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المجلة الصحية لشرق المتوسط

 World Health  
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La Revue de Santé de la  
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World Health Day celebrates the role of nurses and midwives and highlights the central role of these professions in advancing universal health coverage, achieving health-related sustainable development goals, and the Eastern Mediterranean Region Vision 2033: Health for All by All

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## 2020 – the year of the nurse and midwife: a call for action to scale up and strengthen the nursing and midwifery workforce in the Eastern Mediterranean Region

Ahmed Al-Mandhari,<sup>1</sup> F Gulin Gedik,<sup>2</sup> Awad Mataria,<sup>3</sup> Arwa Oweis<sup>4</sup> and Rana Hajjeh<sup>5</sup>

<sup>1</sup>Regional Director; <sup>2</sup>Coordinator, Health workforce Development; <sup>3</sup>Director, Health Systems and Innovation; <sup>4</sup>Regional Advisor, Nursing and Midwifery; <sup>5</sup>Director of Programme Management; World Health Organization Regional Office for the Eastern Mediterranean, Cairo, Egypt. (Correspondence to: F Gulin Gedik: [gedikg@who.int](mailto:gedikg@who.int)).

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The World Health Organization (WHO) has declared 2020 as the Year of the Nurse and the Midwife. World Health Day on 7 April is dedicated to supporting nurses and midwives and highlights the central role of these professions in advancing universal health coverage, achieving health-related sustainable development goals, and the Eastern Mediterranean Region Vision 2023: Health for All by All (1).

This year, we sadly mark World Health Day in the face of the devastating COVID-19 pandemic, which has brought to attention more than ever the crucial and invaluable role of health workers, who are working tirelessly day and night to care for patients and save lives. In fighting COVID-19, not only might they become infected and put their own lives at risk, but they also face distress and burnout because of long working hours. In addition, many health workers have to be away from their homes for prolonged periods, for fear of putting their own families at risk of acquiring the infection. Even before the pandemic, the safety and security of health workers in the Eastern Mediterranean Region has been a significant concern, as more than half of the countries of the Region face acute and protracted crises, and 70–80% of total recorded attacks on health facilities globally occur in the Eastern Mediterranean Region.

Nurses and midwives make up more than 50% of the health workforce. Multiple studies have revealed the important role of well-educated nurses to address the rise in infectious as well as chronic noncommunicable diseases, in addition to their substantial contribution to improve maternal, infant and child health (2–5). Commitments to strengthen nursing and midwifery have been provided over the years by the World Health Assembly and the Eastern Mediterranean Regional Committee. However, despite this high-level commitment, the Region continues to face deep challenges in ensuring adequate nursing capacity. The State of World Nursing 2020 Report (6), launched on World Health Day, highlights the global shortage of 5.9 million nurses, with the Eastern Mediterranean Region accounting for 17% of this global shortage. While the

global density of nurses is 36.9 per 10 000 population, for the Region it is only 15.6 nurses (6).

Although the number of nursing education programmes and nursing graduates have increased over the past few decades, the density of nurses in the Region has not changed in the majority of Member States, and has even declined in 11 out of 22 countries since 2010. Compared to a global average of 22.6 nurse graduates per 100 000 population, there are only 7.1 nurse graduates per 100 000 population in the Eastern Mediterranean Region – the lowest among all WHO regions. Moreover, in many countries medical graduates outnumbered nursing and midwifery graduates in 2016, thus exacerbating the gap in the skills mix (7).

In order to address the shortage by 2030, the total number of nurse graduates needs to increase by 10% per year on average. In addition, there needs to be an improved capacity to employ and retain these graduates by providing them with adequate incentives (6). The Report on the State of World Nursing 2020 estimates that an additional investment of US\$ 10 per capita is needed for nursing education in low- and middle-income countries, a small price to pay for such a highly needed health care skill set.

Advocacy is important to improve the numbers as well as the public perception for nurses and midwives. A three-year global Nursing Now campaign (2018–2020) has been initiated to raise the profile and status of nurses, and influence policy-makers to support nurses and build a global movement (8). Promoting nursing and midwifery as a career choice is also expected to lead to improved public perception, attractiveness and increased enrolment in the nursing and midwifery professions (9).

Despite the continued global and regional efforts to address these challenges, progress in scaling up nursing and midwifery has been slow in the Eastern Mediterranean Region. Therefore, in 2019 the Regional Committee for the Eastern Mediterranean adopted a resolution calling for action to strengthen the nursing workforce in the Region. This call for action, based on a systematic comprehensive approach, emphasized

primary care nursing by defining and expanding nurses' roles and scope of practice in order to maximize the utilization of their capacities. Thus, nursing education requires reorientation to respond to countries' needs and governments must be committed to invest in education, employment and retention of nurses and midwives. Since health systems in the Region are overburdened by growing demands resulting from population increase, ageing and decreased funding, it is important that nurses and midwives become central members of health teams and key promoters of health and well-being. For this

to happen, we need relevant regulatory frameworks, appropriate financing systems and adequate information systems.

In the midst of the COVID-19 pandemic that has already affected the lives of so many health workers, acknowledging and investing in the health workforce, especially nurses and midwives, is crucial (10). The Year of the Nurse and the Midwife provides immense opportunity to take forward the call for action in the Region and enhance the health workforce development agenda.

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## Do WHO pharmaceutical pricing guidelines help low- and middle-income countries to price medicines rationally?

Mehrnaz Kheirandish<sup>1</sup>

<sup>1</sup>Director-General, Department for Assessment and Control of Prescribing and Use of Medicines and Health Products, Food and Drug Administration, Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran. (Correspondence to: Mehrnaz Kheirandish: mehrnazkheirandish@gmail.com).

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Pharmaceutical expenditure accounts for a large share of health expenditure, and one of the main challenges in the countries with limited resources is selection of the most appropriate pharmaceutical pricing method. There are many approaches to pharmaceutical pricing as well as a variety of pharmaceutical production technologies; therefore, health systems often face difficulties in selecting the best methods that fit their goals. For developing countries, setting affordable medicine prices to ensure people can access the medicines they need, while at the same time supporting the domestic pharmaceutical industry to ensure a sustainable supply chain is a challenge for their health systems (1). Therefore, practical guidelines are needed that can help low- and middle-income countries by explaining steps for pharmaceutical pricing (2). Equitable access to medicines is a global concern and will not be guaranteed unless medicines are available at a price that the consumer can afford (3). Health systems should ensure that people are able access and buy essential medicines when they need them and in the quantity they need. Hence, not only is rational pharmaceutical pricing required, but also other supportive policies such as insurance coverage or subsidy.

Because of the variety, ambiguity and complexity of the different pharmaceutical pricing methods, countries of the World Health Organization (WHO) Eastern Mediterranean Region need guidelines to explain each of these methods, including their implementation, strengths, limitations and requirements in different country settings. In 2015, WHO developed its guidelines on country pharmaceutical pricing policies to help countries, especially low- and middle-income countries, make appropriate decisions on methods for pricing medicines (4). However, there are still unanswered questions.

First, the high expenditure on pharmaceuticals is not only because of the high cost of medicines, but also because of high consumption (5). Therefore, the total pharmaceutical expenditure needs to be separated from the price of medicines, as each requires different policies. High consumption of medicines could occur because of the irrational use of medicines as a result of self-medication or over-prescribing by physicians. The

routinely adopted pricing policies, such as the cost plus method, are usually more effective if the main aim is to control expenditure. Implementation of an essential medicines list and evidence-based guidelines which are not directly linked to pricing policies (6,7) should be complemented with pricing policies when the main concern is high and irrational consumption.

Second, consideration of the technology for the production of medicines is important in choosing the pricing method. For example, most of the expensive medicines are new and/or specialized medicines with no available generic forms. Controlling the price of these medicines through generally recommended policies such as cost plus or reference pricing is difficult because often valid reference prices are limited and the production costs are unclear to policy-makers (8).

Third, some defined methods, such as generic substitution or health technology assessment, can be used to control medicines prices indirectly (9). These methods have no clear role in setting the price of medicines directly. Therefore, they should not be listed as pricing strategies, but rather as price control strategies. For example, a country might use health technology assessment to reduce the medicine price when the stated price is more than its value according to the results of health technology assessment (10).

Fourth, it is important to distinguish between value-based pricing, mentioned in the WHO guideline, from health technology assessment (4). Defining the value of a medicine is difficult and not a useful way of pricing medicine. For example, if a medicine is life-saving, should it be priced highly? If yes, then this will have major implications for the health system. Also, it is worth noting that value-based pricing can lead to companies determining a high price for their products.

Fifth, one of the pricing methods recommended in the WHO guideline and which is widely used globally is external reference-based pricing. In most countries, especially European countries, external reference-based pricing has been used to first control parallel imports and then pharmaceutical pricing (11). However, for low- and middle-income countries, particularly countries in the Eastern Mediterranean Region, the main goal of using



this method is to price medicines. Therefore, the correct implementation of this method is critical due to the many different country settings. For example, choosing reference countries, determining valid prices and maintaining the same price in neighbouring countries are important considerations. In addition, having adequate cooperation and coordination between countries in the same region is necessary if using this method.

In conclusion, a guideline on pharmaceutical pricing methods, to be more useful, should provide clear step-by-step advice on how to implement pricing approaches in practice, so that the *dos and don'ts* of each approach

are clear. Such a guideline should also avoid general recommendation of methods that are subject to wide interpretation and misuse, for example, value-based pricing. In addition, it is important to separate the discussion of tools and resources that can help price setting (for example, health technology assessment) from the pricing approaches. Ideally, a guideline on pharmaceutical pricing methods should help countries with different health system capacity and resources select pricing approaches that assist them in enhancing access to medicines and improving universal health coverage.

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# Food safety knowledge, attitudes and self-reported practices among food handlers in Sohag Governorate, Egypt

Ahmed Hamed<sup>1</sup> and Nesreen Mohammed<sup>1</sup>

<sup>1</sup>Department of Public Health and Community Medicine, Faculty of Medicine, Sohag University, Sohag, Egypt. (Correspondence to: Nesreen Mohammed: nesreenhammad180@yahoo.com).

## Abstract

**Background:** Foodborne diseases are of public health importance worldwide. Most of the factors related to their occurrence are the responsibility of food handlers.

**Aims:** This study aimed to determine the knowledge, attitudes and self-reported practices of food handlers in Sohag Governorate about food safety and the factors affecting their knowledge, attitudes and practices.

**Methods:** A cross-sectional study was done from May 2016 to March 2017 with food handlers working in cafeterias, restaurants, food establishments and roadside food stands from four randomly selected districts in Sohag Governorate. A questionnaire was used to collect data on their sociodemographic characteristics – age, sex, residence (urban, rural), education (illiterate, primary, preparatory, secondary, university) and job (cook, assistant) – and food safety knowledge, attitudes and practices.

**Results:** Of the 994 food handlers included in the study, 39.2% had good knowledge of food safety, 61.2% had positive attitudes and 56.3% reported good food safety practices. In univariate logistic regression, most of the variables were significantly associated with participants' knowledge. Only residence and education were significantly associated with positive attitudes. None of the variables was significantly associated with participants' practices. In multivariable logistic regression analysis, age, male sex, urban residence, higher education and working as a cook were strongly associated with good knowledge. Residence and education significantly influenced positive attitudes.

**Conclusion:** Food handlers in our sample had poor knowledge of food safety and inadequate compliance with food safety practices. Educational and training programmes should be implemented to improve their knowledge, attitudes and practices.

Keywords: food safety, food handlers, hygiene, foodborne diseases, Egypt

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## Introduction

Safe food is defined as not causing harm or illness to the consumer (1). Changing lifestyles and living and working conditions have given rise to a greater number of working women relying on convenience foods (fast foods) and greater negligence of food safety and hygiene. Lack of attention to food safety and hygiene causes an increase in foodborne diseases (2,3), which are important public health problems worldwide (4). These illnesses are generally transmitted by ingestion of viable pathogens or their toxins in amounts that are enough to cause illness (5). Low- and middle-income countries are much more affected by foodborne diseases because of poor food safety training, noncompliance with hygiene practices, inadequate potable water and unhygienic storage (6).

The World Health Organization determined five factors connected to the occurrence of foodborne illnesses including unhygienic practices and insufficient sanitation by food handlers, inadequate cooking

procedures, improper storage without considering temperature requirements, cross-contamination, and sourcing food from unsafe places (3). Most of these factors are the responsibility of food handlers who are involved in food production and preparation. Food handling includes all steps of storing, preparing and preserving food until it reaches final consumption (7).

Studies have found pathogenic microbes on food handlers' hands, and therefore these workers are a source of foodborne diseases (8,9). Furthermore, previous studies have demonstrated an association between inadequate knowledge, attitudes, and practices among food handlers and the occurrence of food poisoning (10–12). In addition, food handlers' attitudes have an important effect on their practices (13).

This study determined the knowledge, attitudes and self-reported practices of food handlers in Sohag Governorate, Egypt, with regard to food safety, and the sociodemographic and work-related factors associated with their knowledge, attitudes and practices.

## Methods

### Study design

This was a cross-sectional study conducted from May 2016 to March 2017 in Sohag Governorate. The target population was food handlers in cafeterias, restaurants, food establishments and roadside food stands in selected districts of the governorate.

### Study setting and sample selection

Sohag Governorate has an estimated population of 4.9 million and 12 districts. Multistage sampling was used to select the sample. Four districts – Sohag, Akhmim, Girga, and Tama – were selected by simple random sampling out of the 12 districts. From each district, four regions were randomly chosen: one urban and three rural regions because of the smaller number of food establishments in rural regions compared with urban regions.

All food handlers (involved in preparing and serving food) in the selected areas who consented to participate after the purpose of the research had been explained to them were included. Food handlers who declined to participate in the study were excluded. There were no other exclusion criteria.

### Questionnaire and data collection

An interview questionnaire in Arabic was prepared based on validated questionnaires of previous studies (14,15) to gather data about sociodemographic characteristics, food safety knowledge (15 items), attitude (15 items) and self-reported practices (19 items) of the participants.

Correct responses were scored 2 while incorrect answers were scored 0. The score range was 0–30. Food safety attitudes and self-reported practices were evaluated with a five-point Likert scale. For items under the attitudes section, positively worded questions were scored as follows: strongly agree (4), agree (3), neutral (2), disagree (1) and strongly disagree (0). In contrast, for negatively worded items, “strongly agree” was scored 0 and “strongly disagree” was scored 4. The scores ranged from 0 to 60. For positively worded self-reported practices, “always” was scored 4 with “never” scoring 0. Again, this was reversed for the negatively worded questions and the score range was 0–76.

Total scores equal to or more than 50% of the maximum scores of knowledge, attitude or practices were categorized as good, while lower scores were considered poor or unsatisfactory.

### Data analysis

SPSS, version 22 (16) was used for data entry and analysis. Categorical data are presented as numbers and percentages. The data were tested for normality using the Shapiro–Wilk test. As the data were not normally distributed, nonparametric tests were used to test difference between variables: Mann–Whitney, Kruskal–Wallis and Spearman correlation. The association between good knowledge, attitudes and practices and the studied variables

were examined using bivariate and multivariable logistic regression analyses, and odds ratios (ORs) and 95% confidence intervals (95% CI) are presented. The variables were: age, sex, residence (urban/rural), education (illiterate, primary, preparatory, secondary, university) and job, (cook/assistant). A *P*-value less than 0.05 was considered statistically significant.

### Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Sohag University, Egypt. Informed verbal consent was obtained from all respondents. The questionnaires used in information gathering were anonymous and confidentiality of data was guaranteed.

## Results

Our study included 994 food handlers. Those who declined to participate were not counted. The mean age (standard deviation, SD) of the participants was 31.7 (SD 9.9) years (range 16–55 years). Most were males (805, 81.0%) and 531 (53.4%) were rural residents. About one-fifth of the participants (189, 19.0%) were illiterate, 318 (32.0%) had primary education, 184 (18.5%) had preparatory and 227 (22.8%) had secondary education; only 76 (7.6%) had university education. About one third (346, 34.8%) of the respondents were cooks and 648 (65.2%) were assistants. The mean of years of experience was 9.6 (SD 6.3) years.

Only about one third of the participants correctly answered the knowledge questions about the increased risk of food poisoning from eating raw or semi-cooked meat (325, 32.7%), raw unwashed vegetables (357, 35.9%), and covered leftover food kept for more than 6 hours at room temperature (398, 40.0%). Just over half of the food handlers (56.7%) did not know that insects can transmit food-poisoning pathogens (564, 56.7%) and that harmful bacteria multiply rapidly at room temperature (588, 59.2%) (Table 1).

Regarding the participants' food safety attitudes, 435 (43.8%) considered that safe food handling is an essential part of their job; an approximate proportion (426, 42.9%) thought that food safety training courses are necessary; 43.6% (433) agreed that raw and cooked foods should be separated; and 334 (33.6%) did not agree that wiping vegetables or fruit makes them safe to eat. Nearly one third of the participants did not think that food handlers could be a source of outbreaks of food poisoning (311, 31.3%) and did not agree that thorough washing of vegetables and fruits is mandatory to prevent food poisoning (325, 32.7%). Less than half of the participants (447, 45.0%) agreed that vegetables and raw meat should not be cut on the same chopping board, 448 (45.1%) considered that long nails could be a source of pathogens and (466, 46.9%) agreed that food handlers should have a medical examination twice a year.

Table 2 shows that only 185 (18.6%) of the participants always wore gloves when touching cooked food and 177 (17.8%) always washed their hands before food processing.

**Table 1** Distribution of participants according to food safety knowledge

Question	Yes	No
	No. (%)	No. (%)
Food poisoning is caused by pathogenic microbes	360 (36.2)	634 (63.8)
Eating raw or semi-cooked meat may increase the risk of food poisoning	325 (32.7)	669 (67.3)
Eating raw, unwashed vegetables may increase the risk of food poisoning	357 (35.9)	637 (64.1)
Food handlers who are not compliant with hygiene practices can be a source of food-poisoning microbes	369 (37.1)	625 (62.9)
Consuming covered leftover food, kept for > 6 hours at room temperature may increase the risk of food poisoning	398 (40)	596 (60)
Keeping food in the fridge helps to prevent food poisoning	407 (40.9)	587 (59.1)
Hand contact with ready-to-eat food may cause contamination with microbes that can cause food poisoning	463 (46.6)	531 (53.4)
The safest way to defrost frozen meat is to keep it at room temperature during the night	331 (33.3)	663 (66.7)
Food poisoning can lead to hospitalization and sometimes death	442 (44.5)	552 (55.5)
Apparently healthy food handlers might carry foodborne pathogens	358 (36.0)	636 (64)
Insects can transmit food-poisoning pathogens	430 (43.3)	564 (56.7)
Harmful bacteria multiply rapidly at room temperature	406 (40.8)	588 (59.2)
Food-poisoning microbes can be seen by the eye	397 (39.9)	597 (60.1)
Vegetables must be placed on a higher rack inside the refrigerator than meat	341 (34.3)	653 (65.7)
Cooked food should be adequately reheated	332 (33.4)	662 (66.6)

Only 101 (10.2%) reported that they never worked if they had diarrhoea and similar proportions did not work when they had cuts or wounds on their hands (120, 12.1%) or a common cold (145, 14.6%). Just over one fifth (217, 21.8%) stated that they always separated raw meat from cooked food and 210 (21.1%) stated that they checked the refrigerator temperature regularly.

Overall, 390 (39.2%) of our participants had a good knowledge of food safety and 608 (61.2%) had positive attitudes towards food safety. More than half of the participants (560, 56.3%) reported good food safety practices.

Males had higher knowledge and attitude scores than females ( $P < 0.001$ ,  $P < 0.004$  respectively) while the practice scores of were not significantly different between men and women. The participants with higher education had significantly higher knowledge scores ( $P < 0.001$ ), but attitude and practice scores were not associated with education. Residence (rural/urban) significantly affected participants' knowledge and attitude scores, with urban food handlers having higher scores ( $P = 0.005$ ,  $P = 0.002$  respectively). Furthermore, job significantly affected knowledge scores, with cooks having higher scores ( $P < 0.001$ ). A significant positive correlation was found between knowledge scores and participants' age (Spearman correlation coefficient  $r = 0.171$ ,  $P < 0.001$ ) and years of experience ( $r = 0.123$ ,  $P < 0.001$ ) – older and more experienced food handlers had better knowledge scores.

Univariate logistic regression analysis indicated that most of the studied variables were significantly associated with good food safety knowledge. Education (OR = 6.9, 95% CI: 5.4–8.8), job (OR = 4.4, 95% CI: 3.4–5.9) and sex (OR = 2.3, 95% CI: 1.6–3.3) were strongly

associated with good knowledge scores. With regard to attitudes, only residence (OR = 1.5, 95% CI: 1.2–1.9) and education (OR = 1.1, 95% CI: 1.03–1.3) were significantly associated with participants' positive attitude. However, none of the studied factors significantly influenced food safety practices (Table 3).

A multivariable stepwise logistic regression analysis was done for the variables that were significantly associated with food knowledge and attitude in the univariate analysis. Age, male sex, urban residence, higher education and being a cook were strong indicators of good food safety knowledge, and residence and education were significantly associated with positive food safety attitudes (Table 4).

## Discussion

Foodborne diseases cause considerable morbidity and death worldwide (17). Food mishandling and inadequate hygiene in all stages of food processing, preparation and serving increase transmission of foodborne illnesses (18,19).

Our study indicates that only 36.0% of participants correctly identified that healthy food handlers might carry foodborne pathogens, which is lower than the results of a study in Ghana where 71.5% answered correctly (20). In addition, 56.7% of our participants did not know that insects could transmit food-poisoning pathogens, which contrasts with a study in the United Arab Emirates, in which 97% of the sample identified the relation between insects and foodborne illnesses (21).

About 60% of our participants knew that harmful bacteria multiply rapidly at room temperature, which is lower than a study of food handlers in Malaysia, where

**Table 2** Distribution of the participants according to compliance with food safety practices

Item	Always No. (%)	Usually No. (%)	Sometimes No. (%)	Rarely No. (%)	Never No. (%)
Wearing gloves when touching ready to eat food	185 (18.6)	242 (24.4)	237 (23.8)	232 (23.3)	98 (9.9)
Washing hands with water and soap before food preparation	177 (17.8)	238 (23.9)	249 (25.1)	233 (23.4)	97 (9.8)
Working if you have diarrhoea	177 (17.8)	268 (27)	248 (24.9)	200 (20.1)	101 (10.2)
Working if you have a cut or wound on your hands	160 (16.1)	274 (27.6)	226 (22.7)	214 (21.5)	120 (12.1)
Having long nails	162 (16.3)	280 (28.2)	222 (22.3)	214 (21.5)	116 (11.7)
Washing vegetables and fruits before peeling	149 (15)	300 (30.2)	211 (21.2)	223 (22.4)	111 (11.2)
Keeping cooked meat or chicken for > 4 hours at room temperature	159 (16)	289 (29.1)	214 (21.5)	216 (21.7)	116 (11.7)
Cleaning surfaces on which food has been handled before and after processing	169 (17)	262 (26.4)	212 (21.3)	220 (22.1)	131 (13.2)
Working if you have a common cold	177 (17.8)	246 (24.8)	208 (20.9)	218 (21.9)	145 (14.6)
Washing vegetables and fresh fruit before eating	171 (17.2)	255 (25.7)	217 (21.8)	231 (23.2)	120 (12.1)
Washing hands with soap and water before eating	170 (17.1)	277 (27.9)	205 (20.6)	222 (22.3)	120 (12.1)
Washing hands with soap and water after handling raw meat	176 (17.7)	269 (27.1)	207 (20.8)	236 (23.7)	106 (10.7)
Washing hands with soap and water after using the toilet	200 (20.1)	266 (26.8)	184 (18.5)	243 (24.4)	101 (10.2)
Drying hands after washing them	220 (22.1)	259 (26.1)	207 (20.8)	228 (22.9)	80 (8.1)
Eating under-cooked eggs	208 (20.9)	275 (27.7)	249 (25.1)	190 (19.1)	72 (7.2)
Separating raw meat from ready-to-eat food	217 (21.8)	262 (26.4)	258 (26.0)	172 (17.2)	85 (8.6)
Checking the refrigerator temperature regularly	210 (21.1)	251 (25.3)	254 (25.6)	182 (18.2)	97 (9.8)
Drinking unpasteurized milk	209 (21)	264 (26.6)	237 (23.8)	197 (19.8)	87 (8.8)
Eating under-cooked meat	202 (20.3)	262 (26.4)	231 (23.2)	205 (20.6)	94 (9.5)

77.7% knew that keeping food at room temperature for a prolonged time increased bacterial growth (22). In addition, 98.2% of the Malaysian food handlers considered safe food handling was a vital part of their work compared with only 43.8% in our study. Furthermore, 42.9% of our participants thought that food safety training was essential, which is again lower than other studies (21,23), where 96% and 93.6% respectively believed in the importance of food safety training.

Only 44% of our food handlers agreed that raw and cooked foods should be separated compared with 79.9% of food handlers in a study in Malaysia (15). Furthermore, 45% of our food handlers agreed that vegetables and raw meat should not be prepared on the same chopping board which is more than the 27.6% reported in a study in Saudi Arabia (24). About 45% of our participants considered long nails could be a source of food-poisoning pathogens compared with 88.1% in the study in the United Arab Emirates (20). Almost half of our participants (46.9%) agreed that food handlers should be medically examined regularly, which is less than a study in food vendors (68.5%) (25) and workers in eating places (71.1%) in Nigeria (26).

As regards practices, 18.6% said that they always wore gloves when touching cooked food and 17.8% always washed their hands before food processing. These figures

are much lower than food handlers in Dubai, where 92.2% confirmed that they always used gloves and 90.1% that they always washed their hands before and during food preparation (3). Our results are also lower than the study in Malaysia where 44.4% of the participants said they always wore wear gloves and 86.4% said that they always washed their hands before food preparation (17).

Only 10.2% of our participants stated that they never worked when they had diarrhoea. This figure is similar to a study in food handlers in the United States of America (11.9%) (27). Only a small proportion of our food handlers reported that they refrained from work when they had cuts or wounds on their hands or a common cold (12.1% and 14.6% respectively). These proportions are lower than those in the study in Saudi Arabia, where 64.4% said that they did not handle foodstuffs when they had cuts or wounds on their hands and 65.5% said they stopped handling food when they were ill (24).

Only 20.1% of the respondents stated that they always washed their hands with soap and water after using the toilet. This is much lower than the findings of studies in Nigeria (26) and Sri Lanka (28) where 71.7% and 88.5% of food handlers respectively confirmed that they complied with this practice. Moreover, 21.8% of our participants said that they always separated raw meat from cooked food compared with 84.7% in the study in Dubai (3).

**Table 3 Univariate logistic regression analysis of factors affecting (good) knowledge, attitudes, practices of the participants**

Variable	Crude odds ratio (95% confidence interval)	P-value
<b>Knowledge</b>		
Age	1.01 (1.001–1.03)	0.034*
Sex (male)	2.3 (1.6–3.3)	< 0.001*
Residence (urban)	1.3 (1.04–1.7)	0.024*
Education	6.9 (5.4–8.8)	< 0.001*
Job (cook)	4.4 (3.4–5.9)	< 0.001*
Years of experience	1.003 (0.98–1.02)	0.783
<b>Attitudes</b>		
Age	1.004 (0.9–1.02)	0.512
Sex (male)	1.4 (0.9–1.9)	0.055
Residence (urban)	1.5 (1.2–1.9)	0.002*
Education	1.1 (1.03–1.3)	0.013*
Job (cook)	0.9 (0.7–1.2)	0.719
Years of experience	1.01 (0.9–1.03)	0.512
<b>Self-reported practice</b>		
Age	1.002 (0.9–1.02)	0.776
Sex (male)	1.1 (0.8–1.5)	0.466
Residence (urban)	0.9 (0.7–1.1)	0.380
Education	1.01 (0.9–1.12)	0.869
Job (cook)	1.12 (0.9–1.4)	0.415
Years of experience	1 (0.9–1.02)	0.988

\*Statistically significant at  $P < 0.05$ .**Table 4 Multivariable logistic regression analysis of factors significantly affecting (good) knowledge, attitude, practices of the participants**

Variable	Adjusted odds ratio (95% confidence interval)	P-value
<b>Knowledge</b>		
Education	12.2 (8.8–16.9)	< 0.001*
Job (cook)	20.2 (11.2–36.4)	< 0.001*
Age	1.04 (1.01–1.06)	0.004*
Sex (male)	1.9 (1.09–3.4)	0.024*
<b>Attitude</b>		
Residence (urban)	1.5 (1.1–1.9)	0.005*
Education	1.1 (1.005–1.3)	0.033*

\*Statistically significant at  $P < 0.05$ .

In our study, 39.2% of the food handlers had good food safety knowledge, 61.2% had positive attitudes to food safety and 56.3% reported good practices. In a study in Borneo in food vendors, a lower proportion of participants had good knowledge (36.8%), attitudes (19.1%) and practices (10.8%) (29). The study in Nigeria found that 81% had good knowledge, 71% had positive attitudes and 37% had good practices (25).

Age, male sex, urban residence, higher education and being a cook were indicators of good food safety knowledge in our study. This is consistent with the study in Malaysia which found that age, sex and education significantly influenced food safety knowledge (17).

However, another study in Malaysia reported that none of these factors significantly influenced food handlers' knowledge (14). Residence and education were significantly associated with positive attitudes in our study. The study in Malaysia also found that education was significantly associated with the attitude of food handlers (14). However, a study in India found that only age and sex significantly influenced participants' attitudes (30).

None of the studied variables affected participants' practices, which concurs with the findings of other studies (17,30–32) that indicated that age, sex and education had no effect on practices. On the other hand, a study

in northern Nigeria reported that age and education had a significant effect on food vendors practices (33). A study in Belgaum City, India, also found that education significantly affected the knowledge and attitudes of food handlers but that it had no effect on their practices (34).

