was developed and it was checked by forward then backward translation by qualified translators. The questionnaire was designed to obtain detailed information on sociodemographic background, women's and husbands' characteristics, the prevalence of all forms of violence, the forms of violence ever-married women had ever experienced during their marital relationships with their current husband or most recent husband. Over the study period of 5 months, trained female data collectors interviewed eligible women to complete the pre-designed questionnaire.

The survey explored various types of spousal violence, specifically, physical, sexual, emotional and economic spousal violence. When a woman confirmed that she had experienced at least 1 of these acts of violence, it was considered in the analysis that she had experienced the indicated form of violence. *Physical violence* questions asked about being slapped or beaten, or the husband throwing things to harm the wife, being pushed or grasped by force, being kicked or dragged, being strangled or burned on purpose and being threatened with a knife or gun or actually having such a weapon used on them. *Sexual violence* questions referred to a wife being forced to have sex against her will, being forced to have sex when she was ill, being forced to have sex during menses, being hit during sex, being told hurtful words during sex and being forced to do things or be in positions she finds insufferable during sex. *Emotional spousal abuse* included being insulted, being ignored or treated indifferently, being threatened with harm, either to herself or someone she cares about (e.g. her children), being threatened with having to leave house or be divorced, being insulted or humiliated in front of other people, being deliberately frightened, and being forbidden to go out or take part in social activities. *Economic abuse* focused on being forced to work (if she did not want to work) and the husband not working, husband refusing to spend money on home demands (when he had money), husband controlling (in a bad way) how she spent her own money (e.g. spending it on his pleasure), being forced to give husband all the money she earned, being forced to borrow money from people, and being forced to beg every time she asked for money.

### Data analysis

Data entry and analysis were carried out over a 5-month period using *SPSS*, version 16. Univariate analysis was performed with the Chi-squared test whenever applicable. Logistic regression analysis was used to identify variables that were significantly related to spousal violence. The outcome variable was ever exposure to any spousal violence with women's and their husband's characteristics taken as covariate (independent) variables.

### Ethical considerations

After explaining the study objectives and procedures, women who agreed to participate were interviewed alone in specially arranged settings in the health units to ensure confidentiality during the interviews. Written informed consent was obtained from the participants at the start of the interview (oral in the case of illiterate women). In addition, at the start of each module, each respondent was read a statement to inform her that her answers were completely confidential.

Interviews lasted an average of 35 minutes (range 25–45 minutes).

## Results

### Sociodemographic characteristics

Women's age ranged from 16 years to 68 years, mean 36.6 (standard deviation 9.8) years. Regarding education level, 38.5% of the participants were illiterate or could just read and write and 30.5% of them had secondary education. Most of the participants (87.6%) were currently married; 73.6% reported being married before the age of 25 years. More than two thirds of the participants were housewives (71.8%), while only 5.6% of them had professional jobs. Nearly half of the surveyed women (56.9%) had a family size of 4–5 persons. About half the participants (51%) reported having a monthly family income of 400 to < 900 Egyptian pounds (US$ 1 = 5.93 Egyptian pounds).

Just over half the husbands were married before age 30 years (55.4%). As for the husbands' education, 37.4% were illiterate or just could read and write, 29% had secondary education or technical diploma, and 17.4% were university graduates with higher degrees. Just over half of the husbands were manual workers (55,0%), with 5.1% of the participants reporting that their husbands were not working. The majority of the husbands were smokers (66.0%), 12.4% were drug addicts, and 4.2% were alcoholics. Nearly, 4% of participants reported that their husbands were ever treated for psychological illness.

### Prevalence of spousal violence

More than three-quarters of our participants (2519 women) had experienced spousal abuse of any type during their marital life. About half the women who reported ever experiencing spousal violence were subjected to 2–3 types of violence (49%), with 28% suffering all 4 types of spousal abuse (data not shown). Emotional abuse was the most common type of spousal abuse reported (2322 women, 71%).

Approximately 70% of the women suffered from emotional abuse during their marital life (Table 1) and 10% of these reported that their husbands ever used abusive language to insult them and make them feel bad. Nearly 90% of women who ever experienced

emotional abuse said that they experienced multiple forms of emotional abuse (data not shown).

Half the women who participated in this study reported experiencing some form of physical violence by their husbands at some point in their marital life. The most common forms of physical violence reported were slapping (44.7%) and beating (30.5%) (Table 1).

More than 1 in 3 women (37.1%) ever experienced some form of sexual violence. The most common forms were: being forced to have sex against their will (25.4%) and being forced to have sex when they were ill (23.3%) (Table 1).

Overall, 43% of women reported economic abuse in any period during their marital lives; 27% of these said their husband forced them (under threat of violence) to beg for money (Table 1).

**Table 1 Distribution of ever-married women ($n$ = 2519) who had ever experienced spousal abuse/violence, Alexandria Governorate, 2010**

| Type of abuse | % |
|---|---|
| ***Physical (n = 1645; 50.2%)*** | |
| Slapping/beating | 47.7 |
| Pushing/grasping hair | 30.5 |
| Kicking/dragging on the floor | 19.0 |
| Strangling/burning | 6.9 |
| Threatening with a knife or gun | 5.1 |
| ***Sexual (n = 1213; 37.1%)*** | |
| Sex against her will | 25.4 |
| Sex when ill | 23.3 |
| Hateful positions/things | 11.9 |
| Told words she hates | 10.0 |
| Sex during menses | 6.1 |
| Being hit during sex | 6.0 |
| ***Emotional (n = 2322; 71.0%)*** | |
| Insulted or made to feel bad | 59.4 |
| Ignored or treated indifferently | 52.3 |
| Insulted/humiliated in front of others | 41.0 |
| Threat of divorce/separation | 36.3 |
| Deliberately frightened | 31.5 |
| Forbidden to go out or participate in social activities | 6.7 |
| Forbidden to visit parents | 25.4 |
| Threat to harm her or the children | 15.8 |
| ***Economic (n = 1334; 40.8%)*** | |
| Makes her beg for money | 27.0 |
| Forces her to borrow money | 25.4 |
| Refusal to spend on home demands | 14.4 |
| Forces her to give him all her earnings | 13.5 |
| Spends her money on his pleasure | 10.8 |
| Not working and forces her to work | 6.0 |

## Factors associated with women's exposure to spousal violence

Characteristics of women and their husbands which were associated with spousal violence are illustrated in Tables 2 and 3. Spousal violence was most prevalent among women aged 25–< 35 years ($P$ < 0.05) (Table 2). Spousal violence varied significantly among women who had different levels of education and different types of occupation. Women who had never attended school and those who were involved in manual work or inferior jobs such as janitor or maid were at greater risk of experiencing spousal violence than their counterparts. Divorced/separated women, those who were married before age 20 years and women who were married for 5–10 years showed greatest exposure to spousal violence ($P$ < 0.05). Women who lived in larger families, those with a low monthly family income and those who had a history of exposure to severe physical violence since age 15 years reported the highest frequency of spousal violence ($P$ < 0.05). Prevalence of spousal violence against the woman was lower when the couple had similar educational attainment than for their counterparts (Table 2).

Husband's age at marriage seems to have no association with the risk of spousal violence (Table 3). There was an association between husbands' habits and women's exposure to spousal violence: a statistically significantly higher proportion of women reported suffering from spousal violence if their husbands were smokers, drank alcohol or were addicted to drugs. Over 90% of the husbands who were being treated for any psychological illness were violent (93.2%) (Table 3).

In the logistic regression analysis, women whose husbands were addicted to drugs were over 10 times more likely to experience violence than their counterparts (Table 4). Divorced/separated were about 6 times more likely to experience violence than married women. Women with a history of exposure to physical violence since the age of 15 years had a 3-fold increase in the incidence of spousal violence compared with those who had no such exposure.

**Table 2 Characteristics of women (*n* = 2519) and their exposure to any form of spousal violence, Alexandria Governorate, 2010**

| Characteristic | Ever exposed to violence (%) | *P*-value[a] |
|---|---|---|
| ***Age (years)*** | | |
| < 25 | 73.9 | |
| 25– | 79.0 | 0.04 |
| 35– | 78.9 | |
| ≥ 45 | 72.9 | |
| ***Education*** | | |
| Illiterate/read and write | 80.4 | |
| Primary/preparatory | 78.3 | 0.01 |
| Secondary/diploma | 78.1 | |
| University/postgraduate | 65.1 | |
| ***Occupation*** | | |
| Housewife | 78.2 | |
| Manual worker | 83.9 | < 0.01 |
| Employed in service sector | 72.5 | |
| Professional | 64.5 | |
| ***Marital status*** | | |
| Married | 76.3 | < 0.01 |
| Divorced/separated | 95.7 | |
| Widowed | 65.6 | |
| ***Age at marriage (years)*** | | |
| < 20 | 80.0 | |
| 20– | 78.7 | 0.01 |
| 25– | 71.1 | |
| ≥ 30 | 71.8 | |
| ***Duration of marriage (years)*** | | |
| < 5 | 73.7 | |
| 5– | 80.3 | 0.03 |
| 10– | 78.8 | |
| ≥ 20 | 75.1 | |
| ***Family size*** | | |
| 1–3 | 72.4 | < 0.01 |
| 4–5 | 78.4 | |
| ≥ 6 | 79.6 | |
| ***Monthly family income (Egyptian pounds)*** | | |
| < 400– | 79.2 | < 0.01 |
| ≥ 900 | 70.7 | |
| ***History of exposure to severe physical violence since age 15 years*** | | 0.01 |
| Yes | 88.4 | |
| No | 69.0 | |
| ***Educational difference*** | | |
| Same level | 76.1 | |
| Husband higher education than wife | 76.4 | 0.02 |
| Wife higher education than husband | 81.1 | |

[a] *Chi-squared test significant at P < 0.05.*

**Table 3 Husbands' characteristics and exposure of women (*n* = 3271) to any form of violence, Alexandria Governorate, 2010**

| Husband's characteristic | Wife ever exposed to violence (%) | *P*-value[a] |
|---|---|---|
| ***Age at marriage (years)*** | | |
| < 25 | 75.8 | |
| 25– | 77.6 | 0.04 |
| ≥ 30 | 77.5 | |
| ***Education*** | | |
| Illiterate/read and write | 81.2 | |
| Primary/preparatory | 80.3 | < 0.01 |
| Secondary/diploma | 77.5 | |
| University/postgraduate | 65.1 | |
| ***Occupation*** | | |
| Not working | 76.3 | |
| Manual worker | 79.4 | 0.03 |
| Employee | 74.6 | |
| Professional | 71.3 | |
| ***Smoking*** | | |
| Yes | 82.9 | < 0.01 |
| No | 66.2 | |
| ***Drug addiction*** | | |
| Yes | 98.4 | < 0.01 |
| No | 74.1 | |
| ***Drinking alcohol*** | | |
| Yes | 93.7 | < 0.01 |
| No | 76.4 | |
| ***Being treated for psychological illness*** | | |
| Yes | 93.2 | < 0.01 |
| No | 76.1 | |

[a]*Chi-squared test significant at P < 0.05.*

## Discussion

In this survey among women attending family health facilities in Alexandria, Egypt, around 77% reported some form of spousal violence; the most common type was emotional abuse. Our data together with the world-wide literature confirm that domestic violence is a universal phenomenon existing in all communities [5,7,11].

According to a 2005 survey, 36% of Egyptian women had ever experienced some form of marital violence (emotional, physical, and/or sexual) by their current/most recent husband [9]. A survey published in 2009 indicated a much higher proportion of Egyptian women (62.6%) reporting exposure to emotional violence by their husbands than physical violence (28%) [10]. The women who participated in our study in Alexandria reported experiencing higher rates of spousal violence than those reported in both the 2005 and 2009 household surveys [9,10]. The rate of intimate partner violence documented in primary care settings varies widely; different studies have reported 22%–90% of women seen in primary care facilities had suffered such violence [8,12,13].

The methodological differences and data collection methods used in the household studies [9,10] make comparability with our findings difficult. Several factors may be involved; the most important is that women in our study may have felt more comfortable speaking because the interviews were conducted in health facilities and not in their homes (which may affect women's willingness to disclose abuse). Additionally, confidentiality can be more easily assured in health care facilities than in households. There is often a culture of silence around the topic of domestic violence, which makes the collection of data particularly challenging, especially when the women are surrounded by their relatives. Confidentiality concerns, embarrassment, and fear of escalating violence were the most important barriers to abuse disclosure reported by women in a previous study conducted in the United States of America [12].

Generally, women visiting the publicly-funded health facilities in Alexandria Governorate belong to lower socioeconomic groups, and thus were more vulnerable to domestic violence. Low socioeconomic status was associated with more violence in many settings in the WHO multi-country study and in an Iranian review of nationally representative surveys [5,13]. Our study included a larger, more in-depth set of questions regarding all types of violence compared with some other studies on violence among Egyptian women [9,10].

The levels of all forms of spousal violence reported in the current study were high, with emotional abuse being the most frequent form. It is possible that emotional abuse may be considered part of the Egyptian culture: people shout, swear and insult each other more easily than in many other cultures, but physical violence is not so common, possibly because of lower levels of alcohol and drug addiction in the abusive men [14]. In addition, the present study included a comprehensive list of questions on emotional abuse that might have resulted in this high rate. The rate of emotional abuse reported in our study (71%) was at the upper end

**Table 4 Logistic regression analysis of factors associated with overall spousal violence among women in Alexandria Governorate, 2010**

| Characteristic | Adjusted OR | 95% CI |
|---|---|---|
| ***Family size*** | | |
| 1–3[a] | | |
| 4–7 | 1.55** | 1.21–1.92 |
| ≥ 8 | 1.80** | 1.34–2.27 |
| ***Exposure to physical violence since age 15 years*** | | |
| Yes | 3.27** | 2.58–3.93 |
| No[a] | | |
| ***Husband's education*** | | |
| Illiterate or just read & write | 1.59** | 1.18–1.99 |
| Primary & preparatory | 1.49** | 1.11–1.85 |
| Secondary | 1.43* | 1.16–1.95 |
| University & postgraduate[a] | | |
| ***Marital status*** | | |
| Married[a] | | |
| Divorced/separated | 5.58** | 2.62–11.50 |
| Widowed | 0.66** | 0.43–0.94 |
| ***Husband smokes*** | | |
| Yes | 1.84** | 1.54–2.33 |
| No[a] | | |
| ***Husband's addiction*** | | |
| Yes | 10.34** | 4.54–23.4 |
| No[a] | | |
| ***Husband being treated for psychological illness*** | | |
| Yes | 2.78* | 1.12–4.51 |
| No[a] | | |

*Significance of coefficients: *P < 0.05, **P < 0.01; model is significant at chi-squared < 0.05.*
*[a]Reference category.*
*OR = odds ratio; CI = confidence interval.*

of a range previously reported in the 2005 WHO study (20%–75% across all countries) [5].

It is more difficult for women to disclose experiences of sexual violence than physical violence. Likewise, to talk about sexual violence within marriage in such a religious and conservative culture as that in Egypt is not regarded as very appropriate. Nevertheless, 37% of the participants disclosed that they had ever experienced any form of sexual violence. In Egyptian society, cultural and religious norms support a husband's right to sex regardless of a wife's feelings, therefore many women do not consider having sex against their will as abuse. However, a sizeable proportion of the women in our study (25.4%) considered having sex against their well as a type of sexual abuse

Examining the characteristics of women who experience violence and the contexts in which they live helps to identify some of the common risk factors for violence. Among our sample, certain characteristics of women and their husbands may reinforce the subordinate position of women in the family and, therefore, put some women at greater risk of experiencing violence. It is important to recognize that many of these characteristics are interrelated. For instance, persons with higher levels of education are more likely to have higher income or to marry partners with a high level of education [15]. We found that large family size, divorce or separation between the couples, low educational attainment of the husbands, husbands' habits such as smoking and drug use, husbands' psychological status and a history of exposure to physical violence during adolescence were the correlates of spousal violence among the participants in our survey. Consistent with the our findings, secondary analysis of the 2005 Egyptian Demographic and Health Survey data revealed that partner's education, respondent's education, work status and place of residence were significantly associated with marital violence [16,17]. Studies from all over the world identified several sociodemographic factors that might increase the likelihood of women exposure to intimate partner/spousal abuse [5,16,18–21]. These included such factors as spousal educational difference, duration of the marriage, wealth quintile, partner's education, respondent's education and work status, and place of residence

Education has been shown to be a source of empowerment for women [22,23]. The more highly educated participants in our survey reported the lowest levels of spousal abuse. The same pattern was noted for husbands' education. However, husband's education seems to have more influence: it remained significant in the logistic analysis while women's education level did not. It seems that husbands' education helps to change their attitude towards gender norms. Analysis of the 2005 survey data suggested that female education is most likely to help safeguard women against spousal violence when the couple share similar years of schooling [16]. In addition, in most settings in the WHO multi-country study, the greater the education of the women and their partners, the less the reported spousal violence [5].

In our study, women living in larger families were twice as likely to have

experienced spousal violence compared with their counterparts. Having many children places economic and emotional stress on a marriage and increases a woman's likelihood of experiencing abuse. In her in-depth analysis of spousal physical abuse among a sample of women from Minya, Egypt, Yount found that household wealth was negatively associated with physical abuse [24].

The logistic model also indicated that divorced women were about 5 times more likely to report suffering from spousal violence than currently married women. It may be that spousal violence is the leading cause of the divorce in first place, or that women are freer to speak about their previous husbands than their current ones. In addition, recall bias, which is directly related to age and current marital status of the women [25], can also partially explain why younger or currently married women experience more violence. Data from international surveys on violence against women showed that women who were divorced or separated reported higher rates of violence than women who were currently married [5,18].

Unsurprisingly, the logistic model showed that husbands' unfavourable habits such as smoking and drug use were correlated with women's ever exposure to spousal violence. Drug use was mentioned as a risk factor for domestic violence in previous studies [18,26,27].

Policies and programmes aimed at addressing gender-based violence of any kind, including spousal violence, must address the roots of the problem—cultural practices that discriminate against women—and correct the imbalance in rights and power-sharing between males and females in Egyptian families and society. Outdated and patriarchal behaviours and laws that support male domination need to be abolished, and the status of girls and women needs to be raised in both the family and society. Interventions to address violence against women must be carried out across multiple sectors because of the legal, social, cultural, and health implications.

## Conclusion

This study confirms the high prevalence of all forms of spousal abuse among a representative sample of women attending publicly funded health centers in Alexandria, Egypt. Spousal violence is widespread and the rates are alarming, highlighting the urgent need for government and civil society to address the issue and end this scourge that hinders progress toward Egypt's development goals. Empowering women and raising their social status seem to be the key strategies for eliminating spousal violence among this group of Egyptian women.

## Acknowledgement

This study was part of a larger survey carried out by the Alexandria Regional Centre for Women's Health and Development. It was funded by the Ford Foundation.

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***Rapid assessment: health sector capacity and response to gender-based violence in Pakistan***

WHO Pakistan commissioned a rapid assessment with the primary objective of assessing the capacity of the health sector in Pakistan to integrate the issues of gender-based violence. This rapid assessment was conducted under the WHO Gender and Health Programme as part of the One UN Gender Equality Interventions. A qualitative study involving a brief desk review and primary data collection, including interviews and focus group discussions with health service providers, was employed. The study reconfirms that the connection between gender and health is not only poorly understood also that gender-based violence is not internalized as a public health issue by the majority of health service providers at different levels. The outcomes of this assessment will be of interest not only to policy-maker in the context of Pakistan but also to those in other countries, developed and developing alike.

This publication is available on line at: http://applications.emro.who.int/dsaf/EmroPub_2011_1287.pdf

# Cognitive factors related to childbirth and their effect on women's delivery preference: a comparison between a private and public hospital in Tehran

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**العوامل المعرفية المتعلِّقة بالولادة وتأثيراتها على تفضيلات الولادة لدى النساء: مقارنة بين مستشفى في القطاع الخاص وآخر في القطاع العام في طهران**

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**الخلاصة:** تقارن هذه الدراسة المستعرضة المتغيرات المعرفية ذات الصلة بالولادة القيصرية في المستشفيات في القطاعين الخاص والعام في طهران، وتقيم ارتباطها بتفضيل الأمهات لنمط الولادة. وقد شملت العينة 300 حامل في الثلث الأخير من الحمل غير المصحوب بالمضاعفات تم اختيارهن من مستشفى عام وآخر خاص. وقد استكملت المستجيبات للدراسة استبيانات خاصة بالخوف من الألم، والموقف من الولادة، وسلم تصور الألم على أنه كارثة، إلى جانب تسجيل المعطيات الاجتماعية والديموغرافية والتفضيل لنمط الولادة. ووجد الباحثون أن تفضيل الأمهات للولادة القيصرية أعلى بمقدار يُعتدُّ به إحصائياً لدى النساء في المستشفى الخاص، وأنهن كنَّ أكثر ميلاً للخوف من الألم ومن الولادة مما لدى زميلاتهن في المستشفى العام؛ إلا أن كلتا المجموعتين ترغبان بتصوير الألم على أنه كارثة، وقد ترابَطَ تفضيل النساء للولادة القيصرية في كِلا المستشفيَيْن العام والخاص مع جميع العوامل المعرفية، على أن هناك عوامل أخرى يغلب أن تساهم في إحداث الفرق في الموقف من الولادات القيصرية في المستشفيات العامة والخاصة.

ABSTRACT This cross-sectional study compared cognitive-related variables for caesarean delivery in a private and public hospital in Tehran and assessed their association with maternal preference for delivery mode. A sample of 300 pregnant women in their final trimester of uncomplicated pregnancy was recruited from 1 private and 1 public hospital. They completed the Fear of Pain, Childbirth Attitude and the Pain Catastrophizing Scale questionnaires, and their sociodemographic data and delivery preference were recorded. Maternal preference for caesarean delivery was significantly higher in women in the private hospital, and they were significantly more likely to fear pain and childbirth than those in the public hospital; however, both were equally likely to catastrophize in painful situations. Women's preference for caesarean delivery in both hospitals was significantly associated with all the cognitive factors. Other factors are likely to contribute to the difference in caesarean delivery in the private and public hospital.