Our participants self-reported their food safety practices which is a limitation of our study as they may have been subject to social desirability bias and reported that they followed correct practices when they may not have. Direct observation of the hygiene practices is needed to draw an accurate conclusion on the compliance of the participants with food safety practices.

## Conclusion

Our study highlights the poor knowledge of food handlers in Sohag about food safety and the high level of non-compliance with food safety practices. Such non-compliance could result in outbreaks of foodborne illnesses. Therefore, there is an urgent need to raise interest in food safety. Education and training programmes should be implemented to improve food handlers' attitude, knowledge and practices. In addition, licensing and maintaining supervision should be mandated.

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**Competing interests:** None declared.

## Connaissances et attitudes vis-à-vis de la sécurité sanitaire des aliments et pratiques auto-déclarées des manipulateurs de denrées alimentaires dans le gouvernorat de Sohag (Égypte)

### Résumé

**Contexte :** Les maladies d'origine alimentaire constituent un enjeu de santé publique majeur dans le monde entier. La plupart des facteurs liés à leur survenue relève de la responsabilité des personnes qui manipulent des denrées alimentaires.

**Objectifs :** La présente étude avait pour objectif de déterminer les connaissances, les attitudes et les pratiques auto-déclarées des manipulateurs de denrées alimentaires dans le gouvernorat de Sohag en matière de sécurité sanitaire des aliments et les facteurs affectant ces éléments.

**Méthodes :** Une étude transversale a été réalisée entre mai 2016 et mars 2017 auprès des manipulateurs de denrées alimentaires dans des cafétérias, des restaurants, des établissements de restauration et sur des stands alimentaires en bordure de route de quatre districts du gouvernorat de Sohag, sélectionnés de façon aléatoire. Un questionnaire a été utilisé pour recueillir les données portant sur les caractéristiques sociodémographiques – âge, sexe, lieu de résidence (urbain, rural), niveau d'éducation (analphabète, niveau primaire, collège, lycée, enseignement supérieur et profession (cuisinier, commis) – ainsi que sur les connaissances, les attitudes et les pratiques en matière de sécurité sanitaire des aliments.

**Résultats :** Sur les 994 personnes qui manipulent des denrées alimentaires ayant participé à l'étude, 39,2 % avaient une bonne connaissance de la sécurité sanitaire des aliments, 61,2 % montraient une attitude positive et 56,3 % faisaient état de pratiques satisfaisantes à cet égard. Dans la régression logistique univariée, la plupart des variables étaient fortement associées aux connaissances des participants. Seuls la résidence et le niveau d'éducation étaient nettement associés à des attitudes positives. Aucune des variables n'était significativement associée aux pratiques des participants. À l'analyse de régression logistique multivariée, l'âge, l'appartenance au sexe masculin, la résidence en milieu urbain, un niveau d'éducation supérieur et un emploi de cuisinier étaient fortement associés à une bonne connaissance. Le lieu de résidence et le niveau d'éducation avaient une influence significative sur les attitudes positives.

**Conclusions :** Dans notre échantillon, les manipulateurs de denrées alimentaires avaient des connaissances limitées en matière de sécurité sanitaire des aliments et ne respectaient pas les bonnes pratiques dans ce domaine. Des programmes d'éducation et de formation devraient être mis en œuvre afin d'améliorer les connaissances, les attitudes et les pratiques.

معلومات واتجاهات وسلوكيات مناوولي الأغذية تجاه سلامة الأغذية بمحافظة سوهاج، مصر

أحمد حامد، نسرین محمد  
الخلاصة

الخلفية: إن الأمراض المنقولة عن طريق الأغذية لها أهمية للصحة العامة في جميع أنحاء العالم. وتقع مسؤولية أغلب العوامل المرتبطة بحدوث تلك الأمراض على عاتق مناوولي الأغذية.

الأهداف: هدفت هذه الدراسة إلى تحديد معلومات واتجاهات وسلوكيات مناوولي الأغذية في محافظة سوهاج تجاه سلامة الأغذية، والعوامل التي تؤثر عليها.

طرق البحث: أُجريت دراسة مقطعية من مايو/ أيار 2016 وحتى مارس/ آذار 2017 شملت مناوولي الأغذية من العاملين في الكافيتريات، والمطاعم،

والمؤسسات الغذائية، وأكشاك الطعام على جانب الطريق في أربع مناطق مختارة عشوائياً في محافظة سوهاج. واستُخدم استبيان لجمع البيانات حول السمات الاجتماعية السكانية لهؤلاء المناولين – أي العمر، والنوع، ومكان الإقامة (الحضر، الريف)، والمستوى التعليمي (غير متعلم، ابتدائي، إعدادي، ثانوي، جامعي) والوظيفة (طباخ، مساعد) – والمعلومات والاتجاهات والسلوكيات تجاه سلامة الأغذية.

**النتائج:** من بين مناولي الأغذية الذين شملتهم الدراسة، والبالغ عددهم 994 مناوولا، كان لدى 39% منهم إلمام جيد بسلامة الأغذية، وكان لدى 61.2% مواقف إيجابية، وأبلغ 56.3% منهم بسلوكيات جيدة تتعلق بسلامة الأغذية. وفي تحليل الانحدار اللوجستي أحادي المتغير، أظهرت غالبية المتغيرات ارتباطاً جوهرياً بالمستوى المعرفي للمشاركين. ولم يكن هناك ارتباط قوي بالموقف الإيجابي سوى لمكان الإقامة ومستوى التعليم. ولم يقترن أي من المتغيرات بصورة جوهرياً بسلوكيات المشاركين. أما في تحليل الانحدار اللوجستي المتعدد المتغيرات، فقد اقترن كل من العمر، والنوع (الذكور)، والإقامة في منطقة حضرية، وارتفاع مستوى التعليم، والعمل بمهنة الطباخ بقوة بوجود معلومات جيدة عن سلامة الأغذية. وأثر مكان الإقامة ومستوى التعليم بصورة كبيرة على الموقف الإيجابي.

**الاستنتاج:** اتسم مناولو الأغذية في العينة بتدني المعلومات والامتثال غير الكافي بسلوكيات سلامة الأغذية، لذا ينبغي تنفيذ برامج تعليمية وتدريبية من أجل تحسين معلوماتهم واتجاهاتهم وسلوكياتهم.

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# Household disaster preparedness in the Islamic Republic of Iran: 2015 estimation

Ali Ardalan,<sup>1,2</sup> Homa Yusefi,<sup>1,3</sup> Narges Rouhi,<sup>3</sup> Ahad Banar<sup>3</sup> and Sanaz Sohrabizadeh<sup>4</sup>

<sup>1</sup>Department of Disaster and Emergency Health, School of Public Health, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran.

<sup>2</sup>Harvard Humanitarian Initiative, Harvard University, Cambridge, United States of America. <sup>3</sup>Disaster Risk Management Office, Department of Public Health, Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran. <sup>4</sup> Department of Health in Disasters and Emergencies, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran (Correspondence to: Ali Ardalan: aardalan@tums.ac.ir; ardalan@hsph.harvard.edu).

## Abstract

**Background:** The Islamic Republic of Iran is at high risk of natural disasters. Households are the basic unit of society and they need to be prepared for disasters.

**Aims:** This study assessed disaster preparedness among Iranian households in 2015.

**Methods:** Using multistage cluster sampling, 2968 households in the catchment area of 53 public health departments in all 30 provinces of the Islamic Republic of Iran were surveyed on the disaster preparedness measures they had taken in the past year. The data collection questionnaire included 15 disaster preparedness measures. The mean preparedness score was calculated and its association with residence (urban versus rural), house ownership (owner versus renter) and education level of the head of the household (illiterate, elementary school, middle school, high school, university) was evaluated.

**Results:** The mean score for household disaster preparedness was 9.3 out of 100 (95% confidence interval: 8.3–10.3). Multivariate analysis showed higher preparedness among rural than urban households ( $P = 0.02$ ). Higher education level was positively associated with a higher preparedness score ( $P < 0.001$ ), as was house ownership ( $P < 0.001$ ).

**Conclusion:** The level of household disaster preparedness in the Islamic Republic of Iran in 2015 was low. In line with the first priority for action of the Sendai Framework for Disaster Risk Reduction, the current study provides an overall picture of household disaster preparedness in the Islamic Republic of Iran. This estimation can be used as a baseline value for policy-making, planning, and evaluation of public awareness of disasters in the country.

Keywords: disasters, risk reduction behaviour, preparedness, households, Iran

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## Introduction

The Islamic Republic of Iran is at high risk of natural disasters. The Global Assessment Report on disaster risk reduction of 2009 put the country in the high multiple mortality risk class (8 out of 10) (1). Each year on average, natural disasters kill about 90 000 people and affect 160 million people (2). Earthquakes, floods, drought and storms are the main natural disasters that affect the lives and livelihood of Iranians. To mitigate the risk of disasters, the country needs a national disaster preparedness programme that enables the community, including individuals, households, organizations and societies, to respond and recover effectively when disasters strike (3).

Lessons learnt from Iranian disasters and those learnt from other countries highlight the need for individual responsibility in disaster preparedness (3). Local people are the first who need to take protective actions when a disaster occurs. In addition, before the arrival of any professional response team, local people are the first

responders to help their own families and neighbours, especially those with special needs and disabilities (4). Furthermore, studies have shown that citizen involvement is a key component in the natural hazard risk reduction (5), and that improving local preparedness will be effective only if people at risk know how to react appropriately (6).

In the past decade, the Islamic Republic of Iran has invested considerable effort to develop policies and infrastructure for disaster preparedness, including the establishment of the National Disaster Management Organization and strengthening of relief organizations (7). Nevertheless, the preparedness of local people is still a real concern and data on their level of preparedness are needed.

The aim of this study, therefore, was to estimate the level of disaster preparedness of Iranian households, in order to provide baseline figures for future assessment. We focused on the household as this is the most basic and fundamental unit of society.

## Methods

### Study design and sample selection

A cross-sectional survey was conducted in December 2015 covering the catchment area of 54 public health departments in all 30 provinces of the Islamic Republic of Iran. Responses were received from 53 out of 54 (98.2%) public health departments.

The household was the survey unit and was defined as a group of individuals living together under one roof. Multistage cluster sampling was used to select the sample of households. In the first stage, one district was randomly selected from each public health department. Then, two urban and two rural areas were randomly selected from the selected district. Finally, in each selected area, two random clusters of seven households were chosen using registries of households available at the corresponding primary health care centre. This resulted in the selection of 424 clusters including 2968 households.

### Survey tool and data collection

Data collection was done using a questionnaire including 15 disaster preparedness measures. Households were asked if they had taken any of the measures over the past year with yes or no answers.

The questionnaire, called the household disaster preparedness index, was developed and validated for face and content validity by experts in health systems and disaster management. The content and face validity of the questionnaire was assessed and the Cronbach alpha for the awareness and readiness questions was 0.78.

The survey protocol was piloted in four clusters (28 households) in one public health department, and was then revised according to the results of the pilot phase. Study variables were household disaster preparedness as the dependent variable, and residence (urban versus rural), house ownership status (owner versus renter), and education level of the head of the household (illiterate, elementary school, middle school, high school, university) as the independent variables.

A score of 1 was given for each preparedness activity undertaken. Unanswered questions answers were coded as 0 by default. Equal weight was given to each question. A raw score was calculated for preparedness questions by summing of all scores. Finally, preparedness raw scores were normalized on a 100-point scale. In the case of missing data, the field collection teams were sent back for clarification.

The survey was administered by the staff of disaster risk management offices at the public health departments. These staff were trained on the questionnaire, study protocol and interview skills. Each interview lasted about 20 minutes. Most often, the person interviewed was the head of the household, unless he or she was not available, in which case, another person older than 18 years of age was interviewed. If an appropriate household member was not at home at the time of the attempted interview, up to two further visits were made.

### Statistical analysis

A complex sampling design was applied for the strata and clusters; urban and rural areas were considered as different strata. Mean and standard deviation of preparedness score were calculated along with the 95% confidence interval (CI). Independent *t*-test and ANOVA were applied to compare scores between and within the subgroups. Linear regression models were applied to assess the adjusted effects of variables on disaster preparedness.  $P < 0.05$  was considered statistically significant. SPSS, version 22.0 was used for statistical analysis.

### Ethical considerations

This study was reviewed by the Disaster Risk Management Office of the Iranian Ministry of Health and Medical Education and considered exempt as no intervention was carried out and no sensitive data were collected.

## Results

In this national survey, 2968 households (50% urban and 50% rural) were assessed for disaster preparedness; 2527 households (85.1%) were the owner of the houses they were living in, while 441 (14.9%) were living in a rented house. The education level of the head of the household was as follows: 482 (16.2%) illiterate, 738 (24.9%) elementary school, 611 (20.6%) middle school, 712 (24.0%) high school and 425 (14.3%) university.

The mean score of household disaster preparedness was at 9.3 out of 100 (95% CI: 8.3–10.3). Table 1 presents the frequency of preparedness measures reported by the households that they had carried out over the past year.

The mean preparedness score was higher among rural households than urban households (9.5 versus 9.1,  $P = 0.02$ ) (Table 2). A slightly higher but statistically significant preparedness score was found in households that were the owners of the property they lived in compared with those who were living in a rented house (9.4 versus 9.3,  $P < 0.001$ ). A higher level of education of the head of the household was positively associated with a higher preparedness score ( $P < 0.001$ ) (Table 2). The multivariate analysis also showed that all background variables were significantly associated with preparedness score ( $P < 0.001$ ) (Table 2).

## Discussion

Our results indicate that household disaster preparedness is low in the Islamic Republic of Iran; only about 10 out of 100 households, on average, had taken any preparedness measures. Since this is the first national estimation, it is difficult to assess trends that have occurred over the past few years. Nevertheless, we speculate that household disaster preparedness has improved in the country in the past decade through improved public awareness facilitated by the media and community-based initiatives such as annual school drills.

Local people are on the frontline in a response to disasters. They are the first responders before the arrival of any professional team to the affected area.

**Table 1 Disaster preparedness activities carried out over the past year by Iranian households**

Activity	No. (n = 2968)	%
Holding a family meeting for disaster planning	532	17.9
Drawing a household disaster risk map	107	3.6
Assessing structural safety of the house	146	4.9
Taking structural safety measures	93	3.1
Assessing non-structural safety of the house (e.g. furnishing, equipment, electrical and mechanical fixtures)	167	5.6
Taking non-structural safety measures	125	4.2
Preparing an emergency kit	257	8.6
Having a disaster communication plan	230	7.7
Having a disaster evacuation plan	346	11.6
Planning for vulnerable members of the family	433	14.6
Being aware of early warning for hydroclimatic hazards (e.g. flooding)	496	16.7
Having a fire extinguisher in the house	376	12.7
At least one of the household member being trained on medical first aid	427	14.4
Contributing to neighbourhood disaster planning	194	6.5
Carrying out a disaster exercise	206	6.9

Furthermore, preparedness of local people reduces the effect of disasters and associated risks of death and injuries. Such local preparedness includes having an emergency kit ready, conducting regular drills, assisting vulnerable people and having a communications plan. Lessons learnt from disasters around the world highlight the need for individual responsibility and local coordination in response to and recovery from disasters (3). The literature highlights the importance of household and individual preparedness for natural disasters (8,9). Enhanced awareness of people and involvement of citizens in disaster planning is also a strategy that must be incorporated into public values to improve the sustainability of decisions (10). This is why national governments initiate plans to enhance disaster

preparedness at the community level (3).