**Facteurs cognitifs relatif à l'accouchement et leur effet sur les préférences des femmes en la matière : comparaison entre un hôpital privé et public à Téhéran**

**RÉSUMÉ** La présente étude transversale a comparé les variables liées aux facteurs cognitifs pour une césarienne dans un hôpital privé et public de Téhéran et a évalué leur association avec les préférences des mères pour le mode d'accouchement. Un échantillon de 300 femmes enceintes dans leur dernier trimestre d'une grossesse sans complication a été recruté dans un hôpital privé et un hôpital public. Elles ont rempli les questionnaires *Fear of Pain* (peur de la douleur), *Childbirth Attitude (*attitude vis-à-vis de l'accouchement) et *Pain Catastrophizing* (dramatisation de la douleur). Leurs données sociodémographiques ainsi que leurs préférences en matière d'accouchement ont été enregistrées. Les préférences de mères pour une césarienne étaient bien supérieures chez les femmes consultant à l'hôpital privé, et celles-ci étaient nettement plus susceptibles d'avoir peur de la douleur et de l'accouchement que les femmes consultant à l'hôpital public ; toutefois, les femmes des deux groupes présentaient une probabilité égale de dramatiser les situations douloureuses. Les préférences des femmes pour une césarienne dans les deux hôpitaux étaient significativement associées à l'ensemble des facteurs cognitifs. D'autres facteurs sont susceptibles de contribuer à la différence entre hôpital public et hôpital privé en ce qui concerne la préférence d'un accouchement par césarienne.

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Received: 09/07/11; accepted: 21/11/11

## Introduction

The caesarean section (CS) rate has increased dramatically over the past 3 decades both in developed [1] and developing countries [2,3]. Caesarean delivery greatly improves pregnancy outcomes when clinically indicated but high caesarean delivery rates have raised questions about the health and economic consequences of this practice. CSs are associated with an intrinsic risk of increased severe maternal outcomes compared with vaginal delivery [4–6]. Maternal demographic factors such as age, race, education, marital status, race/ethnicity and other non-clinical factors like insurance status and institutional factors have been associated with and may increase the caesarean delivery rate [7–15].

Rates of CS vary according to hospital type; private hospitals have higher CS rates than do public one in both in both developed and developing countries [14–16]. Researchers have demonstrated the role of institutional factors such as ownership (private or public) [17,18]. In the Islamic Republic of Iran, CS prevalence is almost 40% in the public sector and > 90% in some private hospitals [16]. According to the study of Bailit et al. institutional factors and increasing patient demand for elective caesarean delivery can account for the increase in the caesarean birth rate [19].

Cognitive factors have also been implicated in women's requests for CSs and may explain variations in individual CS rates. The majority of women who fear childbirth request an elective CS [20,21]; such a request may be to avoid pain. One of the factors related to the fear of pain is pain catastrophizing [22–24]. Pain catastrophizing is defined as an exaggerated negative orientation to painful stimuli and reflects an excessively negative cognitive and emotional orientation toward pain [25]. People with high catastrophizing scores have difficulty suppressing pain-related thoughts and behaviours [26]. Pain catastrophizing is positively associated with the fear of being overwhelmed by labour pain and maternal tendency to avoid the pain [22]. It has been estimated that over 20% of low-risk pregnancies are complicated by intense fear related to childbirth and 6%–10% of the women describe a fear that is seriously incapacitating [27]. Fear of childbirth has been associated with slower labour and requests for CS [9,28–30].

Recent research suggests the need to analyse women's motives for birth choice [11,12]. Most previous studies of CS have focused on the association between rates and institutional type, size, private insurance [15] and physician factors [31] and there have been few studies that examined cognitive factors associated with preference for CS. Therefore, the primary aim of this study was to compare the differences in cognitive-related variables for CS (fear of pain, pain catastrophizing, attitude to childbirth) in private and public hospitals in Tehran, Islamic Republic of Iran. The association between the maternal preference for mode of delivery and cognitive variables was also studied. A better understanding of these factors might help to improve maternity care and to explain increases in caesarean rates. To our knowledge this is the first study ever to compare cognitive factors related to CS.

## Methods

### Participants and setting

This was a cross-sectional comparative study conducted in 2010. Participants were a convenience sample of pregnant women of gestational age 34–38 weeks attending the antenatal care units of 2 hospitals in Tehran: a private hospital (Atieh) and a government-funded hospital (Akbarabadi). In the private hospital women are allowed to request caesarean births without clinical indications but the public institution does not allow elective CS. The public hospital has the lowest CS rate (23%) and while the figure is > 87% in the private hospital [32].

Inclusion criteria for the women were: no previous surgical delivery, and uncomplicated current pregnancy with no indication for performing CS. Although previous caesarean delivery is not a necessary medical indication for subsequent caesarean delivery, the notion "Once a caesarean, always a caesarean" still always holds true in the Islamic Republic of Iran. Therefore, we treated previous CS as a medical indication for CS. A woman's previous experience of a delivery type may condition her to opt or expect that kind of birth in subsequent deliveries and it could have influenced the study result.

### Ethical considerations

Ethical approval for the study and the approval for conducting the study in hospitals were obtained from the Ethics Committees of Tarbiat Moallem University and the hospitals' Research Committees in 2010. Women invited to participate were assured that all collected information was confidential. All participants gave written informed consent prior to their participation.

### Instruments

Demographic and obstetric data collected included maternal age, marital status, educational level, reproductive history (parity, gestational age at interview), and preferred mode of delivery for the current pregnancy. The instruments used in this study were:

*Fear of Pain Questionnaire (FPQ–III) to assess fears about pain [32].* FPQ–III is a 30-item instrument using a 5-point Likert scale that measures fear about specific situations that would typically produce pain. Total scores range from 30 to 150. FPQ–III is a well-validated instrument appropriate for use in clinical and non-clinical settings and has a good reliability (Cronbach alpha = 0.80) [33,34].

*Pain Catastrophizing Scale (PCS) to assess catastrophic thinking about pain*. PCS consists of 13 items rated on a 5-point scale [35]. Participants are instructed to indicate the degree to which they have specified thoughts and feelings when experiencing pain. Three dimensions of PCS are recognized: rumination, magnification and helplessness. These item scores are summed to yield a total score ranging from 0 to 52 [35–37]. Participants were asked to complete the PCS questionnaire in reference to a previous pain event and indicate the degree to which they experienced the 13 thoughts or feelings during the event. Those scoring > 24 were classified as catastrophizers. Internal consistency was acceptable for the total score ($\alpha = 0.92$).

*Childbirth Attitude Questionnaire (CAQ) to assess women's ability to cope with labour and fear of childbirth*. CAQ consists of 14 items rated on a 4-point scale. The score ranges from 14 to 56. A higher score indicates more severe fear of childbirth. This is a validated instrument with good reliability (Cronbach alpha = 0.84) [38].

### Sample size

Using a formula for sample size determination for between-groups comparison, at a power of 95% and a confidence level of 95%, the minimum sample size was 150 women from each hospital. Women were selected consecutively as they attended a scheduled for a prenatal visit at the study hospitals. The questionnaire was administered and completed by trained interviewers.

### Statistical analysis

The data collected were analysed using descriptive and inferential statistics. We employed a between-subjects multivariate analysis of variance (MANOVA) to assess the significance of the differences in means for cognitive variables between the 2 groups. Pearson correlation coefficients were used to examine the association between cognitive factors and maternal preference for caesarean delivery.

Results are presented as means and standard deviations (SD) or frequency percentages. *P*-values and 95% confidence intervals in multivariate analyses are given; a *P*-value < 0.05 was considered statistically significant. All analyses were done using *SPSS*, version 15.

## Results

All 300 women were included in the analyses. We compared the characteristics of the women in the 2 hospitals and compared the 2 hospitals according to cognitive variables and maternal preference for operative delivery.

The participants were all married. The age distribution was similar between groups and the overall mean age was 27.67 (SD 5.86) years. The biggest proportion of women had a high-school diploma (41.3%), while 23.9% had 9 years of schooling, 15.9% had a bachelor degree, 10.3% had a primary school eduh cation, 5.3% were illiterate and 3.3% had a master's degree. Most of the women were nulliparous (55.3%).

Table 1 presents means and SDs for the demographic and cognitive variables for the 2 groups of women separately. No significant differences were found between the 2 groups with regards to mean age, level of education, gestational age and previous number of pregnancies ($P > 0.05$).

The preferred mode of delivery was elective CS for 47.3% of the women in the public hospital and 68.7% in the private hospital, a statistically significant difference ($P < 0.05$). Among nulliparous women, 55.3% strongly preferred caesarean delivery compared with 44.7% of multiparous women.

**Table 1 Demographic characteristics and scores on cognitive variables of the women by hospital type**

| Variable/type of hospital | Mean | SD |
|---|---|---|
| ***Fear of pain*** | | |
| Public | 74.96 | 21.84 |
| Private | 83.90 | 24.07 |
| ***Pain catastrophizing*** | | |
| Public | 30.43 | 11.14 |
| Private | 28.14 | 12.42 |
| ***Attitude to childbirth*** | | |
| Public | 36.56 | 8.02 |
| Private | 34.18 | 9.07 |
| ***Age (years)*** | | |
| Public | 26.62 | 6.56 |
| Private | 28.72 | 4.87 |
| ***Years of education*** | | |
| Public | 8.05 | 1.06 |
| Private | 10.98 | 1.09 |
| ***Parity*** | | |
| Public | 1.52 | 0.50 |
| Private | 1.58 | 0.49 |
| ***Gestational age (weeks)*** | | |
| Public | 34.7 | 1.2 |
| Private | 34.2 | 1.5 |

*P > 0.05 for all.*
*SD = standard deviation.*

### Differences in cognitive-related variables between hospitals

There were no statistically significant differences in the mean scores for the cognitive factors between the women in the private and public hospitals (Table 1). The PCS indicated that, on average, pregnant women in both groups catastrophize during painful situations – mean overall PCS score was 30.43 (SD 11.14) in the women in the public hospital and 28.14 (SD 12.42) in those in the private hospital (Table 1).

Using MANOVA, we examined the mean difference of the 3 cognitive factors (fear of pain, pain catastrophizing, attitude to childbirth) between the women in private hospital and the women in public hospital. Hospital group served as an independent variable, and age, number of pregnancies and education level were considered covariates (Table 2). There were significant differences between the women in private and public hospital with regard to fear of pain ($P = 0.001$) and childbirth attitude ($P = 0.017$) but not for pain catastrophizing ($P = 0.094$). In addition, we conducted pair-wise comparisons of cognitive factors in the women in the private and public hospitals (Table 3). After controlling for confounding factors, the difference between FPQ–III scores for women in private versus public hospitals was statistically significant ($P < 0.0001$) (Table 3), with women in the private hospital displaying greater fear. However, the mean difference between the 2 groups for pain catastrophizing was not statistically significant after adjusting for the effect of other independent variables ($P = 0.105$), with both groups being catastrophizers. For attitude to childbirth scores, the mean difference between women in the 2 hospitals was statistically significant after adjusting for the effect of other independent variables ($P < 0.017$).

### Correlation analyses

The second objective of the study was to assess the associations between cognitive factors and women's preferences for caesarean delivery. Statistically significant positive correlations were found between maternal fear of pain and maternal preference for operative delivery in the public ($r = 0.32$, $P < 0.01$) and private hospitals ($r = 0.43$, $P < 0.01$) (Table 4) indicating that higher scores were associated with a tendency to prefer surgical delivery. There were no significant differences between the 2 groups regarding their pain catastrophizing scores. Nevertheless statistically significant positive correlations were found between the scores and maternal preference for caesarean delivery ($P < 0.01$) (Table 4). The Pearson correlation test indicated a statistically significant association between attitude to childbirth scores and maternal preference for CS in private hospitals ($r = 0.33$, $P < 0.01$) (Table 4).

## Discussion

Our results show that maternal preference for caesarean delivery was significantly higher in the private than public hospital. In addition, women in the private hospital were significantly more likely to fear pain and childbirth than those in the public hospital. However, both were equally likely to catastrophize in painful situations. Furthermore, women's preference for caesarean delivery in both the private and public hospitals was significantly associated with all the cognitive factors evaluated in the study. Therefore, it may be reasonable to say the difference in the rate of surgical delivery between the public and private hospital is more likely due to the opportunity of women in the private hospital to be involved in decision-making regarding mode of delivery and to have the option of an elective CS.

Several studies have found that the caesarean rate tends to be much higher because of mother's preferred mode of delivery [11,39,40]. Jackson and Irvine report that over 38% of deliveries at a UK hospital were elective CS performed because of maternal preference. The study concluded that maternal request for surgical delivery is a relevant factor for the increasing CS rates [28]. This clearly explains the high CS rates in some regions where women are allowed a role in deciding the mode of delivery. In contrast, in other areas, such as Latin American countries, where women are not allowed such a role and mostly indicate a preference for a vaginal birth, significant differences in preferences between pregnant women in public and private facilities are not generally reported [19]. Potter et al. found that differences in the rates of CS between public and private patients in Brazil were due more to unwanted CSs among private patients than to a difference in preferences regarding type of delivery [14]. In addition, Angeja et al. showed that the higher CS rates in private patients compared with public could not be explained by mother's preference for caesarean delivery [17]. In their study

**Table 2 Between-subject effects for cognitive variables (fear of pain, pain catastrophizing, and attitude childbirth): MANOVA**

| Source | Dependant variable | Type III sum of squares | Mean squares | *F* | *P*-value |
|---|---|---|---|---|---|
| Hospital | Fear of pain | 6003.2 | 6003.2 | 11.36 | 0.001 |
| | Pain catastrophizing | 392.16 | 392.16 | 2.815 | 0.094 |
| | Attitude to childbirth | 424.83 | 424.83 | 5.78 | 0.017 |

*Degrees of freedom = 1 for all.*

**Table 3 Pair-wise comparison for cognitive variables (fear of pain, pain catastrophizing and attitude to childbirth)**

| Dependent variable | (I) Hospital | (J) Hospital | Mean difference (I–J) | SE | *P*-value[a] | 95% CI[a] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Fear of pain total score | Public | Private | –9.510* | 2.603 | < 0.0001 | –14.632 | –4.388 |
| | Private | Public | 9.510* | 2.603 | < 0.0001 | 4.388 | 14.632 |
| Pain catastrophizing scale total score | Public | Private | 2.219 | 1.366 | 0.105 | –0.469 | 4.906 |
| | Private | Public | –2.219 | 1.366 | 0.105 | –4.906 | 0.469 |
| Attitude to childbirth total score | Public | Private | 2.399* | 0.992 | 0.016 | 0.446 | 4.352 |
| | Private | Public | –2.399* | 0.992 | 0.016 | –4.352 | –0.446 |

*Based on estimated marginal means.*
*[a]Adjustment for multiple comparisons: least significant difference (equivalent to no adjustments).*
**Mean difference is significant at P < 0.05.*
*SE = standard error of the mean; CI = confidence interval for the difference.*

of pregnant Chilean women, the vast majority preferred vaginal to caesarean delivery.

Our results also imply that the maternal preference for surgical mode of delivery is sensitive to most cognitive factors in the both hospitals. Psychological issues, such as fear of pain and childbirth-related fear, have been reported to be essential factors behind the request for CS without any medical reason [41]. Studies that examined the maternal reasons for opting for a caesarean delivery found that the most common reason for electing a caesarean is labour pain [42]. Fear of labour pain is strongly associated with the fear of pain in general, and a previous complicated childbirth or inadequate pain relief are the most common reasons for requesting a CS among parous women [43]. In our study, while the women in the private hospital reported greater fear of pain, nevertheless fear of pain was associated with a greater desire for CS in both groups.

Since there was a positive correlation between the fear of pain and maternal desire for CS in both groups, the difference in the rate of caesarean delivery between the public and private sector may be attributable to the fact that the private sector allows pregnant women to elect for CS. Private hospitals usually tend to medicalize childbirth and obstetricians have been eager to use technology to remove their patient's fear of vaginal delivery. In one study, the most common reason why obstetricians carried out CS on maternal request was the patient's fear and her insistence [44]. Although fear of pain is a strong reason why pregnant women would prefer a CS, concern about pain is usually not a scientific-based reason to request CS. When a pregnant woman is afraid of labour pain, it is not an indication for caesarean delivery; instead it is an indication for education and specific reasons for the preference should be explored and discussed. An effective way to address the problem is through patient education—providing information on which patients can make informed choices. With education and information the patient will still have a choice, but the number of women requesting elective CS should fall [45]. Fear of labour pain and lack of childbirth education characterize Iranian women's experience of pregnancy and childbirth [16]. Prenatal education classes rarely present information about the birth process, nor do they introduce coping skills concerning labour pain [16]. Furthermore, no pain relief is given during labour and inadequate pain relief might contribute to maternal preference for caesarean delivery to avoid pain [46]. Therefore CS may seem the only option available to avoid the pain of labour for those who can pay for private care. From our analysis, childbirth fear was associated with preference for CS regardless of hospital type. The participants in the public hospital had significantly higher levels of childbirth fear than the private hospital, although CS is not an option that pregnant women can choose for themselves in the public hospital. Our finding is in line with those of Nieminen et al. that showed a significant correlation between childbirth fear and the desire for CS [47]. In view of the fact that the sample in the public hospital

**Table 4 Correlation between preference for caesarean delivery and cognitive factors in the public and private hospital (*n* = 150 in both hospitals)**

| Measure | Preference for caesarean delivery | |
|---|---|---|
| | Public hospital | Private hospital |
| ***Fear of pain score*** | | |
| Pearson *r* | 0.32** | 0.43** |
| ***Attitude to childbirth score*** | | |
| Pearson *r* | 0.13 | 0.33** |
| ***Pain catastrophizing score*** | | |
| Pearson *r* | 0.19* | 0.46** |

***P < 0.01 (2 tailed); *P < 0.05 (2 tailed).*

sector showed lower fear of pain on FPQs, clearly there were other factors than pain alone that were associated with the high childbirth-related fear.

Fear of childbirth may be related to midwifery care as the support of care providers is one of the most pivotal factors in a positive childbirth experience [48]. Higher levels of childbirth fear in the women in the public hospital could well be the result of the women fearing poor quality of delivery care in the hospital. In these circumstances, choice is not necessarily a preference for CS but rather a choice for safety and predictability. When a woman requests a CS because of childbirth-related fear, she should be provided with counselling and appropriate care to help her to address her fears in a supportive manner.

We found no differences between the women in the 2 hospitals for pain catastrophizing. Nevertheless, considering the elevated PCS scores in both groups of women, all tended to catastrophize during painful situations. The score of > 24 on the PCS for both groups should alert healthcare providers. High labour pain catastrophizing may affect maternal tendency to opt for caesarean delivery but may be a significant predictor of poorer childbirth satisfaction. Research indicates that in a painful situation or anticipation of a painful situation, catastrophizing creates more intense pain and emotional distress [25].

Our study demonstrates the lack of any difference in association between preference for caesarean and cognitive factors in the women in the private and public hospitals. All pregnant women with psychological issues such as fear of pain may show a preference for caesarean delivery but, as the lower rate of CS in the public hospital shows, preference for CSs does not necessarily reflect an indication for caesarean delivery.

Our study has several limitations. The most important limitation was its cross-sectional design; therefore caution must be exercised in the interpretation of the observed associations. In addition, the study examined the women's preference for caesarean delivery with only one item in the questionnaire and did not consider the final decision on mode of delivery. Moreover, our study is based on a small convenience sample of pregnant women in only 1 public and 1 private hospital; thus the sample may not adequately represent the pregnant women population. This makes the generalizability of the results to a wider population uncertain.

Given the high rates of pain fear and its association with CS preference our findings indicate the need for caregivers to provide pregnant women with accurate and realistic information about caesarean indications, labour pain, and ways of coping with pain and emotional distress. In many cases, however, a woman's decision might be more fundamental than just coping with labour pain; it is likely to be about a personal philosophy of labour and expectations of childbirth. To better understand and manage fear associated with pregnancy and childbirth, it would be useful therefore to study women's personal philosophy of labour and childbirth.

## Acknowledgements

Special thanks are given to all the women who participated in the study. We would also like to thank the members of the Scientific Board of the Nursing and Midwifery Department of Arak University of Medical Sciences for their help in running this study. We thank the staff at the 2 study hospitals for their excellent participation and collaboration.

This study was supported by the research centre of Tarbiat Moallem University. The sponsors of the study had no role in study design, data collection, data analysis, data interpretation or writing the report.

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# Upwind responses of *Anopheles stephensi* to carbon dioxide and L-lactic acid: an olfactometer study

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**استجابات الأنوفيلة الاصطفانية بالانجذاب نحو ثنائي أكسيد الكربون وحمض الـ - L لاكتيك: دراسة بمقياس الشم**

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**الخلاصة:** إن إفراغ ثنائي أكسيد الكربون وحمض اللاكتيك في الزفير وفي العرق يعطي شارات شَمِّية للبعوض تمكِّنه من العثور على الناس ولَدْغهم، ولو أن أنواع البعوض يختلف بعضها عن بعض في هذا الصدد. وتستقصي هذه الدراسة الاستجابات الانجذابية بعكس الريح للأنوفيلة الاصطفانية، في شكلها الأليف للقاذورات، وهو من النواقل الهامة للملاريا في آسيا، نحو ثنائي أكسيد الكربون وحمض الـ – L– لاكتيك، ضمن شروط المختبرات. ففي حين أدت جرعة دنيا من ثنائي أكسيد الكربون (90 جزءاً بالمليون) إلى تنشيط البعوض، فإن جرعة تعادل عشرة أضعاف ذلك أدت إلى تثبيطه. ولم يؤد حمض الـ – L– لاكتيك بحدِّ ذاته إلى أي تأثير ذي شأن، إلا أن إضافة 6 ميكروغرام/ دقيقة من حمض الـ – L– لاكتيك إلى مقدار من ثنائي أكسيد الكربون يتراوح بين 90 و410 جزءاً بالمليون أدى إلى اجتذاب البعوض. وتقدم هذه النتائج المزيد من الدعم للنظرية التي تقول بأن لثنائي أكسيد الكربون دوراً هاماً في سلوك البعوض للبحث عن البشر، وتقترح أنه ربّما يكون لحمض الـ – L– لاكتيك دور أكثر شأناً من دور ثنائي أكسيد الكربون في اجتذاب الأنوفيلة الاصطفانية.