A household, by definition, is a place where a group of individuals lives under the same roof. As an important component of the community preparedness for disasters, we focused on households. This is because a household, mostly shaped by members of a family, is the basic unit of society and is a place where members support each other and learn from one another. Each individual interacts with other family members and can both affect others and/or be affected by them. These characteristics can be utilized for community disaster preparedness.

Because of the frequent devastating natural disasters in the Islamic Republic of Iran and the coverage by the media, we can expect the Iranian community to be well-

**Table 2 Comparison of mean score of household disaster preparedness between study subgroups**

Group	Mean (SD)	Bivariate analysis		Multivariate analysis	
		P-value <sup>a</sup>	B	t	P-value <sup>a</sup>
<b>Residence</b>					
Urban	9.1 (9.01)	0.02	0.079	3.021	< 0.001
Rural	9.5 (9.04)				
<b>House ownership</b>					
Owner	9.4 (9.02)	< 0.001	0.001	0.072	< 0.001
Rental	9.3 (9.04)				
<b>Education of family head</b>					
Illiterate	8.1 (8.31)	< 0.001	0.002	6.047	< 0.001
Elementary	9.1 (9.14)				
Middle	9.2 (8.23)				
High school	9.3 (9.33)				
University	10.3 (9.52)				

SD: standard deviation.

<sup>a</sup>P values are calculated based on the complex sampling design.

sensitized and informed about the risks of disasters, especially earthquakes and floods. However, the low preparedness we found, measured as the practical steps taken by the households, shows there is still a gap between what people know and what they do (11). This requires further studies to investigate factors that contribute to this gap.

Preparedness of households for emergency situations depends on complex and multifaceted factors (12). Having sufficient knowledge of how to prepare for emergencies does not guarantee that people will implement self-protection measures (13). The positive association between past disaster experience and preparedness of households has been found in several studies (14,15). However, other research suggests that past disaster experience is not the prime factor that enhances awareness and that school education can provide useful information as a knowledge base for earthquakes (16).

Risk perception is another key factor that determines if people undertake preparedness measures (9,14). Risk perception also affects how people think about sharing responsibility with governmental organizations (9). Research suggests that some households may not be able to prepare for disasters because of a lack of resources (3). This vulnerability may be associated with income, education, ethnicity, age and linguistic isolation. Other research has suggested that those most likely to engage in self-protective behaviour for earthquakes are those living in safer and structurally sounder houses (17). Two studies in Tehran suggest that in order to promote disaster preparedness behaviour, there needs to be a focus on people of low socioeconomic background (11,15). Factors such as income influence access to safe housing, insurance and other resources required for safety measures, such as preparation of emergency kits (3,18). Therefore, limitations on household resources should be taken into consideration when advocating safety measures (17).

People may also overestimate their preparedness (8,19). A study in Queensland, Australia, found that while two out of every three households believed they were prepared or very prepared for a natural disaster, their responses to more detailed questions on preparedness suggested otherwise (19). In our study, the participants expressed low basic preparedness.

Following the 2003 earthquake in Bam, the Islamic Republic of Iran invested considerably in public awareness through the national media. Iranian television and radio channels have produced programmes, such as reports, expert interviews and animations, and have presented them on special occasions, including the anniversary of the Bam earthquake and the National Day of Disaster Reduction. Moreover, an annual earthquake drill is held at schools by the Ministry of Education and the International Institute of Earthquake Engineering and Seismology (20,21). In addition, a neighbourhood disaster preparedness programme has also been developed by the Tehran Disaster Prevention and Management Organization and expanded to other cities (22).

According to the National Disaster Management Organization, the Iranian Red Crescent Society is the lead agency for the disaster public awareness. While the Iranian Red Crescent Society has carried out many activities, including training volunteers and conducting community drills, raising public awareness of disaster management is a difficult task to be managed entirely by one agency. The working group has to make use of the capacities of all governmental bodies and civil societies to create better preparedness.

The Iranian public health system, led by the Ministry of Health and Medical Education, is a key and trusted partner in community disaster preparedness (23,24). Not only has it taken an initiative to measure household disaster preparedness, but it has also utilized the capacity of the primary health care system to educate households in collaboration with community health volunteers. As a result of this initiative, over 500 000 households had received training by the end of 2015 (25). The programme continued in 2016 and is now well integrated into the primary health care system in the Islamic Republic of Iran. Under this programme, each household should have a household disaster preparedness index form in their respective health centre files. Quantifying household disaster preparedness, as presented in this article, provided supporting evidence and was a driving force behind the creation of this programme.

## Conclusion

In line with the first priority for action of the Sendai Framework for Disaster Risk Reduction, which is understanding the risk (26), our study provides an overall picture of household disaster preparedness in the Islamic Republic of Iran. Although the findings of our study support the first priority for action in the Sendai Framework, it can indirectly influence the other three priorities namely: strengthening disaster risk governance, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and to “Build Back Better” in recovery. For example, our estimation of household disaster preparedness can help communities to identify and fill their preparedness gaps and enhance disaster preparedness. This estimation can be used as a baseline value for policy-making, planning and evaluation of disaster public awareness and help strengthen disaster risk governance in the country. Assessment of household disaster preparedness should be repeated on a regular basis, preferably annually, to monitor the effectiveness of interventions to improve preparedness. Further research is needed to explore different aspects of household disaster preparedness, including political sensitivities and legal frameworks to support community preparedness, risk analysis, evacuation plans and community safety, health sector community preparedness and environmental health.

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**Competing interests:** None declared.

## Préparation des ménages en cas de catastrophe naturelle en République islamique d'Iran : estimation pour l'année 2015

### Résumé

**Contexte :** La République islamique d'Iran est exposée à un risque élevé de catastrophes naturelles. Les ménages constituent la cellule de base de la société et ils doivent être prêts à faire face à des catastrophes de ce type.

**Objectifs :** La présente étude a évalué la préparation des ménages iraniens en cas de catastrophe naturelle en 2015.

**Méthodes :** En utilisant un sondage en grappes à plusieurs degrés, 2968 ménages appartenant à la zone couverte par 53 départements de santé publique dans les 30 provinces de la République islamique d'Iran ont été interrogés sur les mesures de préparation face aux catastrophes naturelles qu'ils avaient mises en place au cours de l'année précédente. Le questionnaire de collecte de données comprenait 15 mesures de préparation aux catastrophes. Le score moyen de préparation a été calculé et son association avec le lieu de résidence (milieu urbain ou rural), le fait d'être propriétaire de son logement (propriétaire ou locataire) et le niveau d'éducation du chef de ménage (analphabète, primaire, collège, lycée, université) a été évaluée.

**Résultats :** Le score moyen de préparation des ménages aux catastrophes était de 9,3 sur 100 (intervalle de confiance à 95 % : 8,3-10,3). L'analyse multivariée a montré un niveau de préparation plus élevé parmi les ménages des milieux ruraux que parmi ceux vivant en milieu urbain ( $p = 0,02$ ). Le niveau d'éducation plus élevé était associé de façon positive à un score de préparation supérieur ( $p < 0,001$ ) de même que le fait d'être propriétaire de son logement ( $p < 0,001$ ).

**Conclusion :** En 2015, le niveau de préparation des ménages face aux catastrophes naturelles en République islamique d'Iran était faible. En ligne avec la première priorité d'action du Cadre de Sendai pour la réduction des risques de catastrophe, la présente étude offre une vue d'ensemble de la préparation des ménages aux catastrophes en République islamique d'Iran. Cette estimation pourrait constituer une base de référence en vue de l'élaboration des politiques, de la planification et de l'évaluation du niveau de sensibilisation du public face aux catastrophes naturelles dans le pays.

### التأهب الأسري للكوارث في جمهورية إيران الإسلامية: تقييم عام 2015

علي أردلان، هما يوسف، نرجس روجي، احد بنار، ساناز سهرابي زادة  
الخلاصة

الخلفية: تواجه جمهورية إيران الإسلامية خطراً مرتفعاً جزئياً التعرض للكوارث الطبيعية. وتشكل الأسرة الوحدة الأساسية للمجتمع، لذا فهي بحاجة إلى التأهب للكوارث.

الأهداف: قيمت هذه الدراسة درجة التأهب للكوارث لدى الأسر الإيرانية في عام 2015.

طرق البحث: باستخدام أسلوب المعاينة العنقودية المتعددة المراحل، جرى مسح 2968 أسرة في منطقة الخدمة الطبية التي ضمت 53 إدارة للصحة العامة تغطي جميع أقاليم جمهورية إيران الإسلامية البالغ عددها 30 إقليماً، وذلك لبيان تدابير التأهب للكوارث التي اتخذتها تلك الأسر خلال العام السابق. وتضمن استبيان جمع المعلومات 15 تدبيراً متعلقاً بالتأهب للكوارث. تم حساب متوسط درجة التأهب وجرى تقييم مدى ارتباطها بمكان الإقامة (الحضر في مقابل الريف)، وملكية المنزل (تمليك في مقابل استئجار) والمستوى التعليمي لرب الأسرة (غير متعلم، تعليم ابتدائي، تعليم متوسط، تعليم ثانوي، تعليم جامعي).

النتائج: كان متوسط درجة تأهب الأسر 9.3 من 100 درجة (95% CI = 8.3 - 10.3). وأظهر التحليل المتعدد المتغيرات تأهباً لدى الأسر في الأماكن الريفية أعلى من نظيره لدى الأسر في المناطق الحضرية ( $P = 0.02$ ). وكان هناك ارتباط إيجابي بين المستوى التعليمي وبين ارتفاع درجة التأهب ( $P < 0.001$ )، وكذلك ملكية المنزل ( $P < 0.001$ ).

الاستنتاج: مستوى التأهب الأسري للكوارث في جمهورية إيران الإسلامية في عام 2015 كان منخفضاً. وتماشياً مع الأولوية الأولى للعمل وفق إطار سينداي للحد من مخاطر الكوارث، تقدم الدراسة الحالية تصوراً عاماً حول تأهب الأسر للكوارث في جمهورية إيران الإسلامية. ويمكن استخدام هذا التقييم لما يحمله من قيمة أساسية لراسمي السياسات، والقائمين على التخطيط، وتقييم الوعي العام بالكوارث في البلاد.

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# Profile of risk factors for noncommunicable diseases in major cities of Afghanistan: WHO STEPwise approach

Khawaja Mir Islam Saeed,<sup>1</sup> Muhammad Hafiz Rasooly<sup>2</sup> and Malalai Nejaby<sup>3</sup>

<sup>1</sup>Grant and Contract Management Unit; <sup>2</sup>Influenza Surveillance Unit, Evaluation and Health Information System, Ministry of Public Health, Kabul, Afghanistan (Correspondence to: Khawaja M.I. Saeed: kmislamsaeed@gmail.com). <sup>3</sup>Helping Mothers and Children Thrive Project (HEMAYAT), Johns Hopkins Program for International Education in Gynaecology and Obstetrics, Kabul, Afghanistan.

## Abstract

**Background:** Noncommunicable diseases (NCDs) are a major public health problem worldwide. Despite improvement in the health situation, Afghanistan's health indicators are the worst in the Region. About 37% of Afghan adults die due to NCDs.

**Aims:** We aimed to estimate the proportion of major risk factors for NCDs in Afghanistan.

**Methods:** We analysed the dataset of studies conducted in 5 provinces, Kabul, Balkh, Hirat, Nangarhar and Kandahar, during 2013–2015, using the WHO STEPwise approach to NCD surveillance. This involved multistage cluster sampling from urban citizens aged 25–70 years. EpiInfo, version 7, and SPSS, version 20, were used for data management.

**Results:** In total, 5897 records were included in the analysis; 54% were females. Mean age was 39.56 (standard deviation 12.29) years; illiteracy rate was 61.5% and 83.2% were married. Smoking and snuff use was 8% and 11.1% respectively. On average the subjects were consuming fruits 2.76 and vegetable 3.85 days per week. Overweight, general and abdominal obesity was 19%, 33.7% and 57.1% respectively. Typically, 32.4% had high blood pressure and 12.5% had high blood sugar.

**Conclusions:** The modifiable risk factors of NCDs were prevalent in the major cities of the country. Their identification is vital in attempting to focus on prevalence of NCDs in urban cities. Tailored interventions are needed to focus on NCDs in Afghanistan.

Keywords: noncommunicable diseases, risk factors, Afghanistan, STEPwise

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## Introduction

Afghanistan is a landlocked country in south central Asia. Administratively, the country is divided into 8 geographical regions, 34 provinces and 398 administrative districts. The 2014/15 estimated population of the country was 26.5 million (1). The most recent figures from 2015, though better than the previous (2003) data, estimate a total fertility rate of 5.3 children per women and an infant mortality rate of 55 per 1000 live births (2). About 4 decades of war in Afghanistan has devastated the country's infrastructure, economy and social services, resulting in a low quality of life. The Taliban rule compounded the suffering of women by curtailing their access to already limited health services. Almost 75% of the districts in Afghanistan lacked maternal and child health services and most women gave birth devoid of the presence of a skilled birth attendant (3,4). Moreover, opiate production increased in the country significantly and led to destabilization of the formal economy and the political situation of Afghanistan. According to a 2015 UN report, opium production in Afghanistan accounted for an estimated 85% of global production (5).

Despite improvement in the health situation, Afghanistan's health indicators are the worst in the region. Above all, about 37% of Afghan adults die due to

noncommunicable disease (NCD) (6). Noncommunicable diseases are medical conditions with long duration and slow progression. Currently, NCDs constitute a major challenge with adverse social and economic consequences, particularly in low- and middle-income countries (7). The 4 priority NCDs are cardiovascular diseases, cancer, chronic respiratory disease and diabetes (8). For many years the world has been expending efforts to prevent and control infectious diseases, malnutrition and maternal and perinatal conditions whereas the epidemiological transition indicates the decline of infectious diseases and the upsurge in chronic NCDs (9).

Mortality due to NCDs contributed to 70% of global deaths in 2017 and the documented prevalence in 2008 was 63% (10–12). Recently, the World Health Organization (WHO) has reported that NCDs kill 40 million people a year, and almost 80% of NCD deaths (32 million) occur in low- and middle-income countries. Cardiovascular diseases account for most of these deaths at 17.7 million annually, followed by cancer (8.8 million), respiratory diseases (3.9 million) and diabetes (1.6 million). These 4 groups of diseases account for 82% of all NCD deaths. Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets together increase the risk of dying from an NCD (13). Furthermore, beyond the health



impact, NCDs impose an economic burden on health systems, skewed towards the low-income countries (14–15). In countries of the WHO Region for the Eastern Mediterranean, up to 50% of deaths due to NCDs occur before the age of 60 years compared with less than 10% in Western Europe (16). Nearly 54% of deaths occur due to NCDs in the South-East Asia Region (17). Key factors that greatly contribute to the progress of NCDs have been identified and considered (18). The health goal is to reduce mortality from NCDs by 25% by 2025; this is “the 25 by 25 goal” (19).