ABSTRACT Excretion of carbon dioxide and L-lactic acid through exhalation and perspiration provides olfactory signals to mosquitoes which allow them to find and bite humans; however, mosquito species differ in this regard. This study investigated upwind responses of *Anopheles stephensi*, mysorensis form, an important malaria vector in Asia, to carbon dioxide and L-lactic acid under laboratory conditions. While a minimal dose of carbon dioxide (90 ppm) activated the mosquitoes, 10 times this amount suppressed them. L-lactic acid alone did not produce a significant effect by itself, but addition of 6 µg/min of L-lactic acid to a range of 90 to 410 ppm carbon dioxide resulted in attraction. The results provide further support for the hypothesis that $CO_2$ plays an important role in the host-seeking behaviour of zoophilic mosquitoes, and suggests that L-lactic acid might play a more critical role than $CO_2$ in the attraction of *An. stephensi*.

**Réponses sous le vent d'*Anopheles stephensi* au dioxyde de carbone et à l'acide lactique L une étude en olfactomètre**

RÉSUMÉ L'excrétion de dioxyde de carbone et d'acide lactique L par expiration et par perspiration génère des signaux olfactifs qui permettent aux moustiques de repérer et de piquer les humains ; toutefois, toutes les espèces de moustiques ne réagissent pas de manière identique. La présente étude a analysé les réponses sous le vent d'*Anopheles stephensi*, de type mysorensis, un important vecteur du paludisme en Asie, au dioxyde de carbone et à l'acide lactique L en laboratoire. Alors qu'une dose minimale de dioxyde de carbone (90 ppm) rendait les moustiques actifs, la même dose multipliée par dix avait l'effet inverse. L'acide lactique L seul ne produisait pas d'effet significatif en soi, mais l'association de 6 µg/min d'acide lactique L à une quantité de 90 à 410 ppm de dioxyde de carbone attirait les moustiques. Ces résultats renforcent l'hypothèse selon laquelle le $CO_2$ joue un rôle important dans le comportement de recherche d'hôte chez les moustiques zoophiles, et suggèrent que l'acide lactique L pourrait jouer un rôle plus important que le $CO_2$ dans l'attirance d'*Anopheles stephensi.*

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Received: 29/06/10; accepted: 28/11/10

## Introduction

Malaria remains a major public health problem in southern part of the Islamic Republic of Iran; about 80% of all malaria cases in the country are reported from this region and there are 6 anopheline mosquitoes known to be malaria vectors [1–5]. *Anopheles stephensi* is an important malaria vector throughout south Asia, including the Indo–Pakistan subcontinent and the Middle East. However, it is one of the least anthropophilic malaria mosquitoes in the world [6]. It has 3 biological forms, type, intermediate and mysorensis.

Yearly, a large number of healthy years of human life are lost due to mosquito-borne diseases, including malaria. Excretion of waste materials through exhalation and skin emanations of sweat and respiration accompanied by the act of normal floral microorganisms unintentionally provide potent olfactory signals, inviting physiologically-competent mosquitoes to find and bite humans. Several studies have shown that mosquitoes exploit carbon dioxide ($CO_2$) as a chemical cue in their long-range orientation towards a potential host [7–10].

At the same time, while L-lactic acid alone is reported to be only slightly attractive, neutral or even repellent to mosquitoes, it has been shown that in combination with $CO_2$ it attracts them. This synergistic effect was first noticed for *Aedes aegypti* and then for *An. gambiae* [11], and Kline et al. showed that this binary blend increases catches of certain dipterans, including mosquitoes [12]. However, Stryker and Young did not detect this synergistic effect in the field except for *Ae. vexans* [13].

Although, these comparative studies shed light on principles governing the host-seeking behaviour of mosquitoes, it is clear that practical application of this knowledge in surveillance programmes or effective control measures needs further specific information of a given mosquito species in its locality.

There are 3 biological forms of *An. stephensi*; the mysorensis form is colonized and considered the main malaria vector in the country. Therefore, the aim of this study was to investigate the upwind responses of the mysorensis form of *An. stephensi* to $CO_2$ and L-lactic acid within a dual-choice olfactometer.

## Methods

### Mosquitoes

The *An. stephensi* used was the *mysorensis* form. It originated from Iranshahr, Islamic Republic of Iran and has been kept in the insectary of Tehran University of Medical Sciences, School of Public Health, since 2006. For this study a specific colony of this mosquito was used that was established under 29 ± 1 °C, 80% ± 5% relative humidity, light/dark cycle 12:12 h conditions, with a simulated nightfall at midday. Two small stock cultures of adult females were offered blood from Guinea pigs for 45 minutes biweekly in an alternative schedule. Eggs were laid on wet filter paper, hatched in water bowls and transferred to water-filled plastic trays the next day. Larvae (with density of 1 per mL of dechlorized tap water) were fed with Tetramin® fish food based on a fixed local protocol. Pupae were collected daily from the trays and transferred in populations of 1000–1500 into 30×30×30 cm gauze-covered adult cages. Adults were kept with access only to 10% glucose solution. All experiments were done on 4–5-day-old 8–10-h sugar-deprived host responsive female mosquitoes exactly during the first hour of the middle third of the scotophase. These mosquitoes were put in a population of 10 in 5 small cages and transferred to the laboratory in an opaque plastic box matted with wet tissues.

### Olfactometer, bioassays and procedures

A slightly modified Geier type dual-port olfactometer made by the authors was used [14]. Details of the apparatus have been described elsewhere [15]. In brief, charcoal-filtered, humidified (50% ± 2%) and warm air (29 ± 0.1 °C) was led via PVC pipelines to the olfactometer arms (15×25 cm acrylic cylinders, 15 cm apart). Wind speed in the cylindrical wind tunnel was kept constant at 0.4 m/s. Light from 2 25-watt incandescent bulbs hanging 80 cm above the olfactometer provided 11 lux scattered dim light during the experiments. Two 50×150 cm white plastic sheets at the bilateral sides of the wind tunnel prevented undesirable optical stimulation of mosquitoes.

A precise amount of the chemical stimuli regulated by fine flow meters and in a non-oscillating gaseous form were conducted to the treatment arm through silicone pipelines (5 mm internal diameter, 100 cm length). The flow meter for flow rates above 1000 mL/min was from a different manufacturer (MBLD Instrument Company, China). These chemicals were injected individually or in combination using separate large single bore steel needles piercing a circular rubber septum over a small hole located 3 cm from the treatment arm aperture. According Geier et al. this type of injection generates a homogeneous plume [14]. All injections were performed just a few seconds prior to releasing mosquitoes into the olfactometer.

Any stimulus dosage was tested in 2 consecutive experiment sets, each comprised 1 trial of no chemical stimulus injection as a control followed by 4 trials of test material. Injections were alternated between right and left arms to avoid a systematic bias. In each trial a small cage containing 10 fresh mosquitoes was connected to the downwind end of the wind tunnel. After 1–3 minutes acclimatization, mosquitoes were

allowed to freely choose olfactometer arms during 1 minute experimentation time after to injection of test material. Mosquitoes were removed with an electrical vacuum cleaner at the end of each experiment. The experimenter wore cotton gloves throughout the experiments and avoided touching inner parts of the olfactometer.

### Odours

$CO_2$ and L-lactic acid were tested individually and in combination within the olfactometer. Different concentrations of carbon dioxide were produced by serial injections of 50, 150, 300, 600, 900, 1200 and 2400 mL/min 2% carbon dioxide from a pressurized gas cylinder (Anagaz Co., Tehran) into the treatment arm. An infrared hand-held $CO_2$ analyser (Testo 535, Germany) was used to identify concentrations of these flows in the wind tunnel.

Various concentrations of L-lactic acid were used derived from passing incremental flows of clean dry air (from the air supply of the olfactometer) at 50, 150 and 450 mL/min through 100 mL of logarithmic dilutions of 1:10 or 1:100 aqueous L-lactic acid solutions (original concentration from Merck, Germany) in a 250 mL gas washing bottle. A rough estimation of the exact amount of L-lactic acid released in these flow rates was possible after Geier et al.[14]; therefore measurement attempts were made only for the most effective dosage due to difficulty in lactic acid detection at very low concentrations. To do this, the output of a certain flow of bubbling air in 200 mL of diluted L-lactic acid was passed through 2 serial gas washing bottles containing 100 mL distilled water over a 50-minute period. Trapped L-lactic acid in these 2 bottles was titrated by 0.001 N sodium hydroxide and 0.001 N hydrochloric acid. An estimate of the total amount of L-lactic acid was made from extrapolation of the rate of decrease of dissolved L-lactic acid in these bottles.

### Statistical analysis

The proportion of mosquitoes that left the small release cage and that were trapped inside either arm of the olfactometer at the end of 1 minute experimentation time represented activation (%) and attraction (%) to the treatment or control arms respectively. Data for each trial were entered in *SPSS*, version 11.50. Comparison of a series of variables was done by nonparametric Kruskal–Wallis test ($\alpha = 0.05$), as needed.

## Results

The infrared $CO_2$ analyser did not detect any rise in carbon dioxide (0 ppm) at 50 mL/min 2% $CO_2$ injection over the ambient level (400 ppm) (Figure 1). The most consistent part of this flow concentration function was for 150 up to 900 mL/min, equal to 40 to 270 ppm respectively; the greater the flow of injected $CO_2$, the greater the deviation from the expected concentration value. The highest and the lowest activation of *An. stephensi* was observed at 300 mL/min (90 ppm) and 2400 mL/min (890 ppm) 2% $CO_2$ injection respectively ($P = 0.003$ and 0.005) (Figure 2). However, attraction responses of mosquitoes to $CO_2$ were not significantly different at any concentrations examined or any paired treatment and control arms. In the case of L-lactic acid alone, no stimulus dosage produced

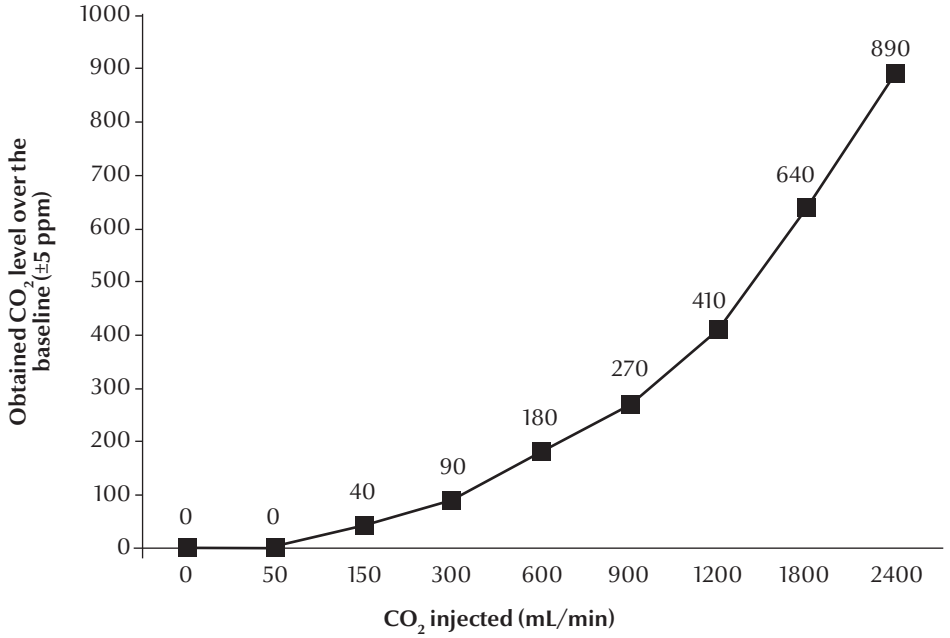



**Figure 1 Flow concentration function for $CO_2$ 2% injection in the wind tunnel over the background level**

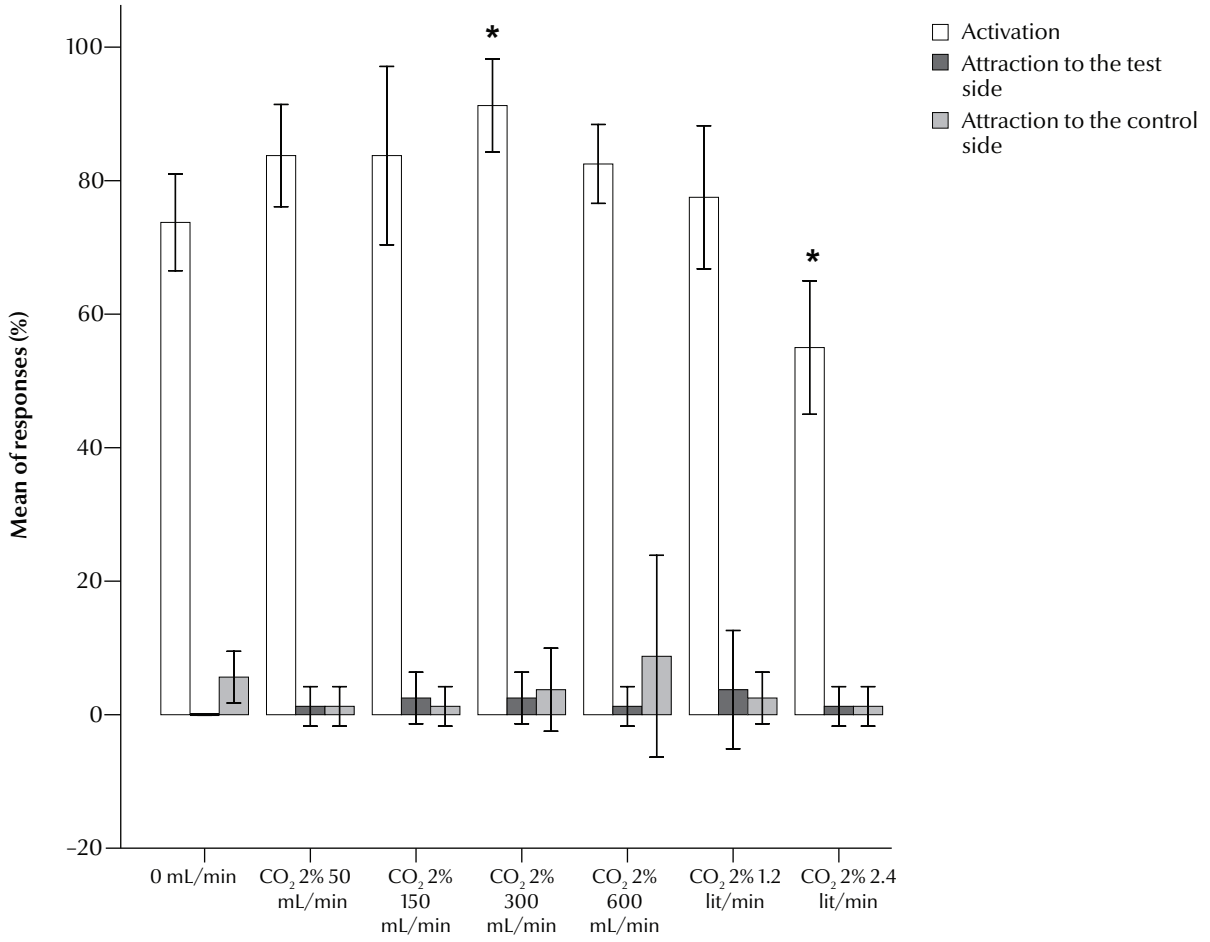



**Figure 2 Upwind responses of *Anopheles stephensi* to different doses of $CO_2$ in the olfactometer: * indicates significant difference ($P < 0.05$) compared with control trial**

a statistically different activation or attraction response (Figure 3). This figure also did not change with proportion of mosquitoes activated in response to any binary blend of $CO_2$ and L-lactic acid (Figure 4). Addition of either 50 or 2400 mL/min 2% $CO_2$ to L-lactic acid at any dilution or flow rate also did not attract mosquitoes at all or the attraction to the treatment arm was not significantly different from the control arm. This corresponds to data from the $CO_2$ analyser and $CO_2$ experiments since the concentration of $CO_2$ in the wind tunnel was no different from the ambient level at 50 mL/min 2% $CO_2$ injection, and injection of 2400 mL/min 2% $CO_2$ (890 ppm) somehow deterred mosquitoes from following the $CO_2$ trail too. On the other hand, injection of either 300 (90 ppm) or 1200 (410 ppm) mL/min 2% $CO_2$ in the treatment arm evoked attraction at almost all injected L-lactic acid dilutions and flow rates. However, the attraction was significantly different from the control are only at the maximum dose of L-lactic acid injection, i.e. 1:10 dilution and 450 mL/min. At this flow rate about 6 µg/min L-lactic acid is released into the olfactometer which is measured by a titration technique.

The mean activation responses of mosquitoes in no-stimulus tests were statistically different from $CO_2$, L-lactic acid, and $CO_2$ plus L-lactic acid experiments (Kruskal–Wallis, $P < 0.001$) (Table. 1).

## Discussion

This study, conducted on the mysorensis form of *An. stephensi* as a model, provides further support for the common finding that $CO_2$ activates and L-lactic acid in the presence of carbon dioxide attract mosquitoes.

### Carbon dioxide experiments

In these experiments mosquitoes were activated with a homogeneous plume of about 0.01% $CO_2$ over the ambient level. To our knowledge this is the first report of activation response of *An. stephensi* to such a low level of $CO_2$. We also observed that this reaction was relatively diminished with 10 times more $CO_2$, i.e. about 0.1%. Takken et al. used pulses of 5% $CO_2$ instead and found that while individuals of this mosquito species were activated at this human equivalent concentration, *An. gambiae* ss does not respond to it well [16]. In a similar study, where *An. quadriannulatus*

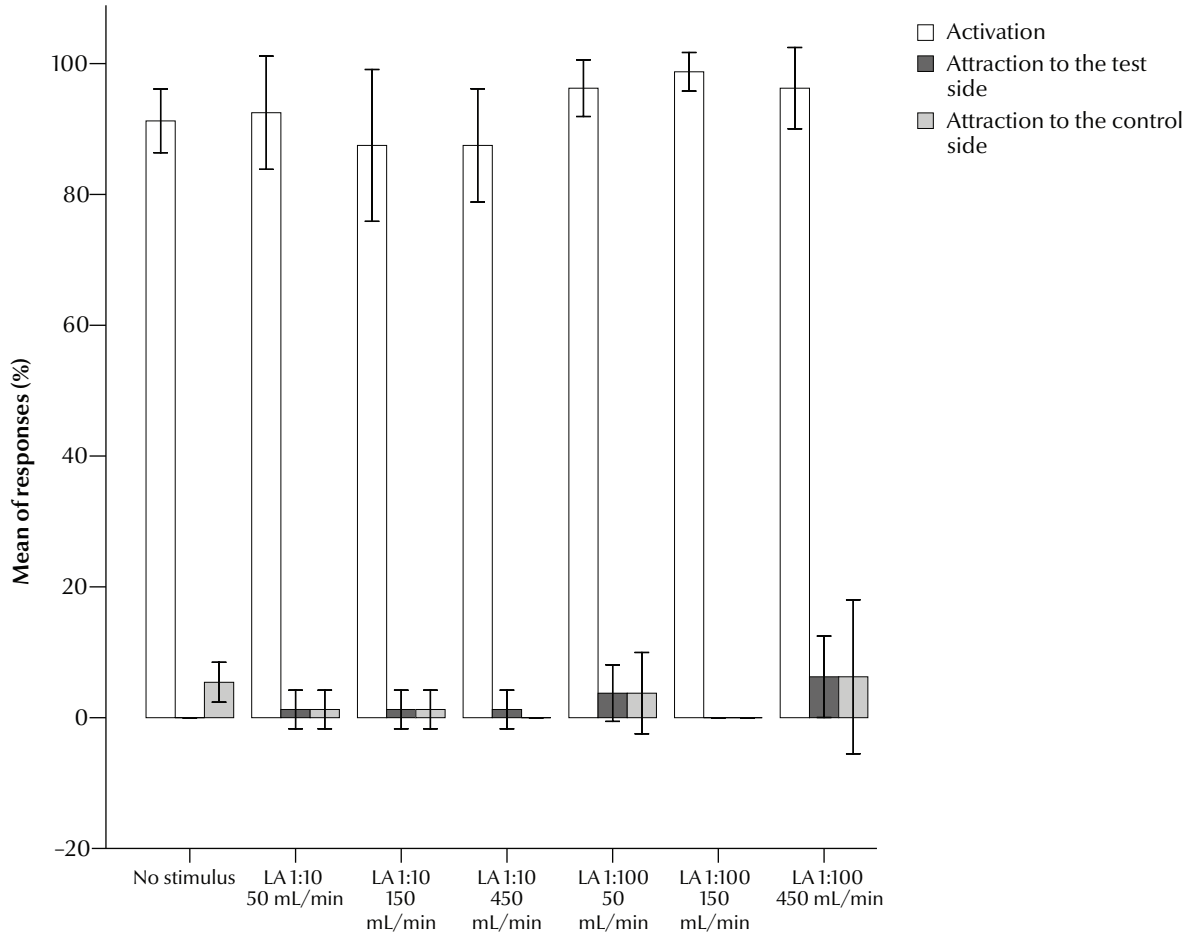
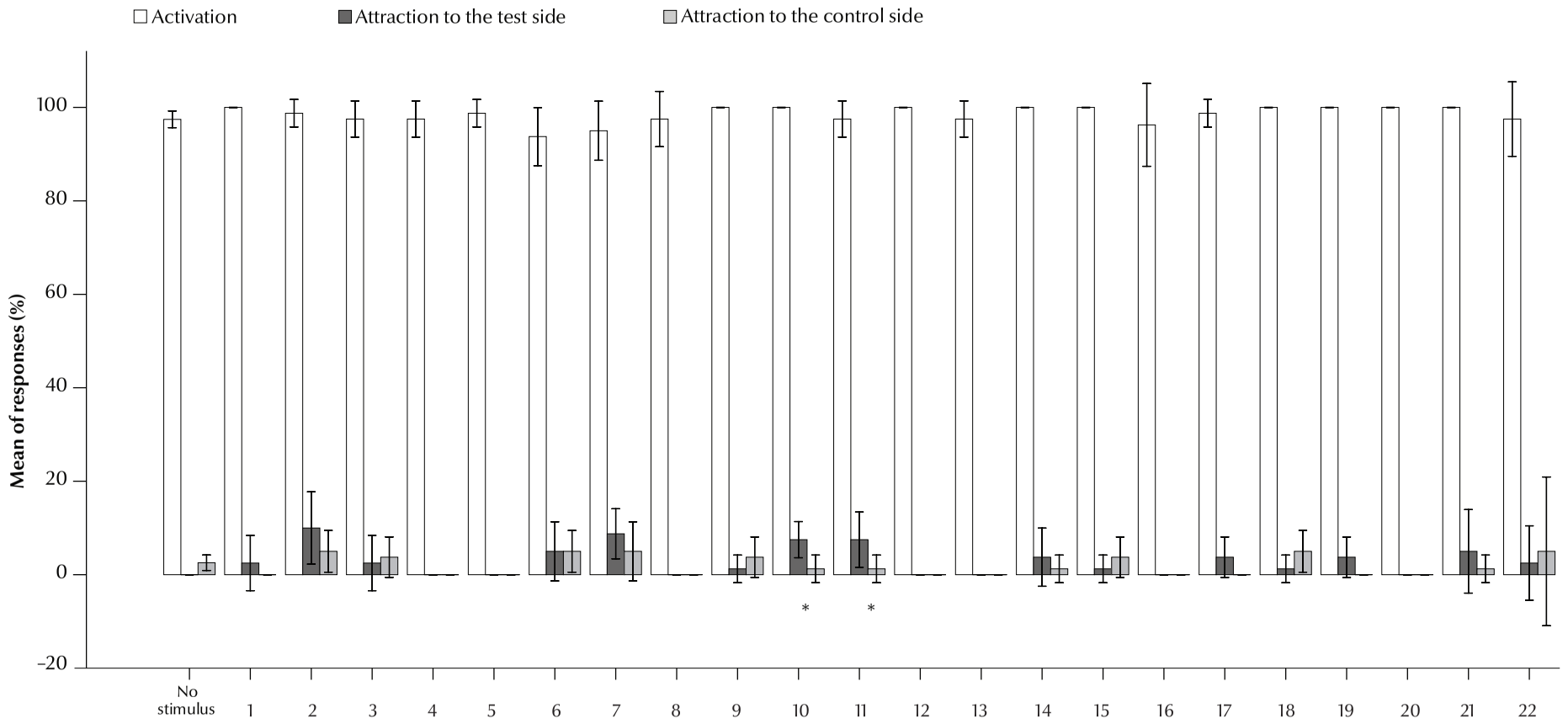