According to WHO, NCDs are estimated to account for 62% of total deaths in Tajikistan, 79% in Uzbekistan, 50% in Pakistan and 76% in the Islamic Republic of Iran and Turkmenistan, all countries neighbouring Afghanistan, conversely NCDs account for 37% of total deaths in our country (20). Similar results were found in the 2010 Afghanistan mortality survey: 33.3% of all deaths in the country were attributed to NCDs (6). Furthermore, WHO estimates the number with diabetes, for instance, is expected to rise nearly threefold in 2030 compared with 2000 (21). Among men aged  $\geq 15$  years in Kabul, the prevalence of smoking was 35% (22), while a 2012 report on prevalence and risk factors of NCDs among the older adult population (aged  $\geq 40$  years) in Kabul reported the prevalence of diabetes mellitus as 13.3%, obesity 31.2% and hypertension 46.2% (23). The national policy for NCDs has recently been developed by Ministry of Public Health (24).

This study aimed to estimate the prevalence of risk factors for chronic NCDs in the urban population in 5 main cities in Afghanistan.

## Methods

### Study setting and design

Using the WHO STEPwise approach, a series of cross-sectional studies were conducted in urban settings of major provinces in Afghanistan: Jalalabad city (May–June, 2013), Mazar-e-Sharif (April to May, 2015), Herat city (May–June, 2015), Kandahar city (October–November, 2015) and Kabul city (November 2015). All permanent residents and household members aged 25–70 years, including men and women, who gave consent to participate were included in the study. Temporary residents (< 6 months), inhabitants of institutionalized settings and insecure areas were excluded. We used an adapted WHO STEPwise instrument; this prescribes 3 steps for measuring NCD risk factors: STEP I measures behavioural risk factors, STEP II covers physical measurements and STEP III measures biological risk factors (25–27). The WHO STEPS tool was adapted for the Afghanistan context. For instance, the part regarding alcohol consumption was removed and some questions regarding use of mouth snuff (called *naswar* locally), which is common in the country, were added. The addition of liquid and solid cooking oil, which is used in the kitchen, was another modification. Some other questions were also modified to easily reflect the meaning without losing the content. The research team translated the data collection tools into local lan-

guages (Dari and Pashto). The tools were tested in Kabul before actual data collection were started.

### Sampling techniques and strategy

Cluster sampling was used as a suitable strategy to approach the households. Assuming the highest proportion (50%), 95% confidence interval (CI) and margin of error of 5%, a sample size of 385 was calculated. However, considering the frequency of risk factors such as smoking, physical activity, dietary habits and other factors and the design effect of cluster sampling, the final sample size was increased to 600 and finally to 1200 ( $deff = 2 \times 600$ ) for each city. After completion of data collection and cleaning of the data, 1200 participants in Jalalabad, 1231 in Mazar-e-Sharif, 1129 in Hirat, 1165 in Kandahar and 1172 in Kabul were included in the final analysis.

For more than 4 decades no census has been conducted in the country and a complete list of villages was not available. The 2015 Expanded Programme on Immunization (EPI) lists of clusters were obtained from EPI unit in provinces and were used as the sampling frame. This frame was used for immunization by the Ministry of Public Health in Afghanistan. Two-stage cluster sampling was used. In the first stage, random sampling was accomplished using *Excel*; from the EPI list, 4 clusters were selected in Jalalabad, 5 in Mazar-e-Sharif, 16 in Hirat, 7 in Kandahar and 5 in Kabul using random numbers from *Excel*. In the second stage, the overall sample of 1200 households was divided among these selected areas proportionate to the number of households in each cluster/area. Based on the frequency and size of each selected cluster, households were selected using a systematic random sampling technique.

### Variables and data collection

The STEPwise approach has a standard questionnaire, which was adapted and used by the interviewers and which covered information on demographic, behavioural and physical measurements. The study variables included sociodemographic characteristics such as age, sex, level of education, occupation, income and marital status; behavioural factors such as physical activity, consumption of fruits and vegetables, use of cooking oil, smoking and *naswar* (tobacco snuff) use; and physical measurements such as blood pressure, weight, height, waist circumference and body mass index (BMI), biological components such as blood sugar, triglycerides and cholesterol. From height and weight, BMIs was calculated:  $\geq 30.0$  kg/m<sup>2</sup> was considered obese, 25.0–29.9 kg/m<sup>2</sup> overweight and 18.5–24.9 kg/m<sup>2</sup> normal weight (28). A waist circumference of 94 cm for men and 80 cm for women was defined as central obesity (29). Systolic blood pressure  $\geq 140$  mmHg and/or diastolic pressure  $\geq 90$  mmHg were considered as hypertensive. Furthermore, systolic blood pressure of < 120 mmHg and diastolic pressure of < 80 mmHg were considered normal while the group between these 2 limits was considered as prehypertensive (30). Those who smoked at the time of the survey were considered smokers and included in proportion. Alco-

hol consumption was removed from the questionnaire due to the very low prevalence and high sensitivity for respondents. Strong and moderate physical activity was defined as those activities which increase the heart rate and breathing intensively and moderately for 10 minutes (see the STEPS approach for details). Local health workers were recruited and trained as data collectors. A field test was conducted and glitches during data collection were identified and rectified. Anthropometric measurements were determined using an electronic weighing scale and plastic measuring tape. Blood pressure was measured using an aneroid sphygmomanometer 3 times and the average was used for proportion. Finally, blood samples were collected on the spot or the next morning after the respondent had fasted for 10–12 hours. They were transported in cold boxes (2–8°C) from the field to the Central Public Health Laboratory in Kabul using Cryovials. The samples were coded with the ID number of the questionnaire. On arrival in the Central Public Health Laboratory, all serum samples were stored at –80 °C and later on were tested for triglyceride, cholesterol and glucose using spectrophotometric method. A fasting blood sugar of  $\geq 126$  mg/dL was considered as diabetes mellitus (31). The cut-off for total biochemical markers was determined as: cholesterol 190 mg/dL, low density lipoprotein (LDL) 100 mg/dL, high density lipoprotein (HDL) for males 40 mg/dL and for females 50 mg/dL, and triglycerides 150 mg/dL. Data management and analysis were carried out using *EpiInfo*, version 7 and *SPSS*, version 20.

According to the plan, 2 days training was conducted for those administering the survey followed by a field-based session where they had a chance to complete the questionnaire, measure blood pressure and waist circumference and practise taking blood samples from adults under field conditions.

A household was defined as a group of people who share the same food pot (not the same roof). In each household the interviewer enumerated all persons who were eligible for our study based on the inclusion criteria. In households with more than one eligible person, we used a lottery system to select the respondent for this survey. In cases of refusal, which was less than 5%, the interviewer approached the next household. This method provided an equal chance of each member of the household being selected.

### Ethical considerations

The protocol was reviewed by the Institutional Review Board of the Ministry of Public Health and a blanket approval was issued. Informed consent was obtained from each individual before the interview. The results of physical and biochemical measurements were communicated to the participants and the confidentiality of the information was maintained. All blood samples were stored at –80 °C in the Central Public Health Laboratory after completing biochemical measurements for further testing. All collected data, hard and soft, were kept confidential in a locked cupboard and a password-protected computer.

### Data analysis

Descriptive analysis was done using mean and proportions to explain and describe the NCDs and risk factors. Statistical tests such as Student *t*-test and chi-squared were used to identify statistical significance whenever needed. The available dataset from each urban setting was used to identify the proportion of related risk factors for NCDs in each of the 5 cities. Later on the datasets were integrated and the pooled proportion was calculated from all datasets. The studies were conducted in a series of time intervals but the research team, data collection tool and protocols remained the same. However, as it is not conducted in a snapshot of time, this combined frequency should be interpreted cautiously. Furthermore, we weighted the data to make it comparable with the original population, which is published by the Central Statistical Office in Afghanistan. Both weighted unweighted results are presented for comparison.

## Results

### Behavioural risk factors: STEP 1

Of the total of 5897 respondents recruited in 5 cities, 2712 were male (46%). The average age of respondents was 39.6 [standard deviation (SD) 12.3] years. Overall, 38% of participants were literate; the highest literacy level (50%) was recorded in Kabul and the lowest (27%) in Kandahar. Around a quarter of the study participants were earning  $\geq 10\,000$  Afghanis (US\$ 175) a month (Table 1). The majority (83.5%) were married; only 7.7% were single. On average, the selected households comprised 3.1 adults eligible for this study, of whom one in each selected household was interviewed. It should be noted that due to missing values (responses) in some variables the subtotals do not always reflect the total number of participants.

We found overall 8.0% of the participants were cigarette smokers and 11.1% were using *naswar*, however, usage was very low in females (2.7% and 2.5% respectively) compared with males (14.1% and 21.1% respectively). There was a statistically significant difference in tobacco use between males and females ( $P < 0.01$ ). The highest level of *naswar* use was in the older population (55+ years) while the younger generation were more likely to smoke cigarettes.

On average, the participants consumed fruits 2.76 days per week and vegetables 3.85 days per week. On a typical day they consumed 1.4 servings of fruits and 1.9 servings of vegetables. More than two thirds (71.1%) consumed fruits  $\leq 3$  days per week and close to half (49.5%) consumed vegetables  $\leq 3$  days per week. Generally, consumption of fruits was slightly higher in the youngest and oldest groups (Table 2). The highest proportion of adult citizens consuming vegetables  $\leq 3$  days a week was in Jalalabad (in all age groups); the lowest percentage was recorded in Hirat.

For other food groups (data not shown), 10.5% of all study participants consumed red meat less than 2 days per week; 4.6% consumed chicken and 35.9% consumed rice more than 3 days per week. The use of table salt was

**Table 1** Frequency distribution of demographic and socioeconomic characteristics among adults aged 25–70 years five cities in Afghanistan, 2015

Category	City																		
	Jalalabad (n = 1200)			Mazar-e-Sharif (n = 1231)			Hirāt (n = 1129)			Kandahar (n = 1165)			Kabul (n = 1172)			Total (n = 5897)			
	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	
<b>Age (years)</b>																			
25–34	459	41.7	32.4	560	45.5	35.3	399	35.3	26.0	520	44.6	35.4	592	50.5	41.0	2526	43.6	34.0	
35–44	286	26.0	26.7	283	23.0	21.8	288	25.5	23.3	323	27.7	27.4	289	24.7	24.6	1494	25.8	24.7	
45–54	212	19.3	22.5	188	15.3	17.6	220	19.5	21.7	188	16.1	19.4	165	14.1	17.1	970	16.7	19.6	
55+	144	13.1	18.4	200	16.2	25.2	222	19.7	29.0	134	11.5	17.8	126	10.8	17.3	810	14.0	21.7	
Female	731	60.9	54.7	664	53.9	48.6	594	52.6	46.9	597	51.2	47.3	599	51.1	46.7	3185	54.0	48.8	
Male	469	39.1	45.3	567	46.1	51.4	535	47.7	53.1	568	48.8	52.7	573	48.9	53.3	2712	46.0	51.2	
<b>Level of education</b>																			
Illiterate	790	66.8	69.5	730	59.3	59.8	607	54.0	55.0	840	73.2	73.1	575	49.6	51.8	3607	62.1	61.7	
Primary/ unofficial	165	13.9	12.7	270	21.9	22.3	380	33.8	33.9	164	14.3	14.6	202	17.4	18.3	1158	19.9	20.6	
Secondary	163	13.8	12.4	110	9.7	9.7	73	6.5	5.7	72	6.3	6.2	226	19.5	19.7	629	10.8	10.6	
High school+	65	5.5	5.4	111	9.0	8.2	64	5.7	5.4	72	6.3	6.2	118	10.2	10.1	418	7.2	7.1	
<b>Job</b>																			
Official employee	110	9.2	10.2	126	10.2	10.5	100	10.2	9.7	125	13.8	13.6	173	14.8	14.6	634	11.6	11.7	
Student	79	6.6	7.6	36	2.9	2.3	89	9.1	9.8	110	12.1	12.8	17	1.5	1.2	331	6	6.3	
Private business	224	18.7	20.3	128	10.4	10.8	184	18.8	20.7	130	14.3	15.6	55	4.7	5.2	721	13.2	14.2	
Worker/ farmer	646	54.1	47.6	190	15.4	16.9	51	5.2	6.0	92	10.2	11	77	6.6	7.2	1056	19.3	18	
Jobless	81	6.8	9.4	69	5.6	6.0	461	47.1	41.5	414	45.7	41.7	61	5.2	5.7	1086	19.8	19.2	
Housework	0	0.0	0.0	578	47.0	42.1	93	9.5	12.4	35	3.9	5.2	368	31.6	28.5	1074	19.6	19	
Unable to work/ DKN	55	4.6	4.8	104	8.4	11.5	0	–	–	0	–	–	415	35.6	37.6	574	10.5	11.6	
<b>Monthly income (AFN)</b>																			
< 10 000	708	89.3	89.1	886	78.3	78.7	454	82.7	82.8	40	42.1	39.8	16	7.6	7.0	2104	75.7	75.8	
≥ 10 000	85	10.7	10.9	245	21.7	21.3	95.0	17.3	17.2	55	57.9	60.2	195	92.4	93.0	675	24.3	24.2	
<b>Marital status</b>																			
Single	91	7.6	7.1	121	9.8	8.0	53	4.8	4.0	120	10.7	9.4	136	12.4	9.9	521	9.1	7.7	
Married	1054	88.5	87.7	1030	83.7	84.5	964	87.6	87.5	922	82.1	79.5	897	82.1	78.4	4867	84.8	83.5	
Widowed	46	3.9	4.2	79	6.4	7.4	83	7.5	8.5	75	6.7	7.1	54	4.9	5.9	337	5.9	6.7	
Divorced	0	0.0	0.9	1	0.1	0.2	1	0.1	0.0	6	0.5	0.4	6	0.5	0.7	13	0.2	0.3	

Due to missing values (responses) for some variables, the subtotals do not always reflect the total number of participants. W = weighted; U = unweighted; BMI = body mass index; DKN = not known; AFN = Afghani.