**Figure 3 Upwind responses of *Anopherles stephensi* to different doses of L-lactic acid (LA) in the olfactometer**

showed a strong response to $CO_2$ even in the presence of its preferred cow host, *An. arabiensis* had a poor response [17]. These results are consistent with findings from field studies in which *An. gambiae* ss and *An. arabiensis* showed a low level of attraction to $CO_2$ [18]. Even a 5-fold increase in the emission rate of $CO_2$ did not improve attractions of *An. gambiae* ss and *An. arabiensis*. There is also evidence that anthropophilic *Culex quinquefasciatus* responds poorly to $CO_2$ both under laboratory conditions [19] and in the field [20]. In all of these studies, the authors postulated that specialist mosquitoes such as anthropophilic *Cx. quinquefasciatus*, *An. gambiae* ss and to some extent *An. arabiensis* rely on more specific cues like skin emanations to find their preferred human host. But in opportunistic or more generalist species like zoophilic *An. quadriannulatus* and *An. stephensi* $CO_2$ could be enough to find a potential host. We believe that our results are in line with these findings and support the hypothesis that the role of $CO_2$ increases with degree of zoophily. Nevertheless, a few issues need to be considered here.

First, although Takken et al. used 4.5% $CO_2$ in their experiments, this concentration decreased upon its injection into the wind tunnel air flow [16]. On the other hand, it is known that the $CO_2$ exhaled by a human is immediately diluted in the ambient air to an estimated concentration of between 0.01% and 1.0% [21]. Therefore, it is likely that the results of these 2 studies are not far different.

Second, it is generally believed that the change in the concentration of $CO_2$ is more important than its actual level and elicits behavioural responses in mosquitoes [22,23]. On the other hand, electrophysiological recording from $CO_2$ sensitive sensilla on maxillary palps of mosquitoes shows that the housing neuroreceptor cells are rapidly adapted to $CO_2$ exposure in a phasic tonic manner. Moreover, the importance of the structure of the odour plume in the upwind responses of mosquitoes has been also illustrated well [14]. Adding to these facts, we frequently observed that some mosquitoes took off with a few seconds delay after confronting the oncoming wave of injected carbon dioxide. All these pieces of evidence together suggest that perhaps the geometry of our wind tunnel, accompanied by the very low concentration of $CO_2$ we used, was such that the generated odour




**1** = LA 1:10 50 mL/min, $CO_2$ 2% 50 mL/min; **2** = LA 1:10 50 mL/min, $CO_2$ 2% 300 mL/min; **3** = LA 1:10 50 mL/min, $CO_2$ 2% 1.2 mL/min; **4** = LA 1:10 50 mL/min, $CO_2$ 2% 2.4 mL/min; **5** = LA 1:10 150 mL/min, $CO_2$ 2% 50 mL/min; **6** = LA 1:10 150 mL/min, $CO_2$ 2% 300 mL/min; **7** = LA 1:10 150 mL/min, $CO_2$ 2% 1.2 mL/min; **8** = LA 1:10 150 mL/min, $CO_2$ 2% 2.4 mL/min; **9** = LA 1:10 450 mL/min, $CO_2$ 2% 50 mL/min; **10** = LA 1:10 450 mL/min, $CO_2$ 2% 300 mL/min; **11**= LA 1:10 450 mL/min, $CO_2$ 2% 1.2 mL/min; **12**= LA 1:10 450 mL/min, $CO_2$ 2% 2.4 mL/min; **13**= LA 1:100 50 mL/min, $CO_2$ 2% 50 mL/min; **14**= LA 1:100 50 mL/min, $CO_2$ 2% 300 mL/min; **15**= LA 1:100 50 mL/min, $CO_2$ 2% 1.2 mL/min; **16**= LA 1:100 150 mL/min, $CO_2$ 2% 50 mL/min; **17**= LA 1:100 150mL/min, $CO_2$ 2% 300 mL/min; **18**= LA 1:100 150 mL/min, $CO_2$ 2% 1.2 mL/min; **19**= LA 1:100 450 mL/min, $CO_2$ 2% 50 mL/min; **20**= LA 1:100 450 mL/min, $CO_2$ 2% 300 mL/min; **21**= LA 1:100 450 mL/min, $CO_2$ 2% 1.2 mL/min; **22**= LA 1:100 450 mL/min, $CO_2$ 2% 2.4 mL/min

**Figure 4 Upwind responses of *Anopheles stephensi* to blends of $CO_2$ and L-lactic acid (LA) in the olfactometer: * indicates significant difference ($P < 0.05$) compared with control trial**

**Table 1 Mean and standard deviation (SD) of the activation responses of *Anopheles stephensi* in control trials of different experiments**

| Experiment | Mean (SD) (%) | No. of replicates |
|---|---|---|
| Carbon dioxide | 77.50 (11.38) | 12 |
| L-lactic acid | 90.00 (10.44) | 12 |
| Carbon dioxide + L-lactic acid | 97.44 (5.81) | 43 |

plume was not completely homogeneous. Besides, the odour plume shape and its variability are more important in the attraction of mosquitoes than in their activation.

Third, Grant and O'Connell with the aid of electrophysiological techniques demonstrated that the $CO_2$ concentration–response curves for $CO_2$ receptor neurons in the sensilla basiconica of mosquitoes from 3 different genera, including anthropophilic and zoophilic species, are more or less similar [24]. This implies that behavioural dissimilarity of various mosquitoes, including the mysorensis form of *An. stephensi*, in responding to a given concentration of $CO_2$ is modulated at the central level.

Fourth, even though Kellogg showed that electrophysiological responses of the phasic peaks of $CO_2$-sensitive receptors in the maxillary palp of *Ae. aegypti* saturate at levels between 0.0% and 0.5%, the negative effect of $CO_2$ on the activation of *An. stephensi* at about 0.1% cannot be easily explained [25]. Nonetheless, the structure of the generated odour plume in the olfactometer and the specific sensitivity of the mosquito species examined probably play a part here.

## L-lactic acid and L-lactic acid plus carbon dioxide experiments

Based on the work of Geier et al., it might be roughly estimated that we tested 0.018 to 19 μg/min of L-lactic acid in our series of experiments [14]. However, the largest dosage used (450 mL/min of 1:10 L-lactic acid) gave only 6 μg/min of L-lactic acid in our olfactometer as measured by a chemical titration technique. Perhaps the most direct cause of this difference comes from the fact that we applied bubbling air passed in an L-lactic acid solution instead of using the headspace air over it. In any case, part of the examined range overlaps with the rate of L-lactic acid output from human hands and arms, which has been measured to be between 0.38 and 2.2 μg/min [26].

Dealing with the activation responses, it is clear that the means in no stimulus trials were very high (Table 1). It is worth saying here that this was observed despite the experimenter using cotton gloves throughout the experiments, careful avoidance of touching the inner parts of the wind tunnel, occasional washing of the wind tunnel with absolute ethanol, supply of air to the olfactometer from outside the building and finally strict control of wind speed, temperature and humidity in the wind tunnel. Therefore, where mosquitoes are already maximally active, one cannot make inferences on the activating effect of the test stimuli.

L-lactic acid alone in the doses we tested did not attract the mysorensis form of *An. stephensi*. A few works have previously reported the same result for other mosquito species. Acree et al. showed that attraction of *Ae. aegypti* to 10 μg of L-lactic acid is not more than 1% in 3 minutes experimentation time [27]. Also, an air stream containing either 153 μg [11] or 1000 μg [28] of L-lactic acid was not attractive for *An. gambiae*. In the field, L-lactic acid was not able to improve the trapping of mosquitoes of different genera in a CDC light trap either [12]. Catches of *Ae. albopictus* in traps baited with L-lactic acid were not statistically different from controls in another field study [29]. However, conflicting with these results are a few reports on slight attraction or even repellence to this compound. Geier et al. found that *Ae. aegypti* was attracted to 3 μg/min of L-lactic acid in the wind tunnel [14]; Williams et al. showed that 4 different geographical strains of *Ae. aegypti* were attracted to L-lactic acid but that the threshold dose for the same level of attraction was remarkably unequal and ranged from 0.03 to 10.27 μg/min [30]. From these studies, including our experiments, it can be inferred that L-lactic acid alone weakly attracts mosquitoes, if at all, especially anopheline species. Perhaps the main sources of variation in the results are the dosages used, the olfactometer type, the experimentation time and protocol, the structure of the odour plume and the mosquito species and geographical strain. Even the atmospheric pressure on the day of experiment is considered to modulate to some extent the attraction responses of mosquitoes [31].

In our study, only the highest dose of L-lactic acid used, i.e. 6 μg/min in combination with either 90 or 410 ppm $CO_2$, attracted *An. stephensi*. Inability of the lower doses of L-lactic acid to synergize with $CO_2$ indicates its dose dependency. This synergistic effect has been previously reported for other mosquitoes; 10 μg of L-lactic acid in the presence of 1000 ppm $CO_2$ attracted 29% to 75% of *Ae. aegypti* in 3 minutes [27]. Nearly the same response has been reported by others [14]. They showed that 8 μg of L-lactic acid in an air current containing 1000 ppm $CO_2$ attracted 86% of *Ae. aegypti*, considerably higher than the 20% and 41% for either L-lactic acid or $CO_2$ alone respectively.

The synergistic action was observed with a fixed dose of L-lactic acid in contrast to a variable dose of $CO_2$. Such a modulatory effect of L-lactic acid over $CO_2$ may be because the L-lactic acid plays a more critical role than $CO_2$ in the attraction responses of mosquitoes. This hypothesis is supported by the findings that addition or removal

of a certain dose of L-lactic acid to or from human skin extracts significantly increases or decreases attraction of *Ae. aegypti* [32].

Regarding the synergistic effect of L-lactic acid with $CO_2$ 2 points should be noted. First, the level of augmented attraction observed under laboratory conditions has never been seen in field studies [12,13,33]. This may stem partly from the strong modifying influence of environmental factors, such as the structure and shape of the odour plume on source-searching behaviour of mosquitoes under uncontrolled conditions. Second, $CO_2$ alone or in combination with L-lactic acid elicited no change in spike frequency of L-lactic acid-sensitive neurons in the antennae of *Ae. aegypti*, indicating that the behavioural synergism of $CO_2$ and L-lactic acid occurs centrally and not at the primary receptor level [34].

## Conclusion

This study provides further support for the hypothesis that $CO_2$ plays a more important role in the host-seeking behaviour of zoophilic mosquitoes than the anthropophilic mosquito species. It also suggests that L-lactic acid might play a more critical role than $CO_2$ in the attraction of *An. stephensi* as a certain dose of L-lactic acid modulates the effect of a range of doses of $CO_2$.

If field trials verify these findings, this information can be used for the development of species-specific odour-baited entry traps which could provide a better estimation of population dynamics of this malaria mosquito in surveillance programmes at least.

## Acknowledgements

The authors are grateful to Dr Patrick Guerin, Department of Animal Sensory Physiology, University of Neuchâtel, Switzerland as his critical discussions and comments on olfaction-based behaviours of mosquitoes. Thanks are also due to Dr Thomas Kröber, Department of Animal Sensory Physiology, University of Neuchâtel, Switzerland.

This study was financially supported by the School of Public Health, Academic Pivot for Education and Research, Tehran University of Medical Sciences, project No. 85-01-63-3687.

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# Obstacles to undertaking research and their effect on research output: a survey of faculty members' views at Shiraz University of Medical Sciences

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**عوائق إجراء البحوث وتأثيراتها على نتائجها: مسح لآراء العاملين في كلية العلوم الطبية في جامعة شيراز**

زهرا كريميان، زهرا صباغيان، آسية صالحي، بهرام صالح صدق بور

**الخلاصة:** إن تحسين جودة البحوث تقتضي فهم عوائق إجراء البحوث. وتهدف هذه الدراسة إلى (1) التعرف على عوائق البحوث كما يراها العاملون في كلية العلوم الطبية في شيراز؛ (2) الفروق بين آرائهم بحسب الجنس والمتغيرات المهنية، (3) تأثير العوائق على أنشطة البحوث. وقد أخذ الباحثون في الحسبان ستة أنماط من العوائق هي المالية، وذات الصلة بالمرافق، والعوائق المهنية، والإدارية – التنظيمية، والعلمية، والشخصية. وتألفت عينة الدراسة من 240 مشاركاً تم انتقاؤهم من 550 من العاملين في الكلية. وجمع الباحثون المعطيات بواسطة استبيان يملأ ذاتياً، ووجدوا أن معدل الاستجابة 91٪، وأن جميع الأنماط الستة من العقبات ينظر إليها معظم المستجيبين للدراسة على أنها تؤثر على أنشطة البحوث؛ إلا أن 90٪ منهم قد حددوا العوائق المالية. وكان هناك فروق واضحة بسبب اختلاف الجنس والدرجة العلمية ومجال الدراسة، وتحمل مسؤوليات تنفيذية، دون أن يشمل ذلك فترة الخدمة في العمل. ورغم وجود هذه العوائق المتعددة أمام إجراء البحوث فإن المستجيبين للدراسة لم يعتقدوا بأن نتائج البحوث قد تأثرت.

ABSTRACT To improve the quality of research, it is necessary to understand the obstacles to undertaking research. This study aimed to identify: i) internal obstacles to research as considered by faculty members at Shiraz University of Medical Sciences; ii) differences between their viewpoints by gender and professional variables; and iii) the effect of these obstacles on research activity. Six types of obstacle were considered: financial, facility-related, occupational, managerial–organizational, scientific and personal. The study sample consisted of 240 participants selected from all 550 faculty members of the University. Data were collected by self-administered questionnaire; the response rate was 91%. All 6 types of obstacle were considered to affect research activities by most of the respondents, with 90% identifying financial obstacles. There were significant differences by gender, scientific rank, field of study, and holding executive responsibilities but not for durations of work experience. Despite these numerous obstacles to conducting research, respondents did not think their research output was affected.

**Obstacles à la conduite d'une recherche et leur effet sur le résultat de la recherche : enquête sur les points de vue des membres du corps enseignant de l'Université des Sciences médicales de Chiraz**

RÉSUMÉ Pour améliorer la qualité de la recherche, il est nécessaire de comprendre les obstacles à la conduite d'un tel travail. La présente étude visait à identifier : i) des obstacles internes à la recherche du point de vue des membres du corps enseignant de l'Université des Sciences médicales de Chiraz ; ii) des différences entre leurs points de vue en fonction des sexes et des variables professionnelles ; et iii) l'effet de ces obstacles sur l'activité de recherche. Six types d'obstacles ont été étudiés : les obstacles d'ordre financier, professionnel, gestionnaire ou organisationnel, scientifique et personnel et en relation avec l'établissement. L'échantillon de l'étude comptait 240 participants qui avaient été sélectionnés parmi les 550 membres du corps enseignant de l'Université. Les données ont été recueillies par auto-questionnaire ; le taux de réponse était de 91 %. La plupart des répondants considéraient que les six types d'obstacles influaient sur les activités de recherche, et 90 % avaient identifié les obstacles financiers. Les différences entre les hommes et les femmes, le grade scientifique, les domaines d'études et le fait d'avoir des responsabilités de direction étaient significatives, contrairement aux années d'expérience professionnelle. En dépit de ces nombreux obstacles à la conduite d'un travail de recherche, les répondants ne pensaient pas que les résultats de recherche étaient affectés.

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Received: 09/08/11; accepted: 02/11/11

## Introduction

Research is one of the main foundations of sustainable development, and the long-term development of research policies without a comprehensive research system is simply not possible [1–3]. Research is so important that indices such as the national investment in research, the number of researchers referred to the total population and the number of published papers are considered criteria in judging a country's progress [3].

The number of publications from the Islamic Republic of Iran has grown from just 736 in 1996 to 13 238 in 2008 [4]; however, the country's participation in global knowledge production has not been satisfactory in terms of published papers. Furthermore, in 2005 the average participation of the Islamic Republic of Iran in knowledge production was only about 0.2%, although this country is home to about 1.0% of the world's population [5]. This implies that to reach the world average in research and knowledge production, the Islamic Republic of Iran should consider strategies to increase its output, such as recruiting skilled human resources, enhancing scientific culture and infrastructure, preparing suitable research tools, and investing in targeted research fields. Lack of financing and resource distribution are key barriers to researchers in all developing countries. The research budget in a typical developed country falls somewhere between 3% and 5% of the GNP [6], whereas in the Islamic Republic of Iran it ranges from 0.2% to 0.4% of the GNP [7,8]. Official bureaucracy, the quantitative orientation of research evaluation, and biases in judging research projects are other obstacles to carrying out research [3].

Lack of interaction and a common language between researchers and scientific policy-makers is another challenge in research, which can undermine the efficient application of research results [9–11]. Majumdar investigated the causes of the inapplicability of medical research in Asian countries [12]; one of the main causes identified was the incongruity between research and the actual needs of these communities.

The greatest barriers to involvement in research in medical schools according to Siemens appear to be time, availability of research mentors, formal teaching of research methodology and the perception that the student would not receive appropriate acknowledgement for work put towards a research project [13].

Uncovering obstacles to research is an important first step towards improving the quality of research. Therefore the research we report here was designed to identify internal obstacles to research activities at a large medical university in the Islamic Republic of Iran in 6 fields: financial, facility, occupational, managerial–organizational, scientific and personal. This paper attempts to answer 3 major questions:

- What are the main inter-organizational obstacles to research activities as seen by faculty members?
- Do the viewpoints faculty members about obstacles affect the quantity of their research?
- Are there differences in the viewpoints of faculty members associated with gender, scientific rank, field of study, executive responsibilities and duration of work experience?

## Methods

### Study sample

This study was a descriptive cross-sectional survey conducted in 2008. The study population was the 550 faculty members of the 8 schools and 15 research centres of Shiraz University of Medical Sciences. The study sample consisted of 227 participants selected from the 550 faculty members by stratified random sampling. We had to select all of the academic staff of some faculties as they had only few such staff (for example the school of health services management); as a result the final sample increased from 227 to 240 participants.

### Data collection

Data were collected by a self-completed, anonymous questionnaire in Farsi devised by the authors. The instrument consisted of 46 closed-ended items, demographic and occupational items, and 3 open-ended items. The responses to the closed-ended questionnaire items were chosen from a 4-point Likert-like scale where 4 = agree, 3 = agree somewhat, 2 = disagree somewhat and 1 = disagree.

The respondents were asked about 6 types of inter-organizational obstacles to research activities: financial, facility-related, professional, scientific, personal and managerial–organizational.

Internal and external validity of the questionnaire were confirmed by review of the relevant scientific literature and review by 15 faculty members from the different schools and centres. The Cronbach alpha coefficient for reliability of the questionnaire was 92.8% based on in a pilot study with faculty members.

Questionnaires were distributed to all 240 participants by one of the researchers who explained the purpose of the study to them.

### Analysis

The analysis of the data was intended to answer 3 basic questions about the influence of obstacles to research on faculty members' research activity. To test the first question, the single-sample *t*-test was used. The second question assessed the effect of faculty members' viewpoints on the quantity of their research activities and there was more than 1 dependent variable (number of papers and research projects). As the variables may have interacted, MANOVA (multivariate analysis of variance) with Wilks' index was therefore used. Independent-sample *t*-tests, one-way ANOVA and the Tukey test were used for the third question.

*SPSS*, version 15 was used for data analysis.

## Results

Of the 240 questionnaires distributed, 218 were returned fully answered (response rate 91%).

The demographic characteristics of the sample are shown in Table 1. Just over half were male (53.3%), the greatest proportion were assistant professors (44.1%); 5.6% were professors. The majority were in the medical or paramedical field (72.4%) and the greatest proportion were in the faculty of medicine (37.4%) followed by nursing/midwifery (13.2%). Just under half had executive responsibilities (46.3%) and 40.2% had less than 10 years' work experience while 39.3% had 11–20 years.

With regard to the main inter-organizational obstacles to research activities, all 6 types of obstacles were reported (financial, facility-related, professional, scientific, personal, managerial–organizational) ($P < 0.01$). Table 2 shows the average percentage agreement scores for each question. The highest average agreement score was found for the financial domain and the lowest for scientific factors.

To elucidate whether faculty members' viewpoints about obstacles affected the quantity of their research, agreement rates were analysed with Wilk's lambda index. The results showed that in the faculty members' views financial obstacles had a significant effect on their research output ($P < 0.03$) while facility, professional, scientific, personal and managerial–organizational obstacles had no influence ($P > 0.05$) (Table 3).

The analysis of third question sought association between faculty members' viewpoint and their gender, scientific rank, field of study, executive responsibilities, and work-experience. There were significant differences by sex, scientific rank, faculty, field of study and executive responsibility in faculty members' viewpoints about professional, personal and managerial obstacles ($P < 0.05$) (Table 4). However, there were no significant associations between demographic variables and the responses regarding other obstacles (Table 4). The average agreement scores for perceived obstacles were higher for instructors and assistant professors than for associate and full professors, and these differences were significantly related to professional, personal and managerial-organizational obstacles ($P < 0.01$). There were also significant differences between faculty members' viewpoints about scientific obstacles and their field of study; respondents from the basic medical sciences fields had the lowest average agreement for scientific obstacles, whereas participants from the medical surgery and nonmedical fields most often agreed that there were scientific obstacles ($P < 0.01$). In addition, faculty members who had more executive responsibilities identified fewer obstacles than other respondents, and this difference was significant for personal obstacles ($P < 0.01$). There were no significant differences between

**Table 1 Demographic characteristics of faculty members of Shiraz University of Medical Sciences who completed the questionnaire**

| Characteristic | % (*n* = 240) |
|---|---|
| ***Sex*** | |
| Male | 53.3 |
| Female | 46.7 |
| ***Scientific rank*** | |
| Lecturer | 32.2 |
| Assistant professor | 44.1 |
| Associate professor | 18.1 |
| Professor | 5.6 |
| ***Field of study*** | |
| Surgeon | 15.0 |
| Non-surgeon physician | 16.3 |
| Medical basic sciences | 34.4 |
| Paramedical | 16.7 |
| Non-medical fields | 17.6 |
| ***Faculty*** | |
| Medicine | 37.4 |
| Dentistry | 9.7 |
| Pharmacy | 7.0 |
| Nursing and midwifery | 13.2 |
| Rehabilitation | 4.4 |
| Paramedicine | 10.2 |
| Health and management | 9.7 |
| Other research centres | 8.4 |
| ***Has executive responsibility[a]*** | |
| Yes | 46.3 |
| No | 53.7 |
| ***Work experience (years)*** | |
| < 10 | 40.2 |
| 11–20 | 39.3 |
| > 21 | 20.5 |

[a]*Have additional managerial responsibilities.*

**Table 2 Average agreement for different internal obstacles to research activities according to faculty members of Shiraz University of Medical Sciences**

| Obstacle | Item | % agreement scores | |
|---|---|---|---|
| | | Mean | SD |
| Financial | Lower funding for research activities than other activities | 90.2 | 14.9 |
| | Allocation of research budget is based on reputation and influence | 89.2 | 15.9 |
| | Insufficient budget for scientific research activities | 87.8 | 15.6 |
| | Unsuitable regulations and mechanisms for research proposal budgeting (extreme bureaucracy) | 87.6 | 15.3 |
| | Lack of independence of university in budget allocation and a dependence on governmental budget | 85.6 | 16.3 |
| | Inappropriate allocation of budget and facilities of the university | 84.1 | 18.9 |
| | University unable to acquire all the available research budget due to inappropriate organization | 78.8 | 18.8 |
| Facility-related | Difficulty and delays in funding procurement process | 90.0 | 13.5 |
| | Lack of skilled and efficient co-researchers | 87.3 | 17.2 |
| | Insufficient access to up-to-date, accurate databases at the university | 86.1 | 14.9 |
| | Lack of research materials | 82.1 | 19.2 |
| | Lack of active research cores in the university | 81.0 | 17.9 |
| | Lack of suitable computer facilities and laboratories for research | 77.9 | 19.9 |
| | Lack of skilled service staff (such as typists, laboratory technicians, etc.) | 78.1 | 20.3 |
| | Inefficiency of university's consultation centres | 75.7 | 19.1 |
| | Insufficient access to scientific references (libraries, scientific database subscriptions, full text articles, documents, etc.) | 64.0 | 22.1 |
| Professional | Involvement in routine executive activities | 87.0 | 16.5 |
| | Heavy load of executive work and insufficient time for research | 86.1 | 16.5 |
| | Lack of proper connection with other research organizations | 83.4 | 17.7 |
| | Personal finanacial problems of faculty members | 83.1 | 20.8 |
| | Limitations to and difficulties in taking part in professional development opportunities | 80.8 | 20.5 |
| | Obstacles to attending seminars and conferences abroad | 73.4 | 23.4 |
| Scientific | Lack of sufficient knowledge of research methods, statistical tests, questionnaire preparation, etc. | 85.6 | 18.5 |
| | Lack of sufficient skills with computer hardware and software | 80.0 | 19.9 |
| | Lack of sufficient skills in writing scientific papers | 79.8 | 17.8 |
| | Lack of suitable skills for preparing articles for international journals and presentations at congresses | 78.9 | 20.3 |
| | Lack of suitable skills for identifying, describing, analysing, and processing research problems | 76.6 | 17.8 |
| | Lack of suitable skills in searching for international articles and using electronic journals | 75.8 | 20.4 |
| | Lack of suitable skills in using foreign language references in different studies | 70.3 | 23.4 |
| Personal | Self-centred attitude among faculty members and lack of involvement in group activities | 87.3 | 15.5 |
| | Declining scientific involvementa | 84.0 | 17.0 |
| | Increasing apathy among faculty members over community's problems | 81.9 | 18.9 |
| | Lack of researchers' commitment to research and scientific trustworthiness | 80.4 | 17.4 |
| | Copying research ideas from other researchers rather than trying to address current problems of society | 79.8 | 18.9 |
| | Lack of individual motivations for research | 79.4 | 21.1 |
| | Personal and family problems | 78.1 | 21.8 |

**Table 2 Average agreement for different internal obstacles to research activities according to faculty members of Shiraz University of Medical Sciences (*concluded*)**

| Obstacle | Item | % agreement scores | |
|---|---|---|---|
| | | Mean | SD |
| Managerial and organizational | Lack of effectiveness of university research in improving society's affairs | 87.7 | 15.1 |
| | Unsuitable evaluation of research performance (lack of distinction between original research and fraudulent or repetitive work) | 86.9 | 16.3 |
| | Insufficient cooperation among medical sciences and other sectors of research activities | 86.5 | 14.7 |
| | Redundant work and repetition of similar research at universities because of inappropriate organization and lack of information | 84.4 | 15.7 |
| | Allocation of research budget to problems that havea trivial impact on society | 83.4 | 17.0 |
| | Unfair and unreasonable evaluation of research | 83.2 | 16.9 |
| | Innumeracy of referees and policy-makers who review the research proposals | 80.3 | 18.5 |
| | Lack of information about research resources, facilities and regulations | 79.5 | 17.1 |
| | In effective motivation system | 79.4 | 19.2 |
| | Insufficient support for researchers | 75.2 | 22.1 |

[a]*Becasue of other managerial responsibilities.*
*SD = standard deviation.*

faculty members' viewpoints and their work experience ($P > 0.05$).

According to the faculty members in the study, research evaluation was sometimes quantitative and aimed at annual promotion.

## Discussion

### Obstacles

#### *Financial*

Our study showed that the large majority of the faculty member clearly identified financial issues and lack of funding as an obstacle to research. This is not surprising as according to other research, financial issues are one of the greatest obstacles to research activities [9,10,14–16]. Majumder also stated that financial and economic obstacles were the most important problems in Asian developing countries [12].

#### *Facility-related*

In this area, the difficult and time-consuming processes needed to obtain and prepare materials to obtain funding was the obstacle that participants identified most often. This is in agreement with Hosseini and Shmsaie [17], who surveyed facility-related obstacles in agricultural research and reported that these obstacles were considerable, and others, who noted lack of research facilities, lack of funding for libraries, out-of-date references, and lack of resources and materials for research activities as important obstacles [12,18,19]. An important consideration here is that in medical sciences, most research is experimental and requires laboratory facilities and materials, medical equipment, and laboratory animals and their maintenance; thus, financial support to obtain and maintain facilities and equipment is imperative.

The vast majority of the respondent also agreed that the lack of skilled co-researchers was an obstacle and Tareff reported that recruiting capable staff and co-researchers who can make efficient use of facilities is more important than procuring facilities [3].

#### *Professional*

All respondents clearly indicated that their day-to-day work and /or involvement in executive work curtailed the time they had for research. This concurs with many researchers who reported that a heavy workload was a significant obstacle to research activities [18,20–22]. Involvement in executive and official activities not only wastes large portions of faculty members' time but can also weaken their motivation for research and replace it with a tendency to do executive tasks [3]. However, our results are in contrast with those of Hosseini and Shamsaie among agriculture scientists who found that professional obstacles were the least important [17]. This discrepancy may reflect differences in the research fields of the respondents (agriculture versus health science fields). Faculty members in medical fields may work in various departments (outpatient, operating room) or in field work and may also work in their private practice so they have virtually no time for research.

#### *Scientific*

Although the majority of respondents agreed that there were scientific obstacles to conduct research, the agreement scores were the lowest, lack of adequate knowledge of scientific methods being the scientific obstacle most agreed with. Other researchers have reported that

**Table 3** Effect of faculty members' viewpoints about obstacles on their research output (Wilk's lambda index)

| Obstacle | Value | *F* | Hypothesis df | Error df | *P*-value |
|---|---|---|---|---|---|
| Financial | 0.944 | 2.624 | 4 | 356 | 0.03 |
| Facility-related | 0.977 | 1.051 | 4 | 356 | 0.381 |
| Professional | 0.964 | 1.644 | 4 | 356 | 0.16 |
| Scientific | 0.976 | 1.086 | 4 | 356 | 0.36 |
| Personal | 0.954 | 2.108 | 4 | 356 | 0.07 |
| Managerial and organizational | 0.990 | 0.459 | 4 | 356 | 0.76 |

*df = degrees of freedom.*

a lack of necessary knowledge about scientific research methods, a lack of information about statistical methods, and the lack of foreign language skills for research were the main scientific obstacles [13,14,23].

In our study only 70.3% agreed that insufficient foreign language skills was an obstacle making it the least important obstacle; however the standard deviation was 23.4% for this item indicating a wide divergence of views.

### *Personal*

The majority of the respondents agreed that personal obstacles existed which concurs with other studies [23–25]. Funk recognized that there is a direct relationship between personal incentives and the amount of research activity undertaken [24].

Among the personal obstacles mentioned, a self-centred attitude was the main obstacle. An earlier survey showed that experts and researchers in developing countries preferred to be more independent in their activities because of the overall atmosphere in the research environment [3]. In contrast, collaboration and teamwork activities have been reported to be essential for research development and productivity, and universities that developed teamwork activities published more research papers than universities that favoured individual activities [26]. A short-answer item in our questionnaire asked faculty members to indicate whether, according to previous experience, they preferred individual research activities or teamwork. Only 10.6% preferred individual work, and we infer from this that if the context is suitable for group activities, researchers will welcome teamwork and interdisciplinary collaboration.

### *Managerial–organizational*

Several studies have surveyed managerial, official and organizational obstacles such as lack of coordination among research organizations [27], inappropriate planning [28], lack of intersectoral collaboration [20], and insufficient implementation of research results [29,30]. Berguist and Bland stated that managerial factors within organizations, such as providing clear plans and objectives, have a direct effect on research productivity [25].-Moreover, Jens and Try found that organizational factors had a significant effect on research output, and this effect was even greater than that of the time devoted to research [31].

The 3 items most agreed as managerial–organizational obstacles were: the lack of effectiveness of research to solve actual problems in society; the inability of the system to properly evaluate research performance; and the lack of cooperation of between scientific fields in research. Some experts believe that research results are not properly presented to policy-makers, managers and executors [32]. As a result, research results are not used to influence policy and solve society's chief problems. In addition, policy-makers and managers may not take research activities seriously; there is no evidence-based decision-making culture or dynamic communication between researchers and managers. Consequently, researchers are not provided with guidance for solving society's problems [32]. In other words, the lack of implementation of research results is not only an obstacle, but also a negative consequence of complicated research systems that ultimately leads to barriers which decrease researchers' motivation.

Another managerial–organizational obstacle is the quantity-based approach to research activities and performance evaluation. The system lacks the ability to distinguish between original research and fraudulent or redundant work which affects researchers' motivation to undertaker new and pioneering research. Furthermore performance evaluation based simply on quantity of research discourages researchers from undertaking original research. As a result faculty members prefer to work on simple subjects and do repetitive and imitative research and focus on quantity.

## Effect of obstacles on the quantity of research

Although the participants noted many factors as significant obstacles, they considered that these obstacles had no effect on their research performance. This could be related to 2 factors. According to faculty members' viewpoints, research evaluation is quantitative and aimed at annual promotion; therefore these obstacles do not impede their research activities. However, such policies may orient researchers toward haphazard and repetitive research activities.

**Table 4 Association between faculty members' viewpoints on obstacles to undertaking research and demographic and work-related characteristics**

| Variable | Obstacles | Type III sum of squares | df | Mean square | *F* | *P*-value |
|---|---|---|---|---|---|---|
| Sex | Professional | 790.40 | 1 | 790.40 | 6.77 | 0.010 |
| | Personal | 913.88 | 1 | 913.88 | 11.85 | 0.001 |
| | Managerial & organizational | 5.18 | | 5.18 | 5.18 | 0.024 |
| Scientific rank | Professional | 1266.942 | 3 | 422.314 | 3.679 | 0.014 |
| | Personal | 971.559 | 3 | 323.853 | 4.158 | 0.008 |
| | Managerial & organizational | 713.703 | 3 | 237.901 | 3.071 | 0.030 |
| Faculty | Facility-related | 2986.597 | 7 | 426.657 | 4.461 | <0.0001 |
| | Scientific | 1972.921 | 7 | 281.846 | 2.161 | 0.042 |
| | Personal | 1302.435 | 7 | 186.062 | 2.394 | 0.025 |
| | Managerial & organizational | 2480.881 | 7 | 354.412 | 5.402 | <0.0001 |
| Field of study | Scientific | 2841.157 | 4 | 710.289 | 5.907 | <0.0001 |
| Executive responsibility | Personal | 434.13 | 1 | 434.13 | 5.500 | 0.021 |

The second factor is related to personal motivation. Sometimes powerful incentives can overcome external obstacles. An open-ended item in this survey asked faculty members what their starting point for research activity was. More than 50% declared that despite the problems and impediments, patient suffering and an interest in finding answers to new questions were their main motivations for research. However, the widespread perception of obstacles evident in our survey could reduce research quality and incentives in the long term.

### Difference between faculty members' viewpoints and socioeconomic characteristics

According our findings, women identified research obstacles more frequently than men and this is in agreement with other research findings [33–35]. However, according to Tajari, there was no significant difference between women and men regarding obstacles to research in social sciences [36]. The discrepancy between Tajari's findings and ours may be related to differences in the male to female ratio in the 2 samples.

Faculty members who had more executive responsibilities identified fewer obstacles than other respondents, However, Tajari reported that there were no significant differences between respondents with and without executive responsibilities in the frequency of perception of personal obstacles [36]; this difference may reflect differences in the configuration of the 2 populations studied. In Tajari's study, only 25% of the participants had executive responsibilities, whereas in our research, 46.3% held executive positions.

There were no significant differences between faculty members' viewpoints and their work experience, which is consistent with the results of Tajari [36]. However, according to Hosseini and Shamsaie's study of agricultural science researchers, those with more teaching experience identified obstacles less frequently than other respondents [17]. Again, the differences between studies may reflect structural differences in the populations that were surveyed.

We found significant differences between faculty members' viewpoints on scientific obstacles depending on their field of study. Researchers in basic medical science had the lowest score for scientific obstacles, whereas clinicians in surgery and nonsurgical specialties had the highest scores. The reason for this may lie in the nature of basic sciences, which is more research based. In contrast, surgeons spend more time providing health care and clinical services, and have less time to do research or participate in research development programmes. In addition we found that language problems were mentioned more frequently in nonmedical fields than in medical and basic science fields. The reason for this difference may be the frequent use of English terms in medical teaching and training activities at Shiraz University of Medical Sciences. Our results suggest a need for faculty members to improve their English language capabilities.

### Study limitations

It should be noted that our study sample may not have been representative of the entire teaching staff at this university or the faculty at any other universities in the country; as such the findings should be extrapolated with caution.

## Conclusion

Our findings show that faculty members in our university consider there are numerous obstacles to conducting research, lack of funding and difficulties in funding procurement being the most important, and significantly more women identified research obstacles than

men. Despite this our faculty members did not think their research output was affected. However, such high reporting of obstacles suggests the system does not favour research and in the long run research quality could decrease. Therefore university management needs to address this and select effective strategies to encourage more and better quality research.

## Acknowledgements

We would like to thank the faculty members of Shiraz University of Medical Sciences for their participation in this research despite their always-challenging work schedules and many commitments. We would also like to thank Ms K. Shashok (AuthorAID in the Eastern Mediterranean region) for help with editing of the manuscript.

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*Review*

# Historical development of health systems in the Arab countries: a review

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**التطور التاريخي للنُظُم الصحية في البلدان العربية: مراجعة استعراضية**

نبيل قرنفل

**الخلاصة:** هذه الورقة هي الأولى من خمس ورقات تدور حول النُظُم والخدمات الصحية في البلدان العربية، وتستعرض التطور التاريخي للنُظُم الصحية على مدى العقود الثلاثة الأخيرة. لقد كان تطور الرعاية الصحية رائعاً بما حققته الحكومات من خطوات واسعة لتحسين الوضع الصحي لسكانها. إلا أن التقدم المحرز كان متفاوتاً من حيث الموارد والفرص. ولقد أمكن تحقيق ذلك التطور من خلال تنفيذ جداول أعمال وطنية للتنمية الاقتصادية والاجتماعية. وقد تَبَنَّت معظم البلدان العربية إعلان ألما آتا عام 1978، كما وسَّعَتْ وكالات الأمم المتحدة، ولاسيَّما منظمة الصحة العالمية، من مجالات الدعم لجميع البلدان العربية بلا استثناء. ولاتزال التحديات الرئيسية التي تُواجه النُظُم الصحية هي نفسها، وتلقى الدول العربية التشجيع من أجل التعاطي مع هذه التحديات بالعمل المتَّسق مع الأطراف المعنية. وتمس الحاجة إلى بذل الجهود لتعزيز الدور المركزي للصحة في التنمية الاقتصادية والاجتماعية الشاملة.

ABSTRACT In the first of 5 papers about health systems and services in the Arab countries, the historical development of health systems over the past 3 decades is reviewed. The evolution of health care has been impressive with major strides accomplished by governments to improve the health status of their respective population. However, the progress has been uneven in view of the differentials in resources and opportunities. This development was made possible through the implementation of national social and economic development agendas. Most of the Arab countries adopted the declaration of Alma-Ata in 1978. The United Nations agencies and especially the World Health Organization have expanded support to all the Arab countries of the Eastern Mediterranean region. Key challenges to health systems remain. Member States are encouraged to address these challenges in concert with all concerned stakeholders. Efforts are needed to promote the centrality of health in comprehensive socioeconomic development.

**Revue du développement historique des systèmes de santé dans les pays arabes**

RÉSUMÉ Dans le premier des cinq articles traitant des systèmes et des services de santé dans les pays arabes, le développement historique des systèmes de santé est examiné sur les trente dernières années. L'évolution des soins de santé a été impressionnante, avec de grandes avancées réalisées par les gouvernements pour améliorer l'état de santé de leurs populations respectives. Toutefois, les progrès ont été inégaux à la lumière des différences constatées entre ressources et opportunités. Cette progression a été rendue possible par la mise en œuvre de programmes de développement économiques et sociaux dans les pays. La plupart des pays arabes ont adopté la déclaration d'Alma-Ata en 1978. Les institutions des Nations Unies et plus particulièrement l'Organisation mondiale de la Santé ont étendu leur soutien à tous les pays arabes de la Région de la Méditerranée orientale. Des problèmes centraux persistent pour les systèmes de santé. Les États Membres ont été encouragés à s'attaquer à ces problèmes en concertation avec toutes les parties prenantes concernées. Des efforts sont nécessaires pour promouvoir la place centrale de la santé dans le développement socio-économique global.