**Table 2 Frequency distribution of behavioural risk factors for noncommunicable disease among adults aged 25–70 years in five cities in Afghanistan, 2015**

Risk factor / age (years)	City															Total (n = 5897)		
	Jalalabad (n = 1200)			Mazar-e-Sharif (n = 1231)			Hirat (n = 1129)			Kandahar (n = 1165)			Kabul (n = 1172)					
No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	
<b>Smoking</b>																		
25–34	32	7.4	8.0	66	11.8	12.3	21	5.3	5.5	51	9.8	10.5	52	8.8	9.5	222	8.9	9.4
35–44	11	3.8	4.4	33	11.7	12.2	18	6.3	6.5	39	12.1	12.7	26	9.0	9.6	127	8.6	9.2
45–54	16	8.0	8.5	14	7.4	7.8	17	7.8	7.8	17	9.0	9.4	11	6.7	7.2	75	7.8	8.2
55+	7	5.9	5.9	9	4.5	4.8	7	3.2	3.2	6	4.5	4.9	6	4.8	5.1	35	4.4	4.6
<b>Use of naswar</b>																		
25–34	34	7.8	8.5	19	3.4	3.6	15	3.8	4.2	61	11.8	12.5	32	5.5	5.8	161	6.4	6.9
35–44	24	8.2	9.1	33	11.7	12.5	20	7.0	7.7	44	13.7	14.4	32	11.1	11.9	153	10.4	11.2
45–54	28	13.9	15.2	24	12.8	13.2	29	13.4	14.2	40	21.3	22.4	20	12.1	12.9	141	14.7	15.6
55+	31	25.6	26.7	26	13.0	13.4	56	25.5	26.2	44	32.8	34.6	30	23.8	24.5	187	23.3	24.2
<b>Serving seasonal fruits (≤ 3 days/week)</b>																		
25–34	140	33.4	33.7	111	19.9	20.1	78	20.7	20.4	204	39.8	39.5	204	35.4	35.2	737	30.1	30.1
35–44	88	30.0	30.3	67	23.8	24.1	28	10.6	10.5	124	39.0	39.0	88	31.5	31.1	395	27.5	27.5
45–54	6	19.1	24.7	32	15.5	19.2	79	42.7	15.2	43	28.1	43.4	237	25.8	27.8	237	25.8	25.7
55+	38	31.9	32.1	41	20.7	21.0	40	20.0	19.7	55	42.6	42.3	45	37.2	37.8	219	28.6	28.5
<b>Serving seasonal vegetables (≤ 3 days/week)</b>																		
25–34	361	80.8	81.3	268	47.9	47.5	120	31.4	30.9	284	54.6	53.9	203	34.8	35	1236	49.6	49.4
35–44	231	75.5	76.0	147	51.9	51.5	72	26.9	26.3	190	59.0	58.6	102	35.4	35.8	742	50.6	50.3
45–54	172	83.1	83.5	94	50.0	49.5	63	29.9	29.0	124	66.0	65.5	56	34.8	35.3	509	53.3	53.1
55+	99	77.3	78.1	96	48.0	47.9	50	24.3	23.8	97	72.4	72.1	41	32.8	33.0	383	48.3	48.2
<b>Strong physical activity (daily)</b>																		
25–34	194	45.4	44.1	81	14.5	14.8	45	11.3	12.0	35	6.8	7.1	55	9.3	9.5	410	16.5	16.5
35–44	127	43.5	43.4	44	15.5	16.2	36	12.6	12.7	17	5.3	5.4	33	11.5	11.8	257	17.5	17.5
45–54	42	21.0	20.9	17	9.0	9.1	22	10.0	10.5	10	5.3	5.9	17	10.4	10.4	108	11.3	11.4
55+	18	15.1	15.4	11	5.5	5.8	13	5.9	6.1	6	4.5	4.4	5	4.0	4.1	53	6.6	6.8
<b>Moderate physical activity (daily)</b>																		
25–34	268	68.7	67.9	197	35.2	35.6	91	23.0	23.0	109	21.0	20.6	116	19.7	19.2	781	31.8	31.5
35–44	184	65.7	65.5	76	26.9	26.9	75	26.4	26.3	86	26.8	26.1	72	25.1	24.8	493	33.9	33.4
45–54	98	52.7	52.8	44	23.4	23.7	42	19.3	18.8	38	20.2	19.7	38	23.0	23.1	260	27.5	27.4
55+	40	40.4	40.6	30	15.0	15.3	33	15.0	14.8	14	10.4	10.2	11	8.7	8.7	128	16.4	16.5

W = weighted; U = unweighted.

also common in 27.8% of respondents.

Daily work involving strong physical activity was less common (14.6%) among reported responses while 29.5% practised moderate physical activity. As a whole, strong and moderate physical activity in the nature of work was more frequent in the youngest age group (16.5 and 31.8%) and lowest in the oldest age group (6.6% and 16.4%). The highest level of physical activity among all age groups was reported in Jalalabad.

### Physical measurements-STEP 2

Table 3 shows the frequency of pathophysiological risk factors of study participants. Overall average of BMI was 25.95 (SD 5.7) kg/m<sup>2</sup>. Mean BMI was higher among women than men (26.84 kg/m<sup>2</sup> vs 24.91 kg/m<sup>2</sup> ( $P < 0.01$ ). Overweight, obesity and central obesity were observed in 19%, 33.7% and 57.1 % of participants. The highest rates for overweight and obesity were found in participants aged 45–54 and 35–44 years, respectively. However, the frequency of general and abdominal obesity was higher with age. The frequency of overweight/obesity was highest in the Jalalabad city (59.6%) and lowest in Hirat city (47.5%). Typically, 32.4% had high blood pressure, of this 23.5% of them were identified by physical measurement being not aware of their problems and the rest were under treatment. The frequency of high blood pressure was significantly higher among females (32.7%) compared with males (26.8%). The highest proportion of hypertension was recorded in Hirat city (35.6%) and the lowest in Mazar-e-Sharif city (30.9%).

### Biochemical measurement-STEP 3:

The overall average proportion of participants who had raised blood sugar was 12.5%, with the highest proportion in Kandahar city (22.4%), much higher than the other cities: after removing the Kandahar data, the overall proportion was 10.0%. The proportion was higher in females (13.1%) than males (11.7%), however, this was not statistically significant. Average (arithmetic mean) levels of fasting blood sugar, total glycerides, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) were 97.9 (SD 65.5) mg/dL, 164.5 (SD 89.4) mg/dL, 184.0 (SD 52.8) mg/dL, 45.1 (SD 20.8) mg/dL and 109.8 (SD 43.0) mg/dL respectively. Mean fasting blood sugar levels increased with age in all provinces but did not differ between males and females. Similarly, averages for triglycerides, cholesterol, HDL and LDL did not differ between women and men (Table 4).

## Discussion

Lack of information on risk factors for NCDs in Afghanistan has been a crucial challenge impeding policy-makers in generating advocacy and developing interventions for prevention and control. In this study, we found that the modifiable risk factors of NCDs were prevalent in the major cities, Kabul, Kandahar, Hirat, Jalalabad and Mazar-e-Sharif. High priority is given to infectious diseases, maternal health and nutrition (32,33) while the burden of NCDs is gradually encumbering the fragile econ-

omy of the country and its newly fledged health system. This report of findings from 5 provinces and analysis of the full database could be used as a proxy for national estimates of factors for NCDs, although further advanced study is still needed.

Several forms of tobacco consumption are prevalent among the Afghan population: cigarette smoking, shisha smoking, mouth and nose snuff, etc. Almost one-tenth of the adult population was using tobacco as snuff or as cigarettes. Consumption of tobacco was higher among men mainly due to the cultural unacceptability of women's use of tobacco in the country. Use of *naswar* was higher in the older age group while cigarette smoking was higher in younger section. The older generation have been using *naswar* for years while the new generation is oriented towards smoking. The low cost of *naswar* (tobacco-snuff) could be the reason for the greater use. Such differences are supported by other studies (34,35). Sex differences in risk factors were also demonstrated in Karachi in Pakistan (36). It seems using tobacco (smoking or smokeless) is common in the country, which is consistent with reports from other low-income countries (37). The frequency (8.0% for cigarettes, 11.1% for *naswar*), however, seems very low compared with a study conducted in Kabul on smoking in men aged 15+ years: the proportion of smoking was estimated to be 35.2% (38); this may be due to sex and age difference in the study populations. Other studies in the Islamic Republic of Iran, Pakistan and India show a high proportion of smoking among men, 36.0%, 23.4%, 28.5% respectively (39–41).

Consumption of fruits was less frequent per week while the frequency was better for vegetables on average. This could be due to low socioeconomic status and low literacy levels. The level of moderate physical activity was higher compared with strong physical activity in daily affairs. Physical inactivity is the fourth leading risk factor for global mortality and has major implications on NCDs, particularly cardiovascular diseases and general health. However low physical activity among our participants could be due to low awareness or the poor availability of open spaces and jogging areas in the cities. Our findings are supported by earlier research (42). There is a need to sensitize and actively promote physical activity in cities. Our findings show that one fifth of the adults in the 5 cities were obese, with more than two-thirds being overweight or obese, a situation that needs to be addressed by public health authorities. These findings are supported by other studies (21,35,43,44). Females had a higher BMI and waist circumference than men, which puts them at higher risk of NCD. Abdominal obesity was another problem with high frequency in women. This could be related to cultural issues in the Afghan context such as access to physical exercise facilities and restriction of female movement outside the home. Besides the general low level of health literacy, the obese are considered healthy, so they are generally reluctant to lose weight.

Overall, almost one-third of our participants had hypertension, of whom just 10% were aware and sought health services. This indicates a high unmet need for

**Table 3 Frequency distribution of biochemical and physical risk factors for noncommunicable disease among adults aged 25–70 years in five cities in Afghanistan, 2015**

Risk factor/ age (years)	City																		
	Jalalabad (n = 1200)			Mazar-e-Sharif (n = 1231)			Hirat (n = 1129)			Kandahar (n = 1165)			Kabul (n = 1172)			Total (n = 5897)			
	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	No.	U %	W %	
<b>General obesity<sup>a</sup></b>																			
25–34	92	22.6	22.3	59	10.5	10	42	10.6	10.1	56	10.8	10.5	91	15.4	15.0	340	13.7	13.4	
35–44	87	31.2	30.5	63	22.3	21.8	54	18.8	18.7	68	21.1	20.6	82	28.4	27.1	354	24.2	23.6	
45–54	67	33.7	32.6	37	19.7	19.2	45	20.5	20.1	34	18.1	17.1	43	26.1	25.3	226	23.5	22.8	
55+	27	22.1	21.4	31	15.5	15.3	36	16.3	15.9	28	20.9	20.1	26	20.6	19.9	148	18.4	17.9	
<b>Central obesity<sup>b</sup></b>																			
25–34	199	51.4	50.3	262	46.8	45.4	174	43.6	41.5	220	47.8	45.6	314	53.0	51.5	1169	48.7	47.1	
35–44	177	66.3	66	186	65.7	64.2	170	59.0	57.6	185	60.1	58.1	188	65.1	63.2	906	63.1	61.7	
45–54	137	71.4	70.8	148	78.7	77.6	136	61.8	60.2	109	59.6	57.6	127	77.0	75.3	657	69.3	67.9	
55+	75	64.1	63.6	129	64.8	63.5	110	49.5	48.4	86	65.6	63.7	74	58.7	57.7	474	59.6	58.4	
<b>Raised blood pressure<sup>c</sup></b>																			
25–34	85	18.9	18.6	69	12.3	12.1	78	19.5	19.3	95	18.3	17.9	97	16.4	16.3	425	16.8	16.6	
35–44	520	33.4	32.6	95	33.6	32.5	89	30.9	30.6	113	35.0	34.0	119	41.2	40.5	520	34.8	34	
45–54	101	48.3	47.8	94	50.0	49.3	98	44.5	44.6	81	43.1	41.7	80	48.5	47.9	454	46.8	46.2	
55+	60	46.9	45.5	122	61.0	60.4	137	61.7	61.4	87	64.9	64.4	83	65.9	65.3	489	60.4	59.7	
<b>Raised blood sugar<sup>d</sup></b>																			
25–34	36	8.0	7.8	32	5.7	5.9	17	4.3	4.2	94	18.3	18.0	22	3.7	3.6	201	8.0	7.9	
35–44	42	13.7	13.6	25	8.8	8.9	25	8.7	8.6	72	22.5	22.1	35	12.1	12.1	199	13.4	13.3	
45–54	31	15.1	15.0	21	11.2	11.4	28	12.7	12.4	60	32.1	31.7	29	17.6	17.5	169	17.5	17.4	
55+	21	16.9	16.4	35	17.5	17.3	42	18.9	18.7	33	24.8	24.6	21	16.7	16.9	152	18.9	18.7	

W = weighted; U = unweighted; BMI = body mass index.

<sup>a</sup>BMI ≥ 30 kg/m<sup>2</sup>.

<sup>b</sup>Waist circumference ≥ 94 cm for men and ≥ 80 cm for women.

<sup>c</sup>Systolic blood pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg.

<sup>d</sup>Fasting blood sugar ≥ 126 mg/dL.

**Table 4 Mean of biochemical factors among adults aged 25–70 years in five cities in Afghanistan, 2015**

Characteristic/age (years)	City											
	Jalalabad (n = 1200)		Mazar-e-Sharif (n = 1231)		Hīrat (n = 1129)		Kandahar (n = 1165)		Kabul (n = 1172)		Total (n = 5897)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Fasting blood sugar (mg/dL)</b>												
25–34	87.8	30.5	84.1	30.5	80.4	31.2	125.7	110.4	83.8	28.9	92.6	59.2
35–44	92.8	40.4	87.9	32.6	85.6	44.4	137.2	120.1	94.4	49.8	100.4	69.9
45–54	101.2	50.3	91.9	38.7	89.1	44.4	138.1	128.0	102.8	57.6	104.0	72.7
55+	97.9	49.1	97.6	48.5	94.5	60.7	133.2	110.4	103.8	58.0	103.6	68.3
Overall											97.92	65.47
<b>Total glyceride (mg/dL)</b>												
25–34	177.6	61.7	157.7	103.1	152.2	55.2	149.5	87.0	154.4	89.8	157.9	84.0
35–44	185.2	83.0	154.8	94.5	158.6	66.1	149.1	93.3	175.1	101.2	164.5	89.4
45–54	205.7	76.8	176.0	135.4	157.3	61.8	179.7	131.0	176.7	90.6	178.9	103.1
55+	187.5	66.8	169.0	108.0	154.9	66.6	153.1	77.0	170.5	89.6	165.6	84.5
Overall											164.51	89.41
<b>Total cholesterol (mg/dL)</b>												
25–34	194.6	39.2	177.1	63.8	177.1	40.6	180.2	49.9	175.6	42.2	180.5	49.1
35–44	199.9	46.5	181.8	62.4	186.0	54.6	182.8	55.8	179.8	46.4	186.1	53.9
45–54	205.7	39.1	183.0	84.3	184.3	45.2	192.2	61.9	185.4	46.3	190.3	57.8
55+	200.8	46.4	177.8	74.7	176.8	48.4	181.8	47.6	180.2	46.8	182.1	56.0
Overall											184.01	52.83
<b>High density lipoprotein (mg/dL)</b>												
25–34	38.4	6.0	49.9	40.4	44.8	10.7	45.4	12.9	44.7	12.9	44.9	21.8
35–44	38.8	6.0	47.5	33.7	46.3	11.0	46.3	15.6	45.9	15.8	44.9	18.9
45–54	40.3	7.5	51.1	32.7	45.3	8.3	47.3	15.5	46.7	15.3	46.0	18.3
55+	40.2	7.5	49.2	36.5	44.4	8.7	44.6	10.9	47.3	33.5	45.4	23.7
Overall											45.07	20.79
<b>Low density lipoprotein (mg/dL)</b>												
25–34	120.3	31.6	112.6	51.1	102.1	33.7	105.7	36.1	100.1	28.5	107.9	38.1
35–44	122.9	33.2	113.1	50.2	105.6	36.3	106.5	39.6	99.3	31.0	109.6	39.3
45–54	128.9	75.8	117.5	65.8	108.3	49.8	111.5	47.5	103.6	32.8	114.3	57.6
55+	123.3	34.3	112.7	59.6	103.8	34.8	109.7	45.3	101.6	33.1	109.6	44.2
Overall											109.82	42.99

SD = standard deviation.

prevention and management of hypertension in the country. Raising awareness on hypertension and a screening programme should be encouraged when adults come to health centres for any other health problem. This finding is supported by an earlier study conducted in Kabul (22), and is consistent with studies in the Islamic Republic of Iran, Pakistan and Nepal (45–48). High level of raised blood sugar is another risk factor for other NCDs which was found as a result of this study. It is consistent with other studies within and outside the country (22,47). Likewise, the high proportion of people in Kandahar with high blood sugar is a point for consideration. After removing the Kandahar data, the overall proportion was 10.0%, thus, more advanced study is required in this city to identify the actual situation (the data were checked and the questionnaire reviewed for errors, however the possibility of non-fasting blood collection cannot be ruled out). Robust studies for diabetes are required in this southern city of the country.

This was a cross-sectional survey, therefore, it is not possible to establish causation. In addition, the surveys were conducted only in the urban setting of the provinces surveyed, therefore, our findings are representative only of the urban area of Afghanistan. The integrated and combined results, although reflected, are not adequately generalized to the general urban adult population as they were conducted over different time periods. Furthermore, the data were not standardized so caution should be used in interpretation of the findings. More than half the study participants (52.2%) had  $\geq 1$  of the 4 main risk factors (obesity, hypertension, smoking and high blood

sugar). Therefore, taking into account the major findings of provincial as well as general overall estimates of risk factors, we encourage the introduction of education campaigns to raise awareness on physical activity and a healthy diet as protective factors against all NCDs.

Urbanization is expanding in Afghanistan and cities are progressively becoming overcrowded, however they have very limited facilities for jogging and other aerobic sports. The establishment of such facilities, particularly for women, is recommended. As a number of risk factors may be present simultaneously in an individual, interventions are needed to target groups of risk factors rather than just one at a time. Although all provincial findings as well as the overall findings are alarming and will be useful as a baseline for future studies, the financial constraints which prevented listing of the households ahead of the study, the overestimation of the NCD burdens due to free checking of blood pressure and blood testing and the poor security situation, which forced the teams to exclude some areas, are further limitations to be taken into consideration.

Nonetheless, the findings of this study undoubtedly fill some of the gaps in the information for policy development and the design of interventions. Our findings pave the way for a nationwide study on NCDs using the WHO STEPwise approach to provide full information at country level. The establishment of behavioural surveillance using the STEPwise approach will place the Ministry of Public Health in a better position to take appropriate action.

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**Competing interests:** None declared.

## Profil des facteurs de risque de maladies non transmissibles dans les principales villes d'Afghanistan : Approche STEPwise de l'OMS pour la surveillance

### Résumé

**Contexte :** Les maladies non transmissibles (MNT) constituent un problème de santé publique majeur dans le monde. Malgré l'amélioration de la situation sanitaire, les indicateurs de santé de l'Afghanistan sont les pires de la Région. Près de 37 % d'adultes afghans décèdent du fait de MNT.

**Objectifs :** La présente étude avait pour objectif d'estimer la proportion des principaux facteurs de risque des MNT en Afghanistan.

**Méthodes :** Nous avons analysé l'ensemble de données des études menées dans cinq provinces (Balkh, Hirat, Kaboul, Kandahar et Nangarhar) au cours de la période comprise entre 2013 et 2015, en utilisant l'approche STEPwise de l'OMS pour la surveillance des MNT. Cela impliquait un échantillonnage en grappes à plusieurs degrés auprès de citoyens urbains âgés de 25 à 70 ans. Les logiciels EpiInfo, version 7, et SPSS, version 20, ont été utilisés pour la gestion des données.

**Résultats :** Au total, 5897 fiches ont été incluses dans l'analyse ; 54 % concernaient des femmes. L'âge moyen était de 39,56 ans (écart type 12,29) ; le taux d'analphabétisme était de 61,5 % et 83,2 % étaient mariés. Le tabagisme et l'usage du



tabac à priser étaient de 8 % et 11,1% respectivement. En moyenne, les sujets consommaient des fruits et des légumes 2,76 et 3,85 jours par semaine et le surpoids, l'obésité générale et abdominale étaient de 19 %, 33,7 % et 57,1 %, respectivement. En règle générale, 32,4 % avaient une pression artérielle élevée et 12,5 % avaient une glycémie élevée.

**Conclusions :** Les facteurs de risque modifiables des MNT étaient répandus dans les principales villes du pays. Leur identification est vitale pour tenter de se concentrer sur la prévalence de ces maladies dans les villes urbaines. Des interventions sur mesure sont nécessaires pour se concentrer sur les MNT en Afghanistan.

## مرتمس عوامل الخطر المتعلقة بالأمراض غير السارية في المدن الكبرى في أفغانستان: نهج منظمة الصحة العالمية للترصد التدريجي

خواجه مير اسلام سعيد، محمد حفيظ رسولی، ملالی نجابی  
الخلاصة

الخلفية: تمثل الأمراض غير السارية مشكلة كبيرة من مشكلات الصحة العامة في العالم أجمع. وعلى الرغم من تحسُّن الوضع الصحي، فإن المؤشرات الصحية في أفغانستان هي الأسوأ في الإقليم. وتسبب الأمراض غير السارية في وفاة نحو 37% من البالغين الأفغان.

الأهداف: هدفتنا إلى تقدير نسبة عوامل الخطر الرئيسية للأمراض غير السارية في أفغانستان.

طرق البحث: أجرينا تحليلاً لمجموعة البيانات المُستقاة من دراسات أُجريت في 5 ولايات، ألا وهي كابول وبلخ وهرات وننكرهار وقندهار، خلال الفترة من عام 2013 إلى عام 2015، باستخدام النهج التدريجي الذي تتبعه منظمة الصحة العالمية في ترصُّد الأمراض غير السارية. وانطوى ذلك على أخذ عينات عنقودية على مراحل متعددة من مواطنين يعيشون في مناطق حضرية وريفية يتراوح سنهم بين 25 و70 سنة. واستُخدم في إدارة البيانات الإصدار 7 من برنامج Epi Info والإصدار 20 من برنامج SPSS.

النتائج: بلغ العدد الإجمالي للسجلات المشمولة بالتحليل 5897 سجلاً، منها 54% لإناث. وكان متوسط السن 39.56 (الانحراف المعياري 12.29) سنة، ومعدل الأمية 61.5%، ونسبة المتزوجين 83.2%. وكانت نسبة المدخنين 8%. ونسبة متعاطي السُّعوط 11.1%. وكان الخاضعون للدراسة يتناولون الفواكه بمعدل 2.76 يوماً أسبوعياً والخضروات بمعدل 3.85 يوماً أسبوعياً في المتوسط. وكانت نسبة زيادة الوزن 19%، ونسبة السمنة العامة 33.7%، ونسبة السمنة في منطقة البطن 57.1%. وكانت نسبة الذين يعانون ارتفاع ضغط الدم 32.4%، وارتفاع مستوى السكر في الدم 12.5%، وهما نسبتان نمطيتان.

الاستنتاجات: كانت عوامل الخطر القابلة للتغيير المتعلقة بالأمراض غير السارية واسعة الانتشار في المدن الرئيسية للبلد. ومن الضروري تحديد هذه العوامل عند محاولة التركيز على انتشار الأمراض غير السارية في المدن الحضرية. ويلزم القيام بتدخلات مُصمَّمة خصيصاً للتركيز على الأمراض غير السارية في أفغانستان.

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# Developing a national minimum data set for hospital information systems in the Islamic Republic of Iran

Zahra Rampisheh,<sup>1</sup> Mohammad Esmaeil Kameli,<sup>2</sup> Javad Zarei,<sup>3</sup> Akram Vahedi Barzaki,<sup>4</sup> Marziyhe Meraji<sup>5</sup> and Ali Mohammadi<sup>6</sup>

<sup>1</sup>Preventive Medicine and Public Health Research Center, Department of Community Medicine, School of Medicine, Iran University of Medical Sciences, Tehran, Islamic Republic of Iran. <sup>2</sup>Department of Community Medicine, School of Medicine, Iran University of Medical Sciences, Tehran, Islamic Republic of Iran. <sup>3</sup>Department of Health Information Technology, School of Allied Medical Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Islamic Republic of Iran. <sup>4</sup>Health Information Management Research Center, Kashan University of Medical Sciences, Kashan, Islamic Republic of Iran. <sup>5</sup>Department of Medical Records and Health Information Technology, Faculty of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Islamic Republic of Iran. <sup>6</sup>Department of Health Information Technology, School of Paramedicine, Kermanshah University of Medical Sciences, Kermanshah, Islamic Republic of Iran. (Correspondence to: Ali Mohammadi:a.mohammadi@kums.ac.ir).

## Abstract

**Background:** Standardized data collection supports disease information management and leads to better quality of care. The Islamic Republic of Iran lacks a standard data set for data collection in hospitals.

**Aims:** The aim of this study was to design a minimum data set for hospital information systems in the Islamic Republic of Iran.

**Methods:** This study was conducted in 2015. Data sets of other countries, hospital records, hospital information systems and electronic health record systems in the Islamic Republic of Iran were reviewed for data elements for the minimum data set. Data elements were collected using a data extraction form and were categorized into similar classes, which were divided into administrative and clinical sections. The list of data elements was reviewed by experts in technical offices of the Iranian Ministry of Health and Medical Education, and a minimum data set was drawn up.

**Results:** There were nine and 18 data classes in the administrative and clinical sections with a total of 166 and 684 data elements respectively. After review by the expert panel, 159 administrative and 621 clinical data elements were retained as the minimum data set for the Iranian hospital information system.

**Conclusion:** Our dataset can be used by the Iranian health ministry, hospital information system companies and health surveillance centres for more efficient management of health data.

Keywords: Minimum data set, hospital information systems, health records, Iran

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## Introduction

Data quality in a hospital information system plays an important role in health policy-making. Low quality of the data increases the rate of medical errors and lowers the quality of care (1). Designing a structure for standardized data collection supports disease information management and leads to better quality of care (2). Standard health care data usually indicate minimum data elements that should be collected (3).

A minimum data set is a standard data collection tool (4). In each area, the minimum data set contains many data elements for demographic data, health and treatment status, reimbursement resources, and patient transfer location (5). The main objective of the minimum data set is to build a national database that can serve as an information management source to equip decision-makers and policy-makers with accurate and up-to-date information (6). The minimum data set of each area strengthens the relationship between the studies conducted and extraction of research results, improves plans, strategies and policies, and provides the

opportunity for equity in the health system (7).

In the health care system, data sets identify data elements that should be collected for each patient and provide definitions for each element based on standards. Data comparison is used for different purposes including external accreditation, evaluation of internal performance, and research and statistical studies. Therefore, it is important to determine standard data sets to manage the clinical performance of health organizations in every country (8).

Although minimum data sets are specific to each country, they should be able to allow data comparison at an international level. In this regard, many countries have developed national general or specialized minimum data sets for their health information systems (9). These include: Qatar (2014) (10), Denmark (1987), Germany (MDIM 1995), United Kingdom of Great Britain and Northern Ireland (NHS-MDS, 1993), the Netherlands (1997), Australia (1995) (11), Canada (1998) (12), New Zealand (1992) (13) and the United States of America (1974) (14).

In the Islamic Republic of Iran, the content of hospital

records, electronic health record systems (Samaneh Parvande Electronic Salamat [SEPAS] established by the Iranian Ministry of Health for data collection), and hospital information systems vary and the data elements of these systems are often incompatible because of the lack of any minimum data set. Collection of standard data and maximizing their quality in the Islamic Republic of Iran requires the development of a minimum data set for hospital information systems. Therefore, in view of the lack of a standard data set in the country, this study was conducted to design a minimum data set to be used in hospital information systems.

## Methods

This descriptive cross-sectional study was conducted in 2015. The data were collected from SEPAS, hospital information system documents of companies approved by the Iranian Ministry of Health and Medical Education, and inpatient records used in the Islamic Republic of Iran. Moreover, a review of the literature was done to find relevant resources, including documents, reports, guidelines and websites related to data elements of hospital, disease, administrative, equipment and medical intervention information systems by searching the Internet and print material.

The resources retrieved from the Internet search were selected based on the criteria in Table 1 and evaluated until saturation was achieved. The SEPAS documents were similar and data elements of the records were standard; therefore, the data elements in the SEPAS system and one of the records were evaluated. In addition, the data elements of the documents of 26 hospital information system companies approved by the Ministry of Health and Medical Education were evaluated.

A data extraction sheet was used for data collection. The data elements retrieved from the Internet, SEPAS system, hospital information system companies and hospital records were extracted separately and collected in four separate files: 1) Iranian and foreign studies as

electronic and print material, 2) SEPAS system documents, 3) hospital information system documents and 4) medical records. The data elements retrieved from each source were categorized based on similar classes and subjects, and a complete file was created by combining all four files. The new file was categorized into administrative and clinical sections and each section was classified into different data classes.

Classification of data elements into administrative and clinical sections and their subclasses was done according to information management standards: the classification proposed by American National Standards Institute, American Society for Testing and Materials standards for Core Health Data Elements, reference books, classifications found in retrieved studies (4,15,16), hospital records, hospital information system and SEPAS system. The views of the Information and Statistics Management Office of Ministry of Health and Medical Education were also considered.

For each class, the data elements of different resources (retrieved from, e.g. the Internet, health information system documents and SEPAS) were reviewed. Among common data elements, those with a more complete and comprehensive definition, format, domain, justification, code and source were included in the class. All uncommon data elements were also included. A Farsi or English title and definition was provided for the elements that only appeared in English or Farsi texts; in other words, all listed data elements had English and Farsi titles and a definition in Farsi.

The data elements for each data class were included in a checklist. The content validity of the checklist was assessed by 10 experts of the Ministry of Health and Medical Education technical offices, including four health information management experts, four physicians and two information technology experts. They were asked accept or reject each data element for inclusion in the hospital information system.