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## Introduction

This is the first of five papers reviewing the health systems and services in the Arab world [1–4], starting with the historical development of health systems in the Arab region, with an emphasis on the last three decades. The evolution of health care in the Arab countries in recent decades has been impressive, with governments taking major strides to improve the health status of their respective populations. The health profile of the whole region has been transformed over this relatively short period. The progress, however, has been uneven, in view of the differentials between countries in resources and opportunities. It is particularly unfortunate that some countries have even regressed in their health and social indicators due to conflicts, crises and natural catastrophes that have affected most countries of the region. Table 1 illustrates this transformation. The improvement in life expectancy at birth ranged from 4.2% in the United Arab Emirates (UAE) and Lebanon to 40% in Yemen. Oman saw the greatest improvement in both infant and under-5 years mortality rates among the Arab countries (close to 65%–70% reduction respectively) while Sudan and Djibouti had the lowest (12% and 37%). Bahrain had the best rate for maternal mortality ratio in 2006 (1 per 100 000 live births) while Iraq regressed from 117 to 294 per 100 000 live births.

## Development of health systems in the Arab region

It is difficult to put a precise date on the beginning of modern medical services in the Arab world. The French army under Napoleon turned Qasr Al Aini in Cairo, Egypt, into a military hospital, while later in the 19th century religious missionaries established medical colleges in the Levant and in Bahrain and Oman in the early 20th century. In the period between 1900 and 1950, several hospitals were established in different parts of the Arab world. These were usually small hospitals, typically of 20–30 beds, that were owned by physicians who had received their medical education in Lebanon, Syrian Arab Republic, Egypt, Iraq or in Europe and who had returned to practise in their home country. This was the beginning of private medicine in the region. These hospitals were typically small, often handling a single specialty, but they slowly evolved and enlarged to become acute general hospitals.

After the Second World War, although many Arab countries gained independence, most of them continued to follow the medical system that had been established by the colonial powers. These systems were generally run by the public sector or sometimes the voluntary, charitable and religious associations. What was common to these systems across the Arab world was the paternalistic attitude to health care. Health care was until then a service offered by government to the population, as a charitable donation and not as a citizen's right.

The development of these curative facilities is to be seen against the background that the role of governments was then essentially limited to protecting society rather than providing clinical services. This role included the provision of quarantine facilities, health legislation, public health, the development of sanitation and environmental services and the treatment of indigenous patients, most of whom at that time were suffering from communicable diseases such as tuberculosis, leprosy, smallpox, cholera and other infectious illnesses. As such the treatment of patients suffering from communicable diseases reflected the need to protect society from contagion, rather than the provision of services as a human right [5]. Government facilities would treat patients free-of-charge; however, patients needed to produce evidence that they were poor and destitute in order to receive care in inpatient facilities. The more prosperous strata of the population would seek care in the voluntary hospitals and in the smaller clinics owned by physicians in the private sector. Outpatient care was provided either freely or at a minimal cost in dispensaries operated by municipalities and charitable associations.

This pattern of health services started to change after the Second World War, i.e. after 1950. The notion of health as a human right started to take root in the region, following trends that were being developed in Europe. Following the example of Great Britain, Arab countries that had been former British colonies—principally Egypt, Iraq, Sudan and Jordan—adopted the model of provision of medical services by the public sector financed by their treasuries. In 1964, Lebanon adopted the National Social Security Fund, demonstrating the commitment of the State to provide end-of-service entitlements, family support and medical coverage in a spirit of social solidarity between employers, employees and the State. The Maghreb countries—Tunisia, Morocco, Algeria, Mauritania—provided services mainly through the public sector. Tunisia adopted a sweeping social policy, espoused by the State, that ensured education and health for all, with support for the role of women. This led to the rapid production of scores of health professionals in a country that had barely a handful of physicians at the dawn of independence.

The Gulf countries—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE)—adopted a public sector welfare system financed by oil revenues. These countries had the advantage of starting fresh after they gained independence, since health systems prior to independence had been rudimentary at best. Bahrain anchored its system on primary health care as early as 1976, even before the

**Table 1 Key health indicators for Arab countries of the Worle Health organization Eastern Mediterranean Region in 1990 and 2006**

| Country | Life expectancy at birth (years) | | Infant mortality rate per 1000 live births | | Under-5 mortality rate per 1000 live births | | Maternal mortality ratio per 100 000 live births | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 2006 | 1990 | 2006 | 1990 | 2006 | 1990 | 2006 |
| Bahrain | 70 | 75 | 20 | 8 | – | 10 | 60 | 1 |
| Djibouti | – | 44 | – | 102 | 164 | 124 | 740 | 546 |
| Egypt | 62 | 71 | 39 | 21 | 56 | 26 | 174 | 63 |
| Iraq | – | 58 | – | 108 | – | 130 | 117 | 294 |
| Jordan | 68 | 72 | 35 | 22 | 39 | 27 | 80 | 41 |
| Kuwait | – | 78 | – | 8 | – | 10 | – | 4 |
| Lebanon | 68 | 71 | 44 | 19 | 56 | 19 | 150 | 88 |
| Libya | 66 | 70 | 31 | 25 | – | 31 | 60 | 40 |
| Morocco | 66 | 70 | 54 | 40 | 69 | 47 | 50 | 227 |
| Oman | – | 74 | 29 | 10 | 34 | 11 | 150 | 15 |
| Palestine | – | 73 | – | 21 | – | 24 | 90 | 11 |
| Qatar | – | 76 | 13 | 8 | 17 | 11 | 9 | 7 |
| Saudi Arabia | 69 | 74 | 30 | 19 | 34 | 22 | 41 | 12 |
| Somalia | 48 | – | – | 120 | 252 | 224 | 1600 | 1600 |
| Sudan | – | 58 | 70 | 62 | 123 | 91 | 660 | 590 |
| Syrian Arab Republic | 66 | 72 | 33 | 18 | 44 | 22 | 143 | 58 |
| Tunisia | – | 73 | 50 | 21 | – | 30 | 80 | 48 |
| UAE | 70 | 73 | 11 | 8 | 15 | 10 | 5 | 1 |
| Yemen | 45 | 63 | 130 | 75 | 190 | 102 | 1400 | 366 |

*Source: [22].*
*UAE = United Arab Emirates;*

principle of primary care became World Health Organization (WHO) policy in the declaration of Alma-Ata [6]. Support for health facilities was provided in those early days by Kuwait, in the form of modern health centres in Bahrain and general hospitals in Dubai and Sharjah in the UAE. Regional cooperation surfaced between the Gulf countries through the establishment of the Secretariat of the Gulf Ministers of Health at their first meeting in Riyadh, Saudi Arabia, in 1975. The 7 Gulf countries—including Iraq at that time—promoted regional cooperation and proceeded with programmes of joint purchasing of medicines and medical supplies that continues to this day, assuring the very best quality of medicines at discounted prices [7]. The same ministers of health that formed the core of the Gulf Secretariat energized the Conference of the Ministers of Health of the Arab World. The fruits of this cooperation led to the establishment of the Arab Board for Medical Specializations, in 1978, based in Damascus, Syria, and the establishment of a Masters of Epidemiology course at Ain Shams University in Cairo, Egypt, in 1983.

On the eve of independence, the health situation in most countries of the region was marked by poor health indicators and by an acute scarcity of human resources for health. "Real health system development in the region started in the late 1950s and 1960s under the leadership of national governments. This development was made possible through the implementation of the national social and economic development agendas, where health was among the main priorities. In many constitutions, health care and education were referred to as human rights, and governments were entrusted to ensure these were provided free of charge. This situation contributed to an increased health coverage, leading to improved health outcomes as reflected in increased life expectancy and overall reduction of morbidity and mortality. Governments contributed to the development of social protection for various categories of workers, building on existing employer-based insurance schemes and expanding their coverage gradually" [8]

Gulf countries began the construction of their inpatient facilities after 1970. Many of the modern health care facilities in Saudi Arabia, Qatar or the UAE were then managed by foreign hospital management companies. This was the fastest way to provide medical services to the population of nationals and expatriates in a rapidly developing economy. Later, the management of these establishments was mostly

transferred to the national health authority of each country.

Most of the countries of the Arab region adopted the declaration of Alma-Ata in 1978 [9], and started to build their health systems on the philosophy, concepts, programmes and referral system inherent in the concept of primary health care. Networks of modern primary care centres now serve communities all over the region.

Since the mid-1980s, there has been a steady increase in the involvement of the private sector in medical education and the provision of medical care. The growth of the private sector in service delivery and in the education of health care professionals was made possible through direct and indirect involvement of governments. In some countries, incentives were offered to private investors in the form of tax credits and other benefits. Health sector reforms in many countries of the region called for a greater role to the private sector, based on management and economic theories concerning the flexibility, managerial capacities and entrepreneurship of the private sector. Furthermore, the accession to the World Trade Organization in the late 1990s and early 2000s of many countries of the region was a stimulus to greater privatization of health care and development of what has become known as "medical tourism". Legislative support, norms and standards were developed by ministries of health and higher education with a view to improved regulation of health care provision in the private sector.

It should be noted that all through these 6 decades, the United Nations organizations in general, and the WHO in particular, have expanded their support to all the countries of the Arab region [10]. The development of health care in the Arab Region parallels the efforts of WHO in the past 60 years. The focus of this support has changed over time; while the programmes focused initially on combating infectious diseases, these have evolved as the countries' priorities changed and programmes now address the shortage of health workforce (through fellowships), improving maternal and child health, highlighting the environment and public health and lately to combating noncommunicable diseases.. As health conditions improved in the region, WHO channelled its programmes increasingly towards health promotion, tobacco cessation, healthier lifestyles, noncommunicable diseases and delivery of support in emergencies and during conflicts and post-conflicts.

## Current situation

In most of the Arab countries the public sector is dominant, except in Lebanon where the private sector takes the lead. However, whereas the provision of care as well as resource generation can be shared between the 2 sectors, the stewardship or governance function of the health system remains a public sector responsibility in all countries. This is because the functions of regulation and legislation have to be the prerogative of the public sector. Ministries of health are responsible for health protection by implementing essential public health functions, including surveillance systems and provision of programmes of immunization, environmental protection, food fortification and food safety. In undertaking the public health functions to protect national health security, ministries of health in certain countries often face a number of challenges, including limited financial resources, inappropriate supply systems and lack of effective national regulatory authorities to implement quality and safety standards.

It is the ministries of health (and to a lesser extent, the medical services of the army, the internal security forces and other military institutions and the ministry of social affairs) that provide personal medical services in most countries of the Arab region. The health care systems in the region provide all types and levels of care, including health promotion, preventive services, ambulatory care, hospitalization, rehabilitation and palliative care. The role of government in service delivery is essential to ensure equity in health care, particularly in rural and remote areas which may not be profitable for the private sector. In several countries, the direct provision of health services by governments contributes to market regulation for both pricing and quantity of services [8].

## Key challenges facing governments in health development

The changes and challenges which evolved globally, regionally and nationally during the last half of the 20th century have had a significant impact on health systems in the Arab region, on the pace of their development and on health outcomes. In the political field, democratization, with more participation of civil society in governance, has affected health systems worldwide. The main challenge since the early 1980s has been the move towards market economies and the reduction of interest in the central planning of social and economic development. In many developing economies, macroeconomic reforms have often necessitated cuts in public spending on social services [11]. Cost-sharing policies were implemented in order to compensate for diminishing government budgets allocated to health.

"The reduction in government health spending has contributed to passive privatization, as public institutions increasingly lacked the necessary medicines and human resources, encouraging those users of the public sector who could afford it to shift to private providers." [8]. Active privatization policies were also adopted in most health systems, allowing government health workers to practise privately inside and

outside public facilities. For example, WHO reported in 2004 that only 11% of physicians had only 1 job, 73% had 2, 14% had 3 and 2% had 4 jobs. It was also reported that 84% of all physicians practised in urban areas [12].

In the social field, there has been an almost total absence of sound and long-term social policies to combat poverty, deprivation, gender differences, social exclusion and unemployment. This has contributed to increased disparities in health within and between countries [13]. Tunisia, on the other hand, achieved its transformation through well-enforced social policies initiated at its most vulnerable period, at the time of independence when the health care system was almost totally wrecked by the departure of large numbers of health professionals. The impact of globalization has yet to be ascertained, as more Arab countries join the World Trade Organization. This is not to denigrate the enormous strides that have been made in all countries of the region. The example of Oman is striking. The changes that have occurred from 1970 to this day have catapulted this country's health system into one of the best in the world. This has been accomplished through perseverance, wise and effective governance and a commitment to health as an essential human right for all.

Analysis of the national health accounts of Arab countries has shown that in most middle-income and low-income countries, government spending, as a percentage of total health expenditure, is decreasing over time [14]. This has led to decreasing equity in health care financing. Some studies carried out in middle-income countries have found that 2% of households face catastrophic expenditures due to ill health, being forced to spend between 30% and 40% of their disposable income on medical treatment [15]. In low-income countries, the government share of total health care spending represents only 20%–30% [16]. The financial gap is so large that it is feared that the United Nations Millennium Development Goals are unlikely to be achieved [17]. In high-income countries efforts are being made to reduce public spending in health by implementing user charges for publicly provided services, especially for the expatriate population.

In some countries of the Arab region, the outsourcing of public services to private providers is being encouraged [18]. However, the management of public–private partnerships is difficult due to the institutional weaknesses in the public sector, particularly in relation to governance and regulation. Standard-setting and the development of norms for quality assurance and improvement are also weak.

WHO EMRO has reported key challenges to health systems in the region [19]. Most are relevant to the Arab member states:

- Institutional strengthening of ministries of health for better governance.
- Development of policies and institutional capacity for regulation and enforcement.
- Equitable and adequate financing and provision of essential health services.
- Providing universal access to an essential package of health services.
- Identifying cost-effective interventions that target the major health problems.
- Human resources planning, production and management.
- Quality management in personal and population-based health services.
- Control of risks and threats to public health through cost-effective interventions.
- Increasing the availability, access and use of information.
- Applied research in public health.
- Developing health promotion programmes.
- Social participation in health through community-based initiatives.
- Health system performance assessment through monitoring of health outputs and outcomes.
- Health protection and maintenance in the face of emergencies and disasters.
- Intersectoral collaboration to address health determinants.

These challenges reflect the priorities for health in the Eastern Mediterranean Region. The implementation of these functions would lead to further development of the health systems. Governments are encouraged to adopt them and define their national policies and programmes based on these priorities.

## Summary

An adequate network of hospitals and primary health care facilities exists in the Arab region, except in the least developed countries. However, the role of each level of care is often not well defined, the referral chains are not well functioning, the diagnostic capabilities are variable and the services are unresponsive to the changing demographic and epidemiological burden of the region [20]. The latter is especially true at the primary health care level. Despite the availability of hospitals, quality improvement and accreditation has not yet been institutionalized, due to lack of political commitment, inadequate structures and processes, limited partnerships and insufficient resources [21].

Governments have an important role in health development in the Arab region. The efforts of governments to build modern health systems must be continued and adapted to the changes and new challenges in the political, economic, social and cultural fields. Despite the pressures facing governments in managing the social sectors, ministries of health should continue to play their leadership role in health development and should protect the social values of equity, solidarity and fairness. Health

development should be coordinated between all concerned government ministries and agencies and with all stakeholders, including academia, professional associations, the private sector and civil society organizations. Efforts must be made to promote the centrality of health in comprehensive socioeconomic development. The private sector is assuming a growing role in both financing and delivery of health care [18]. However, care must be taken to ensure that such developments are implemented under strong leadership and good governance.

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*Review*

# Historical development of health professions' education in the Arab world

*N.M. Kronfol*[I]

**التطور التاريخي لتعليم المهن الطبية في العالم العربي**

نبيل قرنفل

**الخلاصة:** يستعرض الكاتب في هذه الورقة التطور التاريخي لتعليم المهن الطبية في البلدان العربية، ويوضح دور منظمة الصحة العالمية في دعم القوى العاملة الصحية. ويناقش أهم التحديات، مثل هجرة أرباب المهن الصحية، والحاجة إلى فرص تعليمية إضافية في الصحة العمومية وفي إدارة الخدمات الصحية، والحاجة إلى تكييف التعليم بما يلبي احتياجات المجتمع. وتمس الحاجة إلى بذل الجهود لتطوير المزيد من الجودة والملاءمة للتعليم، ولتلبية احتياجات النُظُم الصحية، وللمعافاة في المجتمعات. ويزداد الاهتمام بإنتاج البحوث بالتعاون مع أصحاب القرار السياسي من أجل تعزيز القرارات والسياسات استناداً إلى الاحتياجات التي توضحها البيِّنات.

ABSTRACT This paper reviews the historical development of health professions' education in the Arab countries and highlights the role that the World Health Organization has played in the support of the health workforce. Challenges such as the migration of health professionals, the need for additional educational opportunities in public health and in the management of health services and the need to adapt education to address the needs of society are discussed. Efforts are needed to develop further the quality and relevance of education and to address the needs of the health systems and the welfare of communities. The production of research in cooperation with policy-makers to enhance decisions and policies based on evidence needs increased attention.

**Développement historique de la formation aux professions de la santé dans le monde arabe**

RÉSUMÉ Le présent article examine le développement historique de la formation aux professions de la santé dans les pays arabes et souligne le rôle que l'Organisation mondiale de la santé a joué dans l'appui aux personnels de santé. Les difficultés telles que la migration des professionnels de santé, la nécessité d'opportunités de formation supplémentaires en santé publique et en gestion des services de santé ainsi que l'adaptation nécessaire de la formation en réponse aux besoins de la société sont abordées. Des efforts sont nécessaires pour obtenir une formation de meilleure qualité et d'une pertinence accrue et pour répondre aux besoins des systèmes de santé et améliorer le bien-être des communautés. La production de recherches en coopération avec les décideurs politiques pour renforcer les décisions et les politiques fondées sur des bases factuelles requiert une attention accrue.

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## Introduction

The evolution of the health workforce has been one of the most impressive achievements that have occurred in the health systems of the Arab countries in the past 3 decades. In parallel with the rapid developments in the health services in the Arab region [1], there has also been great progress in training the health workforce in the region. This paper is the second in a series of five reviews about health services in the Arab region [1–4]. It reviews the historical development of health professions' education in the Arab countries, highlighting the role that the World Health Organization (WHO) has played over past decades in the support of human resources in health and the changing needs in the various member states. The migration of health professionals is also highlighted with a particular focus on the nursing profession. Training in public health and the management of health services is singled out as a pressing need for the future development of health services.

## Early years

Established by the French after Napoleon's invasion of Egypt, Qasr Al Aini is the oldest hospital and medical college in the region. Later developments included the arrival of religious missions in the Levant after the events of 1860 in Mount Lebanon: In 1866, the Syrian Protestant College was established, to be followed 1 year later with the intake of the first medical students at this College. The first cohort to medical graduates from this College was in 1871 in Beirut. In 1887, Jesuit missionaries in Beirut established the Université Saint-Joseph which included a medical college. These 2 medical colleges were to play an important role in the provision of medical services in the Region as well as medical and nursing education. At the turn of the 20th century, American missionaries established hospitals in Bahrain in 1900 and in Muscat, Oman. Government-funded medical colleges started to be established soon after the end of the First World War in Egypt, Syrian Arab Republic, Iraq and Sudan. In the mid-1960s and early 1970s, medical schools were established by the governments of Jordan, Kuwait, Saudi Arabia and Iraq. In the mid 1980s, the University of Al Ain Faculty of Health Sciences was established in the United Arab Emirates (UAE), to be followed by medical schools in Oman, Dubai and Ajman (UAE) and Yemen.

Most of the medical schools in the region were established and funded by governments. However, in the past few years, privately funded medical colleges, mostly for-profit institutions, have been established, for example in Bahrain, UAE and Sudan. Other private medical colleges are being considered in the region. Another trend over the past few years has been the affiliation of medical colleges with prestigious institutions in the developed world. The Bahrain Medical College is managed by the College of Physicians and Surgeons of Ireland. Weil Cornell University has established a branch in Qatar, funded by the Qatar Foundation for Science and Education. The Gulf Medical College in Ajman has a collaborative arrangement with the University of West Virginia in the United States. The newly established faculty of medicine in the University of Sharjah entered into a contractual agreement with University of Monash in Australia.

## Current situation

A closer examination of the data on Arab countries shows wide disparities in the ratios of the health workforce per 10 000 population across the countries in all categories. To illustrate, whereas the proportion of physicians per 10 000 was 1.8 in Djibouti in 2005, that ratio was greater than 20 in Egypt, Jordan, Bahrain and reached 29 in Lebanon. The proportion of nurses showed even greater disparity, ranging from 5.7 per 10 000 population in Yemen to more than 30 in Tunisia, Jordan, Egypt, Kuwait and Oman, even reaching 55 in Bahrain and 74 in Qatar(Table 1). It should be noted in this respect that the Arab countries have succeeded in developing their human resources within one generation, moving from a shortage of physicians in the early 1970s to an overabundance in some countries by the turn of the century. To illustrate, the ratio of physicians per 10 000 population increased by only 40% between 1970 and 2005 in Djibouti but rose 22.5-fold in Yemen and 44.8-fold in Oman. Most countries had 4–8 times the numbers of physicians per 10 000 population in 2005 versus 1970 (Table 2)

The development of human resources in the Arab countries has resulted from major efforts expended by governments to establish educational institutions for all categories of human resources. For example the number of medical colleges in the Arab region rose from only 8 in 1950 to 161 in 2005, due to the growth in the number of private medical colleges since the 1990s (Table 3).

## Development of the nursing profession

The changes in the density of nurses from 1970 to 2000 are shown in Table 4. In some countries the density has increased dramatically and in others the figure is very low and has fallen. The poor social status of the nursing profession makes nursing an unattractive career choice for the nationals of some countries in the Arab region. The exception is Oman, which has successfully encouraged nationals to enter the profession through the establishment of district schools of nursing across the country, thus educating nurses to serve within their own communities. A study

**Table 1 Density of medical staff in the Arab countries of the World Health Organization (WHO) Eastern Mediterranean Region, 2005**

| Country | No. of staff per 10 000 population | | | |
|---|---|---|---|---|
| | Physicians | Dentists | Pharmacists | Nurses |
| Bahrain | 27.6 | 4.1 | 8.3 | 55.0 |
| Djibouti | 1.8 | 0.7 | 3.4 | 8.0 |
| Egypt | 24.3 | 3.4 | 12.5 | 33.5 |
| Iraq | 6.6 | 1.2 | 1.1 | 12.6 |
| Jordan | 24.5 | 8.2 | 12.0 | 33.0 |
| Kuwait | 18.0 | 3.0 | 2.0 | 37.0 |
| Lebanon | 28.4 | 9.8 | 13.8 | 13.2 |
| Libya | 12.5 | 2.5 | 2.0 | 48.0 |
| Morocco | 5.6 | 1.1 | 2.3 | 9.0 |
| Oman | 17.9 | 1.9 | 3.1 | 37.7 |
| Palestine | 10.7 | 0.9 | 1.4 | 14.7 |
| Qatar | 27.6 | 5.8 | 12.6 | 73.8 |
| Saudi Arabia | 20.0 | 2.1 | 3.5 | 34.6 |
| Sudan | 2.9 | 0.1 | 0.07 | 9.1 |
| Syrian Arab Republic | 14.8 | 7.4 | 6.5 | 18.8 |
| Tunisia | 9.5 | 1.8 | 2.0 | 31.4 |
| UAE | 16.1 | 4.0 | 5.8 | 29.1 |
| Yemen | 3.6 | 1.0 | 1.0 | 5.7 |

*Source: Annual reports of the Regional Director, WHO Regional Office for the Eastern Mediterranean.*
*UAE = United Arab Emirates; PHC = primary health care.*

in Qatar was undertaken to identify female students' reasons for choosing nursing and how the students perceived the community's attitudes towards nursing as a career [5]. Students stated that their reasons for joining the nursing profession were their interest in medical work and the humanitarian nature of the nursing profession. These results are similar to those of Munro who investigated the motives and attitudes of young graduate nurses in the USA [6]. Most of the students in the Qatar study acknowledged, however, that there were negative attitude towards nursing. The main reasons given were that nursing involved contact with the opposite sex, whether patients or colleagues, and the pattern of working hours. These same reasons and the poor social image were also given for the refusal of Saudi parents to approve their sons or daughters joining the nursing profession [7]. This negative

**Table 2 Changes in the density of physicians in the Arab countries of the World Health Organization (WHO) Eastern Mediterranean Region, 1970–2005**

| Country | No. of physicians per 10 000 population | | | | | Ratio of no. of physicians year 2005 to 1970 |
|---|---|---|---|---|---|---|
| | 1970 | 1990 | 1995 | 2000 | 2005 | |
| Bahrain | 5.6 | 13.0 | 11.1 | 13.2 | 27.6 | 5.0 |
| Djibouti | 4.6 | 2.1 | 2.0 | 1.3 | 1.8 | 0.4 |
| Egypt | 5.0 | 17.3 | 20.2 | 21.8 | 24.3 | 4.9 |
| Iraq | 1.7 | 5.8 | 5.1 | 5.5 | 6.6 | 4.0 |
| Jordan | 2.9 | 18.3 | 15.8 | 19.8 | 24.5 | 8.6 |
| Kuwait | 10.0 | 14.8 | 17.8 | 16.0 | 18.0 | 1.8 |
| Lebanon | 6.7 | 8.9 | 19.1 | 29.2 | 28.4 | 4.3 |
| Libya | 4.6 | 13.7 | 13.7 | 14.0 | 12.5 | 2.8 |
| Morocco | – | 1.6 | 3.4 | 4.6 | 5.6 | – |
| Oman | 0.4 | 8.6 | 12.0 | 13.5 | 17.9 | 44.8 |
| Palestine | – | – | 0.9 | 9.4 | 10.7 | – |
| Qatar | 8.3 | 18.2 | 14.3 | 20.1 | 27.6 | 3.3 |
| Saudi Arabia | 1.0 | 18.8 | 16.6 | 17.1 | 20.0 | 20.0 |
| Somalia | 0.6 | 0.6 | 0.4 | 0.4 | – | – |
| Sudan | 0.5 | 1.0 | 1.0 | 1.5 | 2.9 | 5.5 |
| Syrian Arab Republic | 2.9 | 8.6 | 10.9 | 13.1 | 14.8 | 5.2 |
| Tunisia | 1.3 | 5.7 | 6.7 | 7.0 | 9.5 | 7.6 |
| UAE | – | 17.5 | 16.8 | 17.8 | 16.1 | – |
| Yemen | 0.2 | 1.4 | 2.6 | 3.5 | 3.6 | 22.5 |

*Source: Annual reports of the Regional Director, WHO Regional Office for the Eastern Mediterranean.*
*UAE = United Arab Emirates.*

**Table 3 Changes in the number of medical colleges in Arab countries of the World Health Organization (WHO) Eastern Mediterranean Region, 1950 and 2006**

| Country | No. of colleges | |
|---|---|---|
| | 1950 | 2006 |
| Bahrain | 0 | 2 |
| Djibouti | 0 | 1 |
| Egypt | 3 | 26 |
| Iraq | 1 | 20 |
| Jordan | 0 | 4 |
| Kuwait | 0 | 1 |
| Lebanon | 2 | 4 |
| Libya | 0 | 24 |
| Morocco | 0 | 5 |
| Oman | 0 | 2 |
| Palestine | 0 | 2 |
| Qatar | 0 | 1 |
| Saudi Arabia | 0 | 12 |
| Somalia | 0 | 3 |
| Sudan | 1 | 30 |
| Syrian Arab Republic | 1 | 6 |
| Tunisia | 0 | 4 |
| UAE | 0 | 6 |
| Yemen | 0 | 8 |
| Total | 8 | 161 |

*Source: Al Sheikh G, unpublished presentation at WHO meeting on human resources in Muscat, Oman, December 2006.*

attitude existed even though both Saudi parents and university students recognized the humanitarian nature of nursing, and the religious, social and psychological reasons behind the need for Saudi national nurses. Similar findings have been reported from Jordan, Egypt and Kuwait [8–10]. The publication of *Nursing education in the Eastern Mediterranean Region* in 1998 by the World Health Organization Regional Office for the Eastern Mediterranean (WHO EMRO) facilitated the process of nursing education reform at the basic and post-basic specialist level [11]. This document was very well received and was regarded as an important tool for initiating change in nursing education.

To enhance the process of educational reform in the region, support by WHO EMRO has been provided to countries to strengthen the human and material resources of their educational institutions. This has included national training activities to promote capacity-building of teachers and the provision of nursing and midwifery literature, and audiovisual aids. In addition, fellowships have been awarded to teaching staff to increase their capabilities in educational methodology, community-oriented nursing curricula and clinical nursing subjects. All countries, without exception, have taken initiatives to improve basic nursing education through increasing the number of programmes, reorienting the curriculum towards the primary health care approach, training teachers and improving library and clinical skills laboratory resources. Most countries are now better able to attract students to nursing and midwifery programmes and the demand on nursing schools is increasing [11–16].

## Migration of physicians, nurses & other health professionals

The migration of health personnel is a phenomenon that affects the health system of several Arab countries. While all GCC countries are net importers of health care staff, many middle and low-income countries are next exporters of health personnel both within and outside the region. The main exporting countries include Egypt, Sudan, Jordan, Syrian Arab Republic, Lebanon, Iraq, Morocco and Tunisia [17]. An important consideration, however, is whether the migration of personnel is temporary or permanent.

Since the early 1960s, migration from the Arab Maghreb countries to Europe has become a prominent social phenomenon that has raised considerable controversy in the European countries [18]. According to the United Nations Development Programme, Lebanon has lost more than 895 000 people to permanent emigration since 1975, including 320 000 skilled, educated individuals [19]. Of all medical graduates from the American University of Beirut over the period 1935–74, only 33.2% were practising in Lebanon in 1977 [20]. Yet this 40-year period was a period of prosperity in the country. A follow up of these graduates in 1984, 9 years after the beginning of the civil disturbances, revealed that only 16.5% had remained in the country [21]. Most of these remaining graduates were associated with academic medical centres [22].

Several medical colleges in the Arab region have designed and/or revised the medical curriculum based on the standards adopted in the industrialized countries, principally the United States. Their graduates have excelled in scoring on international examinations, as well as in postgraduate training in some of the best academic

**Table 4 Changes in the density of nurses in Arab countries of the World Health Organization (WHO) Eastern Mediterranean Region, 1970–2000**

| Country | No. of nurses per 10 000 population | | |
|---|---|---|---|
| | 1970 | 1980 | 2000 |
| Bahrain | 26.4 | 30.2 | 45.7 |
| Djibouti | 27.9 | 8.8 | 8.0 |
| Egypt | 10.8 | 16.5 | 26.5 |
| Iraq | 3.5 | 6.1 | 12.1 |
| Jordan | 13.2 | 8.3 | 32.5 |
| Kuwait | 45.9 | 54.6 | 40.0 |
| Lebanon | 9.5 | 13.9 | 30.0 |
| Libya | 15.3 | 31.3 | 50.0 |
| Oman | 2.9 | 8.5 | 37.0 |
| Qatar | 25.8 | 35.4 | 54.8 |
| Saudi Arabia | 2.7 | 7.2 | 32.3 |
| Somalia | 3.4 | 5.2 | 2.0 |
| Sudan | 6.5 | 7.3 | 5.1 |
| Syrian Arab Republic | 3.7 | 8.9 | 18.8 |
| Tunisia | 14.1 | 11.7 | 36.4 |
| UAE | 10.5 | 40.0 | 35.2 |
| Yemen | – | 2.6 | 5.2 |

*Sources: [50,51].*

medical centres in North America and Europe. However several studies have documented that this excellence in teaching resulted in a massive exodus of their medical graduates to occupy permanent positions in the country of postgraduate education, thus contributing to migration and the loss of excellent human resources from the region [20–24]. This has been the experience at Pahlevi University in Shiraz in the Islamic Republic of Iran (prior to 1979) [23], the American University of Beirut in Lebanon [20–22] and more recently the Aga Khan University in Karachi, Pakistan [N. Kronfol, unpublished observations].

## Migration of nursing professionals

The international migration of nurses from the region first emerged as a major public health issue in the 1940s, when many nurses emigrated to the United Kingdom and the United States. By the mid-1960s, the losses were causing concern. Migration has continued and the international recruitment of nurses from the region has become prominent features in the last few years. While there is nothing new in nurses moving across borders, what has changed in recent years is the increase in active recruitment by employers from developed countries that are facing nursing shortages.

The "push" factors in the nurses' country of origin can be related to low pay, poor career prospects and in many cases instability and violence. The "pull" factors exerted by many destination countries include better pay, career and educational opportunities [23]. It is difficult for developing countries to compete in the global market for nurses. The salary disparity between low- and high-income countries means low-income source countries cannot hope to match the pay that is on offer in the high-income destination countries. There is an increasing debate about the ethical dimension of international recruitment activity [25]. There is a need to evaluate new models and policies. This can include bilateral agreements between countries, and the use of "managed migration" initiatives, such as those being tested in the Caribbean [26] and highlighted in the Commonwealth Secretariat International Code of Practice [27]. Research indicates that nurses are attracted to and retained at their work because of opportunities to develop professionally, to gain autonomy, to participate in decision-making and to be fairly rewarded [28,29]. Workplace factors can be critical influences on the turnover of nursing staff [30–36]. There is some evidence that a participative management style, flexible employment opportunities and access to continuing professional development can facilitate the retention of nursing staff as well as improve patient care [37–40].

Many of these issues are addressed in the "magnet hospital" model which has developed over the last 20 years. The concept of the magnet hospital was developed initially in the 1980s in the United States [40]. The initial focus of that research was to identify the human resource practices and associated organizational characteristics that enabled these hospitals to attract and retain staff, even in difficult labour market conditions. The research highlighted that these improvements in staffing indicators are also related to improvements in patient care. The idea of the magnet institution has been sustained and developed over the successive decades through a series of research studies [34] and by the development of a magnet nursing services accreditation programme [41,42]. This, and similar approaches, are now being investigated in several countries. In 2009, the nursing service of the American University of Beirut medical centre was recognized as a "magnet hospital", thus providing a model for other medical centres to follow suit.

## Role of the World Health Organization

The development of human resources for health has been a vital area for WHO EMRO's collaborative work with member states ever since its inception half a century ago [43]. While the commitment of WHO EMRO to human resources for health development has remained steady, the focus of its collaborative development work in this field has shifted over the years, in parallel with the different phases of development of health systems and human resources in member states.

In the 1960s, WHO's technical collaboration was directed towards expanding and bolstering national capacities for the production of the main categories of health personnel. This goal was pursued through the provision of assistance to countries in the form of long-term fellowships for training professionals, the fielding of expatriate trainers and the procurement of equipment, appropriate technology and essential supplies for the implementation of national training programmes. At the same time WHO EMRO started providing technical assistance to ministries of health to establish structures such as training departments and units responsible for the management of human resources for health and training activities in the countries of the region.

In the 1970s, EMRO began to prioritize its assistance to selected areas, and public health, nursing and allied health personnel training programmes were targeted. This was in line with health care delivery strategies advocated by WHO at the time, and adopted by the EMRO countries, which emphasized the delivery of maternal and child health services. Later, the integrated health care delivery model evolved out of these strategies.

By the late 1970s strategies began to focus on improving the quality and performance of human resources. WHO EMRO was a pioneer in the international movement towards the reform of training curricula to become more community-oriented and thus more relevant to people's needs, and it supported several institutions in the region in this regard. The University of Gezira in Sudan and Suez Canal University in Egypt were among the founding members of the international movement towards community-based medical education. Special efforts were also made in 1981 to adopt a community-oriented medical curriculum in the Faculty of Health Sciences of the Gulf University in Bahrain [N. Kronfol. Feasibility study on the establishment of the Gulf University Medical School in Bahrain. WHO assignment report January 1981]. This author has observed that medical colleges of Tikrit and Basra in Iraq and of Hadramaut in the Yemen have developed strong community health departments with opportunities for field practice for medical students. Institutions in the region also were supported to adopt the most effective and up-to-date training methodologies and access quality training/learning resources. Educational development centres were established in most countries of the region.

The lack of human resources remains aggravated by imbalances in skill mixes, by inequitable distribution of resources inside the countries, and by internal as well as external migration of professionals. Health professionals in the Arab region were, and still are, trained in non-mother-tongue languages (for example English, French or Italian, depending on the colonial legacy), with the notable exception the Syrian Arab Republic, which spearheaded the teaching of medicine and all other health professions in Arabic language, while Egypt, Sudan and Iraq adopted a partial approach to the use of the national language..

Special programmes were also established by WHO EMRO to support the use of national languages in the education of health professionals. Strong efforts were made to initiate, develop and consolidate the Arabization programme in collaboration with several educational associations, principally the regional office of the United Nationals Educational, Scientific and Cultural Organization (UNESCO) and the Islamic States Educational, Scientific and Cultural Organization (ISESCO).

In 2000, EMRO began working towards the launch of a new initiative for the reform of education of medical and health professionals in the region. Development of partnerships was adopted as an essential strategy of the initiative. Guidelines on reform interventions were prepared and adopted in May 2002 [44,45]. The changing roles of health professionals in the face of evolving health needs figured prominently in these reforms. Some of the recommendations proposed by EMRO and other professional bodies highlighting the social accountability and civic orientation of medical colleges have been recently espoused by the Lancet Commission on Medical Education [46].

Nevertheless, despite the progress achieved in recent years in reforming and improving performance of the health care system and the practice and education of health professionals, key challenges are still faced in any effort to improve relevance, equity, cost-effectiveness and quality. In the health services of a range of countries across the region, there is evidence of considerable investment in facilities and services but often with limited attention to support for management infrastructure and capacity [47]. In other words, the development of human resources has not always kept pace with the physical development of the services, leading to a steady increase in inefficiency and ineffectiveness in the provision of health care. Prominent obstacles for workforce development have been identified and include [48]:

- The absence of a comprehensive national health development strategy for the health sector.
- The education programmes of academic institutions are not linked to the needs of the country.
- Admission policies to institutions of higher education and universities are often unrealistic.
- Too little attention is given to continuing education of health professionals.
- Primary health care and non-clinical activities are overlooked.
- There is little or no coordination between ministries of health, universities, training institutions and the public.

## Training in management

Education in the disciplines of epidemiology, health administration and biostatistics can offer a long-term solution to the problem of lack of expertise in planning and management of health services. Unfortunately, despite the plethora of medical schools that have mushroomed, very few schools of public health have been developed in the past 30 years in the region. The High Institute of Public Health in Alexandria, Egypt, and the School of Public Health at the American University of Beirut, Lebanon, have contributed to preparing public health professionals from all countries of the region since the 1950s. Since the 1980s, WHO EMRO had drawn attention to the urgent need for a cadre of trained leaders and managers to lead, develop, direct and manage the health care facilities and programmes in all countries of the region. There have been several initiatives in this field over the last 2 decades, namely the Leadership Development Programme, the Postgraduate Diplomas in Public Health, the Sudan Medical Specialization Board, the collaborative training programme on Leadership and Management, the Health Academy [48], the Management Effectiveness Programme [49] and the Health Leadership Service. The Leadership Development Programme started in 1989 in EMRO with participants from a large number of countries of the region. The goal of the programme was the development of young leaders who will lead and manage their national health systems.

In 1983, and at the invitation of the Executive Committee of the Council of Arab Ministers for Health, WHO EMRO assisted in the planning and implementation of a Masters in Epidemiology programme at Ain Shams University in Cairo [N. Kronfol, unpublished report]. The aim of the programme was to train epidemiologists from the Arab countries to return to their countries and assist in the implementation of an epidemiological mapping exercise for the region.

EMRO in 1988 invited 2 consultants to propose a curriculum for a Diploma in Public Health [N. Kronfol, M. Khojali, unpublished report]. The proposal was approved and programmes were established in the Syrian Arab Republic in 1989 and in Jordan in 1991. The Syrian Arab Republic continued with this programme and today almost all health care facilities in the country house graduates of their Institute of Public Health who proved to be a very effective element in the development and management of all the health care system facilities in the country. The School of Health Management was established in Damascus in 1997 to train public health professionals and strengthen the management capacity of the health workforce. In 2000, a joint teaching initiative was entered into with the Liverpool School of Tropical Medicine in the United Kingdom, WHO and the United Nations Population Fund, to develop the management skills of students. In addition to the former programme, Jordan, in collaboration with WHO, developed a Community Medicine Programme to prepare physician district managers. More recently Bahrain has established the Health Management Programme in collaboration with the Royal College of Physicians (Ireland). Morocco, Tunisia and Algeria have established the Reseau de l'Economie des Systemes de Santé dans les pays du Maghreb Arabe (RESSMA), a francophone regional network on Health Economics and Health Systems Research that has been conducting a yearly block course in Health Economics over the past several years in French with input from WHO and other agencies. In addition to these formal programmes, WHO EMRO has developed training modules in the areas of management with a special focus on health economics. These courses have included the basic concepts of planning, the conduct of national health accounts and the burden of disease methodology. EMRO has also cooperated with the World Bank in offering courses within the World Bank Institute's Flagship Program. Modules of this programme have been offered in Lebanon, Islamic Republic of Iran, Yemen and Jordan.

Other programmes include a scheme that has been instituted in the UAE **i**n collaboration with EMRO and the International Council of Nurses to help prepare nurses and allied health professionals for management and leadership positions. The Health Academy is a WHO initiative in collaboration with Cisco Systems Inc. that will provide health professionals with on-line training in health information and health management [48]. The Management Effectiveness Programme has been introduced by a number of countries of the region including Syrian Arab Republic and Egypt, who have adapted its elements according to their own specific strategy for improving the management of health care services and health

outcomes [49]. Finally, the mission of the Health Leadership Service is to provide an intensive 2-year supervised work experience to selected health professionals under 38 years of age that equips and motivates them to become health leaders committed to achieving the goals of "health for all", whether working at community, national or international levels [47].

In order to promote primary health care, graduate programmes of family medicine have been introduced into the universities in most countries. The first countries to take the lead were Lebanon, with its Family Medicine programme at the American University of Beirut (AUB) in 1978, and Bahrain, with a programme for the Ministry of Health also in cooperation with AUB. The commitment of nations to primary care was also reflected in educational policies and innovative training schemes.

Reforms of the health sector are being undertaken by many Arab countries. Health financing, cost-effectiveness and access to quality services are the components of reform receiving the most attention. These and other factors that can contribute to improving the performance of the health services will require enhanced human resources which need to be defined and developed accordingly.

## Summary

Preparing a health workforce to meet today's challenges is more likely to be achieved if the universities of the region in general, and medical schools and other health professionals' training schools in particular, are strong and flexible. Curricula will need to be modernized to meet these challenges and respond to the needs of the communities and in partnership with them.

Universities and medical schools will need to improve the fitness-for-purpose of medical graduates. There is a need for continual integration and collaboration between the education system and the health system (an academic and service continuum), as well as an inter-professional approach to developing human resources. Medical education globally is changing in line with changes in society, to which the medical profession and other health and allied professions are responding, adapting or planning ahead.

The shift in balance between hospital inpatient services and those provided by primary and community services has tremendous influence on the practice of medicine today. Practitioners have to be aware of traditional/complementary medical practices and treatments; they have to work within a team in collaboration with colleagues in primary care, social services and other organizations within society.

Health professional education is changing too [46]. These changes are in line with changes in society to which the medical profession and other health and allied professions are responding, adapting and planning ahead. There are many external and internal factors today which influence the theory and practice of medicine. These include changes in the level of morbidity and disease patterns, expectations for the health services, demand for a delivery of high quality care, changing health care needs, medical advances and technology and inter-professionalism in the future workforce

The last 3 decades have witnessed important developments in the number and diversities of health professionals in the Arab states. The time has come to expand efforts towards further development in the quality and relevance of education, the professional development of health professionals, their service and commitment to improve the health systems and the welfare of communities and the production of research and studies in cooperation with policy-makers to enhance decisions and policies based on evidence.

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*Short communication*

# Adapting research to local contexts based on the model of Campinha-Bacote for cultural competence: a case scenario of 3 ethnic groups in the Islamic Republic of Iran

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**تَوْئيم البحوث مع السياقات المحلية في نموذج كامبينها – باكوت للأهليَّة الثقافية: سيناريو لحالة في ثلاث مجموعات إثنية في جمهورية إيران الإسلامية**

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**الخلاصة:** تتناول هذه المقالة قضية الأهليَّة الثقافية في البحوث الكيفية عَبْرَ الثقافية في الصحة النفسية والأمراض النفسية، ويتطلب إجراء البحوث الكيفية في الصحة النفسية والأمراض النفسية أن يكتسب الباحثون الإدراك الكافي إزاء مختلف الثقافات، وتطوير مهارات الأهلية الثقافية لديهم. وقد حدد الباحثون الأهداف الرئيسية وخطوات التنفيذ عند تضمين مفاهيم الأهلية الثقافية في دراسة البحوث الكيفية. ويقدم الباحثون مَشْهداً (سيناريو) لحالة مستمدة من دراسات أجريت حول الاكتئاب عند النساء في ثلاث مجموعات إثنية (فارسية، وكردية، وتركية) في جمهورية إيران الإسلامية. وتقدم المقالة استعراضاً موجزاً لنموذج كامبينها – باكوت، وتتناول المكونات الرئيسية الخمس للأهلية الثقافية على الشكل الذي طُبِّقَتْ فيه في المراحل الثلاث لعملية البحث.

ABSTRACT This article examines the issue of cultural competence in qualitative cross-cultural mental health research. Conducting qualitative research on mental health and illness requires the researchers to acquire sensitivity to different cultures and develop the skills of cultural competence. We outline the main aims and steps of implementation when incorporating concepts of cultural competence into a qualitative research study. We present a case scenario from studies on women's depression in 3 ethnic groups (Fars, Kurd and Turk) in the Islamic Republic of Iran. The article presents a brief overview of the Campinha-Bacote model and addresses the 5 major constructs of cultural competence as they were applied in the 3 phases of the research process.

**Adaptation de la recherche aux contextes locaux à l'aide du modèle de compétence culturelle de Campinha-Bacote : cas de trois groupes ethniques en République islamique d'Iran**

RÉSUMÉ Le présent article examine la question de la compétence culturelle dans un travail de recherche qualitative transculturelle en santé mentale. Mener un travail de recherche qualitative sur la santé et les pathologies mentales nécessite que les chercheurs acquièrent une sensibilité à différentes cultures et des aptitudes en compétence culturelle. Nous avons souligné les principaux objectifs et les étapes de la mise en œuvre de l'intégration des concepts de compétence culturelle dans une étude de recherche qualitative. Nous avons présenté un cas extrait d'études sur la dépression chez des femmes appartenant à trois groupes ethniques (Fars, Kurdes et Turcs) en République islamique d'Iran. Le présent article présente brièvement le modèle de Campinha-Bacote et traite des cinq concepts principaux de la compétence culturelle tels qu'ils ont été utilisés dans les trois phases du processus de recherche.

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Received: 06/02/10; accepted: 22/06/10

## Introduction

People's perceptions of illness and mental health practices are influenced by cross-cultural factors [1]. Implementing such research in a multicultural context raises many issues, including the risk of insufficient description and inconsistent analysis, factors which may mislead or affect the validity of the findings [2]. Conducting qualitative research on mental health and illness therefore requires the researchers to acquire sensitivity to different cultures and to develop the skills of cultural competence.

Cultural competence describes the ability to interact effectively with people of different cultures. The purpose of this article is to describe the process of incorporating cultural competence into a qualitative research study of Iranian people in 3 major ethnic groups (Fars, Kurd and Turk). Our previously published studies aimed to describe concepts of depression among Iranian people, including women and their relatives, lay people and clinicians in the 3 ethnic groups, using an explanatory model framework [3–6]. This model is a way of looking at the process by which illness is patterned, interpreted and treated [7]. In this paper we will discuss how we adapted the research methods transculturally from a similar study conducted in Uganda [8] by a former doctoral student of the third author, and applied them in the 3 different ethnic contexts of the Islamic Republic of Iran. We will address the 5 major constructs of cultural competence in the 3 phases of the research process: pre-interview, fieldwork and post-interview.

## Major constructs of cultural competence and qualitative research

The notion of cultural competence, which is the key to cross-cultural research, is based on the model of Campinha-Bacote [9,10]. This model contains the following 5 constructs: cultural awareness, cultural knowledge, cultural desire, cultural skills and cultural encounters.

### Pre-interview: cultural awareness and cultural knowledge

Of the 5 constructs of cultural competence, the qualitative researcher should first attempt to acquire cultural awareness and cultural knowledge before starting interviews (Table 1). Cultural awareness requires the researcher to be prepared for the historical, geographical, cultural and ethnic backgrounds of the populations under study. It begins with the researcher's self-awareness, which means that as a first step the researcher should be aware of her/his own beliefs and culture to be able to separate them from those of the participants.

To develop competence in culture awareness, we needed to obtain more information about the cultural issues in each ethnic group. We therefore formed a scientific committee of 3 professors in the field of psychiatry and psychology in the 3 universities of medical sciences in the cities of Tehran, Ilam and Tabriz to represent the Fars, Kurd and Turk ethnic groups respectively and to provide advice on cultural issues.

Given a general cultural orientation in the Islamic Republic of Iran that values group customs and collective perspectives, we hypothesized that people would be more prepared to share their ideas if the researcher could speak their language or was accompanied by a member of their ethnic group. In view of this, trained researchers of Kurd, Fars and Turk ethnicities assisted us in recruiting and interviewing the participants. They recommended that one of the observers or interviewers preferably live in the same city of study location to be able speak to same language and also be familiar with participants' culture. In addition, FGDs were conducted separately for men and women in each ethnic group as it was decided that participants especially women in Turk and Kurd ethnic groups would be more comfortable sharing ideas in a same-sex group.

For interviews, 2 researchers (psychiatrists and psychologists) were selected from the 3 above-mentioned universities in the 3 study locations and invited to conduct the interviews and analyse qualitative data because there were more familiar with the local culture. They were trained in a 3-day workshop which was held by the authors. During the workshop the participants became familiar with the project's objectives and questionnaires, and they learned the required skills for conducting qualitative research to help in conducting the study. In addition to the written questions, the workshop participants were trained to raise follow-up questions about the attitudes and beliefs of the interviewees in order to access the roots of their thoughts and theories.

Similarly, a common factor to the 3 ethnic groups, as in Iranian society generally, and indeed other parts of Asia [2], the group's normative values take precedence over individual ideas and opinions. Thus, the research team was aware that the interviewees may reflect what they think the researcher wants to hear. In order to decrease this problem, the interviewers were trained and got awareness about this issue. So, at the beginning of the FGDs, interviewers clearly explained that they were going to listen to all participants' points of view, whether positive or negative. In addition, they tried to ask each question in a different way using examples of the same ethnic group based on previous interviews or the literature. The observers also took note of participants' verbal and non-verbal communication. After each interview, when we listened to the audiotapes and read the notes, if we found that most of the participants were involved in the discussion and different ideas were shared, we accepted the interview. Audiotapes were transcribed

immediately after each interview and prompt feedback was given to the interviewers by the first author.

## Fieldwork: cultural desire

Cultural desire is the researcher's affective recognition of cultural differences by respecting cultural diversity and having a receptive attitude [11]. We hypothesized that minority ethnic groups in the Islamic Republic of Iran were more likely to reveal their opinions if they felt some personal connection with the interviewer. We therefore used a trained interviewer of the same ethnic group to introduce the research project and the research team to the participants and who would endeavour to become accepted as an insider by the participants (Table 1).

## Post-interview: cultural skills and cultural encounters

After the interview, culturally appropriate analytical skills are required in data analysis. Cultural skills denote strategies for capturing respondents' explicit and implicit language expressions [2,10,12] (Table 1). Even if cultural issues are addressed in the first 2 phases, language comes to the fore in the processing of interviews. Handled inappropriately, translation issues can significantly bias the study findings.

The strategy used in this study included transcription and initial coding in the ethnic language. We translated Kurdish and Turkish texts to Persian before coding. For the coding, the text segments were highlighted and a consistent technique was used to develop categories and subcategories. After coding, Persian texts and codes were translated unto English. Independent bilingual researchers from the study

**Table 1 Implementing cultural competences in studies of depression among women in 3 ethnic groups in Islamic Republic of Iran**

| Cultural competences | Definition | Aim of implementation | Steps for implementation |
|---|---|---|---|
| Cultural awareness and cultural knowledge | The researchers being prepared for the historical, geographical, cultural and ethnic backgrounds of the populations under study | To assess the applicability of implementing such research in the 3 ethnic contexts as well as to get more information about the culture of each ethnicity | Forming a scientific committee of academic psychiatrists representing the 3 ethnic groups |
| | | To collect qualitative interview data as well as to get more information about the cultural issues in each ethnic group during the analysis of data | Inviting bilingual researchers in the field of psychiatry and psychology from the 3 ethnic groups |
| | | To familiarize the research team with the study aims and questionnaires, and to teach them the skills required for conducting qualitative research | Holding a 3-day workshop on qualitative research for training the research team to probe the attitudes and beliefs of the interviewees to obtain a deeper understanding |
| | | To adapt the explanatory guiding questions to the local context | Translating all the material into Persian language and back-translating into English by independent bilingual speakers. Using the scientific committee to ensure that the questions and the vignette were culturally acceptable and met the diagnostic criteria according to local culture |
| Cultural desire | The researchers' affective recognition of cultural differences by having respect for cultural diversity and a receptive attitude | To build trust and facilitate interpersonal communication between interviewers and interviewees | Using a team of co-researchers who shared the same ethnic group as the interviewees |
| Cultural analytical skills | The researchers having culturally appropriate analytical skills for data analysis | To help the researcher team gain immersion in the project and obtain an overview of the themes emerging | Using the trained researchers in the 3 locations to help code and analyse the data by transcribing audiotapes, checking translations, cross-checking their coding strategies and validating the coding by discussions with the research team |

locations also listened to a sample of the tapes and transcribed them into Persian to check the translation. The translation included constant contextual comparisons between the meanings in different languages during the categorization of the codes. This made it possible to capture explicit and implicit meanings from the transcripts, along with culturally specific expressions and concepts. After each phase of the study, a 1-day workshop was held with all the research teams in the 3 ethnic groups to crosscheck their coding strategies.

In the final stage, the scheme codes were discussed and some parts validated with members of the research team from the Transcultural Psychiatry and Psychology group at the Karolinska Institutet in Sweden, supervised by the main supervisor, to compare and validate the meaning of translated codes and categories in English.

## Conclusion

Methods and techniques used in developed country settings need to be developed and modified before research and intervention in mental health services are implemented in another country. In this regard, culture and local psychosocial environments must be taken into account in research on mental health. The Campinha–Bacote model is more applicable in this kind of research.

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*Short communication*

# One Health: perspectives on ethical issues and evidence from animal experiments

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**صحة واحدة: وجهات نظر حول قضايا أخلاقية وبيِّنات مستمدة من التجارب على الحيوانات**

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**الخلاصة:** تساهم الأمراض الحيوانية المصدر بأكثر من 60٪ من الأمراض الـمُعْدية المعروفة، وبـ 75٪ من الأمراض الـمُعْدية المستجدة. إلا أن آثارها لم تخضع للرصد أو للوقاية أو للمعالجة بطريقة متكاملة، ويُعتَقَد أن التدخلات العلاجية في الأمراض الحيوانية المصدر هي قابلة للمقارنة في جميع الأنواع بناءً على نتائج صحيحة علمياً مستمدَّة من مجال من التجارب على الحيوانات. إلا أن الالتزامات الأخلاقية تَحُدُّ من عدد الحيوانات والتجارب وتقلّل من تكرار تلك الدراسات. كما أن البيِّنات المستندة على تجارب معشّاة مضبوطة بالشواهد وعلى مراجعات منهجية حول مدى فعالية تدخلات الرعاية الصحية تكون في غالب الأحيان غير قاطعة الدلالة. ثم إن تعريض المتطوعين للأخطار في غياب نتائج صحيحة علمياً مستمدة من تجارب أجريت على الحيوانات يعد لا أخلاقياً. ويُعَدُّ مفهوم "صحة واحدة" أسلوباً سريرياً مقارناً موجّهاً نحو الأمراض الحيوانية المصدر التي تمثل تحدياً للعاملين في البحوث وللعاملين في السريريات. إن مفهوم صحة مُثْلَى للجميع (أو صحة واحدة)، يجب أن يكون مدعوماً بأبحاث ملتزمة بالقواعد الأخلاقية سواء كانت مُجراة على الحيوانات، أو على البشر على أن تكون نتائج كل منهما متمِّمة ومكمِّلة للأخرى.

ABSTRACT Zoonoses constitute more than 60% of all known infectious diseases and 75% of emerging infectious diseases. Their impact is not monitored, prevented and treated in an integrated way. The efficacy of therapeutic interventions for zoonotic diseases is deemed to be comparable across species with scientifically valid results originating from a range of animal experiments. Ethical obligations limit the number of animals used in experiments as well as reduce repetition of studies. The evidence based on randomized controlled trails and systematic reviews for the effectiveness of health care interventions is often inconclusive. Subjecting human volunteers to risk in the absence of scientifically valid results from animal experiments is unethical. The One Health concept is a comparative, clinical approach directed towards zoonoses which present challenges to research workers and clinicians. Optimal health for all—One Health—should be underpinned by ethically conducted research in animals or humans and the results should be complementary to both.

***One health* : perspectives sur les questions éthiques et les preuves obtenues à partir d'expérimentations sur les animaux**

RÉSUMÉ Les zoonoses représentent plus de 60 % de toutes les maladies infectieuses connues et 75 % des maladies infectieuses émergentes. Leur impact ne fait pas l'objet d'une surveillance et il n'est ni prévenu, ni traité de manière intégrée. L'efficacité des interventions thérapeutiques pour les zoonoses est jugée comparable entre les espèces avec des résultats scientifiquement valides issus d'un éventail d'expérimentations sur les animaux. Les obligations éthiques limitent le nombre d'animaux utilisés dans les expériences et réduisent la répétition des études. Les preuves issues d'essais randomisés et contrôlés et les revues systématiques de l'efficacité des interventions des soins de santé sont souvent non concluantes. Exposer des volontaires humains au risque en absence de résultats scientifiquement validés issus d'expérimentations sur les animaux est contraire à l'éthique. Le concept *One health* (une seule santé) est une approche clinique comparative visant les zoonoses qui représentent des défis pour les chercheurs et les cliniciens. Le concept d'une santé optimale pour tous, *One health*, doit être étayé par une recherche respectant l'éthique pour les animaux ou les humains et les résultats doivent être complémentaires pour les deux.

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Received: 25/08/11; accepted: 11/12/11

## Introduction

One Health is a concept based on a systems approach which amalgamates the "collaborative effort of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and our environment" [1]. It can be seen as a strategy for expanding interdisciplinary collaboration and communication in all aspects of health care for humans and animals and more especially within the context of zoonoses. The World Health Organization estimates that 25% of 57 million deaths per annum that occur globally are caused by microbes [2]. A comprehensive literature review by Taylor et al. identified 1415 species of infectious human pathogens [3]. Zoonotic diseases constitute more than 60% of all known infectious diseases, with humans serving as the primary reservoir for only 3% of them, and of the 175 species of infectious organisms considered to be emerging a large percentage (75%) are zoonotic.

The impact of zoonotic diseases on human and animal health is not monitored, prevented and treated in an integrated way, despite the fact that the etiologies and treatments of these diseases are generally similar across species. The efficacy of therapeutic interventions in zoonoses is also believed to be similar across species and it is prudent to demand scientifically valid evidence of efficacy—an obligation in animal experiments for newer drugs—that are applicable to multiple species including humans. There is an increased tendency, coupled with more stringent ethical obligations, towards limiting the number of animals used in experiments while at the same time ensuring that the replication of previous research is reduced.

This paper is a brief discussion of evidence and ethics in animal experiments from a One Health perspective, against a backdrop of an expanding number and species of zoonoses.

## A "numbers game" in animal experiments

Around 50 to 100 million vertebrate animals are used worldwide annually for research and experiments. These continue to further the development of our understanding of the functioning of both the human and animal body [4]. The 3 Rs of humane animal experimentation—Replacement, Reduction and Refinement—are widely considered to be the guiding principles for the use of animals in research, where Reduction refers to methods that enable researchers to obtain comparable levels of information from fewer animals or to obtain more information from the same numbers of animals [5].

The 3 concerns addressed in this commentary are the reduction in animal experimentation in the domain of zoonoses; interdisciplinary One Health; and ethical considerations for humans and other species.

### Does the principle of reduction compromise the sample size required for scientific validity under the pretext of ethics?

Choosing the sample size in a scientific experiment involves balancing the increased information and precision that results from bigger samples against the reduced time and cost that arise from smaller samples. In practice, scientists undertaking animal research justify the number of animals to be used, and committees supervising animal experimentation review this justification for approval.

Using group sizes of 6 or 8 animals regardless of the type of experiment or number of groups is customary in some disciplines, which may be inappropriate in factorial experimental designs or designs with more than 2–3 treatment groups. However, although the conventional sample size of 6 or 8 may be considered appropriate in pilot or exploratory studies [6], this is still open to debate. Notably in animal experiments where welfare remains an issue, there is an additional motive to reduce the numbers of animals that undergo experiments or are sacrificed.

### Can the evidence from such a reduction in animal experiments be carried forward to human trials?

Translating and extrapolating the results of animal experiments to provide reliable evidence of the potential benefits to humans faces similar constraints. Pablo et al. for example conducted a systematic review of 6 interventions providing evidence of a treatment effect, either benefit or harm, in clinical trials [7]. They looked for concordance with the corresponding animal experiments, and concluded that agreement between animal studies and clinical studies varied, in that 3 studies had similar outcomes and 3 did not. Furthermore they concluded that this lack of concordance between animal experiments and clinical trials may be due to bias, random error or the failure of animal models to adequately represent human disease.

Recent results from metabolomics and proteomics studies revealed that the effect size observed in human studies was strikingly lower when compared with matching animal studies [8]. Similarly, in a review on effectiveness of therapies in the treatment of peri-implantitis, the characteristics of the studies were extremely heterogeneous as no animal experiment and human trial had comparable study procedures, including sample size and power [9]. A Cochrane systematic review on antiretroviral post exposure prophylaxis (PEP) for occupational HIV exposure concluded that current clinical practice is based on results from individual primary animal studies, and recommended a formal systematic review of all relevant animal studies [10]. Overall the limitations in translating the results of animal

experiments include, among others, the non-availability of suitable animal models, clinical heterogeneity and predominantly inadequate sample sizes leading to effect size bias.

### Is it ethical to carry out human trials based on the uncertain or inconclusive results of animal experiments?

Even after the inclusion of a substantial number of randomized controlled trials, many systematic reviews, for example those published in the Cochrane library, are still unable to provide conclusive clinical recommendations. Clearly it is the biased or imprecise results from animal experiments that result in clinical trials of biologically inert or even harmful substances, thus exposing patients to unnecessary risk. Besides, scarce research resources such as grants for research, scientific human resources and materials, including experimental animals, are being wasted. Moreover, animals suffer unnecessarily if animal experiments fail to inform medical research adequately.

### Whose ethics are we concerned most with or should there be equity across species in addressing the ethical issues arising in clinical experiments?

It is unethical to subject healthy human volunteers to risk in the absence of precise and scientifically valid results from animal experiments? Clearly the anthropocentric attitude of investigators, who may not have a clear understanding of the dynamics of the disease across species, can result in healthy human volunteers being subjected to unnecessary risk. While designing animal experiments the consideration of ethics should not just be limited to the animals alone but also to multiple species to whom the results are then taken forward. In the case of zoonoses such inadequacies in evidence from animal experiments are shared risks which affect not only humans but also multiple species.

## Conclusion

Broadly speaking, animal experiments play an important part in the chain of research evidence and as such are used to decide which interventions are taken forward in clinical trials. Efforts to minimize bias and random error are therefore as important when reviewing the results of animal models as when reviewing the results of clinical trials in humans. Conversely, the repetition of experiments is considered necessary for the improvement of the precision and reliability of the results [11]. An increase in the number of animals included in experiments will improve the precision and reliability of the results and ultimately their generalizability.

The One Health concept is a comparative clinical approach which takes into consideration the "shared risks" between humans and animals concerning zoonoses and in this way it promotes better cooperation and collaboration between human and animal health professionals to identify and reduce such risks. To determine similarities between animal models and clinical trials, researchers engaged in animal experiments need to direct their attention to the following:

- Standardization of research procedures to reduce heterogeneity between animal and human studies.
- Power analyses and sample-size calculation in animal experiments.
- Prospective registration of animal experiments, similar to registration of clinical trials on humans. This will go a long way towards reducing publication bias.
- Producing evidence through systematic reviews and meta-analyses of animal experiments for comparison with clinical trials.

A recent commentary published in the *Journal of Evidence-based Medicine* proposed that the Cochrane Collaboration should consider registering a new group dedicated to conducting systematic reviews on zoonotic diseases thus underpinning the systems approach and One Health [12].

In summary, researchers should not only avoid using more animals for experiments than needed, they should also aim to avoid using too few. Either way can result in unethical research that is wasteful of resources and time and that produces results that are of limited relevance, most notably for zoonoses.

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e-ISSN 1687-1634
e-ISBN 9789290219262