**Table 1 Search strategy for retrieving data elements of minimum data set for hospital information system in the Islamic Republic of Iran**

Sites, criteria, strategy	Descriptions, characteristics
Search engines	Yahoo, Google, Google Scholar
Websites	World Health Organization,
Databases	PubMed, Web of Science, Scopus, EMBASE, IEEE ( <a href="https://www.ieee.org/publications/periodicals.html">https://www.ieee.org/publications/periodicals.html</a> ) Cochrane, SID ( <a href="https://www.sid.ir/fa/journal/">https://www.sid.ir/fa/journal/</a> ), Magiran, IranMedex, Civilica, Irandoc (up to September 2015)
Inclusion criteria	Literature in English and Farsi  Papers, annual reports, reports, guidelines and peer-reviewed research published up to September 2015 from valid sources, with full text, a clearly stated purpose, and keywords in the title or abstract.
Exclusion criteria	Non-peer-reviewed papers, reports and forms retrieved from personal blogs and abstracts with no accessible full text.
Search terms	“Patient minimum data set”, “Patient data element”, “Hospital information system” And “Data element”, “Hospital Information system” And “Minimum data set”, “Health information system” And “Minimum data set”, “Hospital information database”

**Table 2 Technical office for determining administrative and clinical data elements**

	Data classes	Department/Office/Centre of the Ministry of Health and Medical Education
<b>Administrative</b>	Demographic	Hospital information and statistics management office and Hospital management and clinical excellence department
	Admission	
	Legal	
	Discharge	
	Personnel identifier of care provider	Medical emergency management centre Tariff Office – Health technology assessment, standardization and tariff department, Supreme Council for income distribution, and Economic planning and health insurance group
	Organization identifier	
	Geographic	
	Incident	
Financing		
<b>Clinical</b>	Pre-hospital emergency	Medical emergency management centre
	Hospital emergency	
	Diagnosis	Five physicians in total in: Hospital information and statistics management office – Curative resource management office – Hospital management and clinical excellence department
	Diagnostic/therapeutic procedure	
	Orders	
	Medical imaging	Health reference laboratory Food and drug administration Rehabilitation medicine specialist Hospital information and statistics management office and Hospital management and clinical excellence department Nursing office Network management centre
	Follow up	
	History and review of patient body system	
	Consultation	
	Anaesthesia	
	Laboratory	
	Blood products	
	Medicine	
	Medical prosthetics	
	Discharge status	
	Transfer	
	Nursing	
	Death	

The checklist, together with an official letter from the Information and Statistics Management Office of the Ministry of Health and Medical Education, was sent to specialized technical offices and board bureaus and centres (specialized technical offices such as nursing, anaesthesia, laboratory), and the experts were asked to accept or reject the data elements that related to special fields (Table 2). The panel was selected purposively through convenience sampling and consisted of 22 experts working in eight different specialized technical offices and board bureaus and centres of the Ministry of Health and Medical Education, three physicians and three health information managers.

The data elements agreed upon by the experts of the technical offices, and board bureaus and centres of the Ministry of Health and Medical Education were returned to the Statistics and Information Management Office in an official letter.

## Results

The national minimum data set for the Iranian hospital information system had an administrative section and a clinical section with nine and 18 data classes respectively. A total of 166 data elements were collected for the administrative section and 684 for the clinical section. These data elements decreased to 159 for the administrative section and 621 for the clinical section after review by the technical offices, board members, Ministry of Health and Medical Education deputy offices and specialized centres (Table 3).

The demographic class of the administrative section had the highest number of data elements ( $n = 51$ ). In this class, three data elements (mother's first name, mother's family name and distance from home to hospital) were not agreed upon. The data elements of this class relate to identification number, nationality, and religious and social characteristics of the patient. The class of admission

**Table 3 Accepted and rejected administrative and clinical data elements for a minimum data set for hospital information system in the Islamic Republic of Iran**

	Data classes	No. of data elements	Accepted	Rejected
Administrative	Demographic	51	48	3
	Admission	20	20	0
	Incident	20	17	3
	Legal	9	9	0
	Discharge	10	10	0
	Financing	25	25	0
	Personnel identifier	7	6	1
	Organization identifier	16	16	0
	Geographic	8	8	0
	Total	166	159	7
Clinical	Diagnosis	101	100	1
	Pre-hospital emergency	82	40	42
	Hospital emergency	110	104	6
	Diagnostic/therapeutic procedure	78	78	0
	Orders	17	17	0
	Medical imaging	22	22	0
	Laboratory	13	13	0
	Medicines	36	34	2
	Medical prosthetics	15	15	0
	Blood products	10	10	0
	Discharge status	10	10	0
	Transfer	28	28	0
	Follow up	8	8	0
	System history and review	21	21	0
	Nursing	58	48	10
	Consultation	11	11	0
	Death	34	34	0
	Anaesthesia	30	28	2
Total	684	621	63	

had 20 data elements that were all agreed upon. This class includes admission information, such as the date, time, ward, room, and admission number. The class of incident also had 20 data elements, three of which were rejected, namely other participants at the accident scene, accident mechanism and the object or vehicle causing the accident. The data elements of this class relate to the date, time and location of the accident. All proposed data elements in legal, discharge, financing, organization identifier and geographic classes were accepted. In the class of personnel identifier, the data element of full name of the person providing services for the patient was rejected. Table 4 gives examples of the data elements for each data class in the administrative section.

In the clinical section, some data elements in the classes of diagnosis, pre-hospital and hospital emergency, medicines, nursing, and anaesthesia were not agreed upon. The highest disagreement was related to pre-

hospital emergency data elements.

The first data class of the clinical section was diagnosis which had 101 data elements; of these only one was rejected: type of activity during the accident. The data elements of diagnosis include: main complaint; primary, during-treatment and final diagnosis; pre- and post-operative diagnosis; and International Classification of Diseases (ICD) codes (17).

The second class was pre-hospital emergency. The Medical Emergency Management Centre of the Ministry of Health and Medical Education rejected 42 out of 82 data elements in this class. The data elements of this class include dispatch date and time, type of transfer, and pre-hospital emergency procedures. The data class of hospital emergency had the highest number of clinical data elements ( $n = 110$ ), of which 104 were agreed upon. The following data elements were rejected: medical facilities provided for the patient, level of specialized services of

the emergency department, role of service provider, and consultant identifier. In the medicines class, the data elements on current dose and dose unit were rejected. In the anaesthesia class, post-operative pain management methods and hypertension following the use of pre-anaesthetic drugs were the two data elements that were rejected. In the nursing data class, no consensus was reached on the data elements: type of care, duration of admission to the intensive care unit, drug code, drug permission and treating physician. All the data elements of the other classes in the clinical section were accepted by the experts. Table 5 gives examples of the data elements for each data class in the clinical section.

## Discussion

The proposed minimum data set of the Iranian hospital information system has administrative and clinical sections. Some specialized publications (4,15) and studies on specialized minimum data sets have also used this classification (18,19).

Administrative data are used for patient registration, medical centre identification, insurance and reimbursement (16), medical research, outcome evaluation and administrative reports (20). In this study, the administrative data were categorized into nine different data classes. They were more comprehensive than similar hospital minimum data sets, such as those of Qatar (10), Australia (11), New Zealand (13) and the United States (14) and have more data elements, especially in the legal, incident and geographic data classes. The first class in this section is demographics. A number of other studies have considered this class as well (2,3,19,21–23).

Demographic data elements differ between those we propose, and the data elements currently used in Iranian hospital records and the data elements of other national data sets (24), and some essential data elements are needed in order to have comprehensive data. Another difference is the data elements between our set and other data sets relates to ethnicity and race. They are not included in our proposed demographic data set because they are not much needed in the Islamic Republic of Iran due to the racial and ethnic composition of the Iranian population. However, these data elements are used in most minimum data sets in countries with ethnic and migratory populations such as the United States (14,25,26).

In the class of admission, some data elements related to patient admission to the medical centre, such as the date and time of admission, ward, room and bed number, and transferring hospital or centre, were proposed. Most of these data elements are similar to data elements for admission in other studies in the Islamic Republic of Iran (18,21) and the minimum data sets of other countries (10,13,25,27).

As for the class of incident, in order to assist incident registration, some data elements related to the person's activity during the incident and the incident location, mechanism, and intention (e.g. intention to cause injury) were proposed. Recording these data might help implement the system of International Classification of

External Causes of Injury (ICECI) (28). Moreover, these data are among the main data of the minimum data set for traffic incidents and injuries (29,30). However, the proposed data set for the class of incident contained fewer data elements compared with specialized data sets for injuries such as the IDB-JAMIE minimum data set (31).

In the minimum data set designed for the Iranian hospital information system, in order to record data elements on informed consent and informing of legal authorities, the class of legal data was proposed. This class has also been considered in a minimum data set for orthopaedic injuries (18). Most data elements in this class do not appear in other minimum data sets (10,14,25,26,31).

Type of insurance coverage, costs and method of payment for care received are data elements included in the class of financing. Final diagnosis and disease code are also included in this class in order to support a prospective payment system in the hospital. Recording these data has an important role in implementing diagnosis-related groups in Iranian hospitals (32). These data are similar to the financial data elements in most minimum data sets in other countries (10,14,24).

In the class of organization identifier, some data elements such as institute name, identity, and organizational affiliation are similar to the data determined for the service-providing organization in other studies (2,18,19,33) and minimum data sets in other countries (10,24,25,27). However, the data elements of longitude and latitude coordinates to determine the exact location of the accident, website and email address of the health centre were also proposed for our data set. The longitude and latitude coordinates are also recorded in emergency-related data sets in many countries and in traffic incidents in the Islamic Republic of Iran (12,30). Recording these data elements helps to study planning, accessing and distributing of health services based on geographic information systems (34). This data element was proposed in view of the importance of hospital websites in assisting the delivery of health services to patients and its role in the future (35).

In the class of personnel identifier, data elements related to identification of the health staff providing the care, including the first and last name, identity, role, academic qualification, and electronic signature, were considered. The class of geographic data elements was proposed to record accurate location data about the patient's home according to geographical divisions of the country. This was done because, at the time of the study, one of the concerns of the Iranian health ministry was to provide data to accurately define patients' locations in order to determine the level of access to services and assist in the fair distribution of health services, and to determine the prevalence of diseases.

The proposed clinical section had 18 data classes. Compared with similar minimum data sets in other countries (10,14,24,27), our proposed clinical data set has more data elements. We tried to include as many clinical data elements of the patient's medical record as possible.



**Table 4 Examples of administrative data elements for a minimum data set for hospital information system in the Islamic Republic of Iran**

Data class	Data elements
Demographic	Patient's: National identity number, first/last/nick name and middle name, father's name, sex, date of birth, religion, employment status, telephone number, mobile phone number, email address
Admission	Type of entry, type of admission, admission date/hour, admission ward, room, bed number
Incident	Date/hour of incident, address where incident occurred, ICD-10 code for place of injury, longitude and latitude coordinates, site of injury, nature of injury, final outcome
Legal	Reported to the police, advance health care directives, informed consent, type of informed consent, informed consent date, witness first name, witness last name
Discharge	Discharge date/hour, ward, patient discharge status, discharge type, length of stay, discharging physician
Financing	Insurance organization, insurance fund, other insurance organization, complementary insurance, insurance serial number, insurance expiry date, name of service provided, service code, service unit
Personnel identifier	Health care provider – first name, health care provider – last name health care provider – ID, health care provider – role, health care provider – specialty
Organization identifier	Health care centre name, health care centre type, health care centre ID, longitude/latitude coordinates, health care centre affiliation
Geographic	Patient location – geographic position, country, city, province, district, rural area, town, village

Diagnosis was the first class of the clinical section with 101 data elements. This class includes different diagnoses, their codes and disease signs. The ICD codes of different diseases are an important data element in this class which have also been considered in many minimum data sets (18,19,21,27,33).

The class of pre-hospital emergency data rejected by the experts related to the characteristics of the vehicle for patient transfer and the transfer method. The aim of this class is to record the patient transfer method, procedures performed on the patient, information of the dispatching unit, and date and time of the contact and dispatch.

The class of hospital emergency data includes information on the emergency department, diagnoses, date and time of the procedures and the patient's status when emergency procedures had ended. This class has the highest number of data elements because of the wide range of emergency data in some of the data sets we evaluated (11,12) and the importance of these data in hospital emergency information systems (36). The class of diagnostic/therapeutic procedures has 78 data elements which fully describe the diagnostic and therapeutic procedures performed on the patient. These data elements are related to the type, method, date and time of procedures (both start and end), and the ICD-9-CM codes for procedures. Some of these data elements have been mentioned in most studies on minimum data sets (18,19,21,33). The data elements for procedures, especially surgical interventions, are among the most widely used data elements in clinical follow up (37). The class of orders has 17 data elements which aim to support the recording of details of the orders of medical staff, especially the treating physician.

The class of history data and systems evaluation has 21 data elements related to the personal and family history of the patient and evaluation of different organs. Some other studies have also considered this class under other names such as history (21), patient status evaluation (3) or physical examination and injury report (38).

In the class of nursing, some data elements such as interventions performed by nurses, nurses' evaluation at admission, laboratory tests and imaging studies, were rejected by the experts because they were included in other classes (laboratory and medical imaging). Some of these data elements are in line with the data proposed in another study (39).

Two data classes – medical imaging and laboratory – are proposed for paraclinical data. The data elements of medical imaging includes the type of radiography, technique, code, anatomical site, radiologist's name and interpretation. These data were proposed in another study which also had other elements (21). The laboratory data class includes the test name, test group, test code, number of tests and test results. Some other studies have included most of these data (18,19,33).

A separate class with 34 data elements is proposed for the medicines administered, including the name, code, administration route and dose. A number of Iranian studies on minimum data sets have also considered a separate class for drugs (2,3,18,19,38), indicating the importance of drug data. The anaesthesia data elements include the time of starting and ending anaesthesia and duration of anaesthesia, drugs used for anaesthesia, type of anaesthesia (e.g. general, spinal and local) and patient status at the end of anaesthesia.

Medical prostheses and blood products are two other classes. Medical prostheses includes data on the prostheses used for the patient, and blood products covers data on blood transfusions and use of blood products. Both these classes were included in an minimum data set for orthopaedic injuries (18). We propose a more comprehensive list of data elements for prostheses and blood classes compared with hospital information system document, the SEPAS system and hospital records.

Eleven data elements were proposed for the class of consultation, which covered data on specialized consultations with the patient. The data elements are

**Table 5 Examples of clinical data elements for a minimum data set for a hospital information system in the Islamic Republic of Iran**

Data class	Data elements
Diagnosis	Main complaint, clinical finding data source, primary diagnosis, interim diagnosis, pre-operation diagnosis, post-operation diagnosis, final diagnosis, pain scale, stroke scale, patient disability
Pre-hospital emergency	Mode of transport to emergency department, source of referral to emergency department (e.g. police), vehicle dispatch to GPS location, accident/onset date/time, dispatch notified date/time
Hospital emergency	Type of emergency department visit, outcome of emergency department visit, patient problem assessed in emergency department, outcome observation, date/time of patient entering the emergency department, Glasgow coma scale
Diagnostic/therapeutic procedure	Procedure type (medical/diagnostic procedures), date/time of procedure, procedure name by ICD-9CM, principal procedure code, start/end of operation, total time of operation
Orders	Order group, inpatient order, blood reserve order, consultations orders, laboratory tests orders, radiography orders, order date/time
Medical imaging	Type of requested radiography, limb name, limb direction, technique, date of radiography, radiologist notes, radiography result, authentication (signature or stamp)
Laboratory	Test name, main group of test, test code, blood group, number, routine test
Medicines	Name of medications, medications code, types of medication, dosage strength, dose, type of prescription (e.g. intravenous, intramuscular)
Medical prosthetics	Device name, device ID, model number, device purchase date, name of the requested instruments, size, number for each, device serial number, code
Blood products	Blood request, blood type, blood group, date/time of start of injection, date/time of end of injection, unit (e.g. L/mL), blood pack serial number
Discharge status	Revenue codes, discharge recommendations, discharge date, follow-up, places to visit for follow up
Transfer	Date/time patient departs, destination hospital, physician acceptance, cause of dispatch or transport, diagnosis, arrival time, patient symptoms
Follow up	Referral practitioner name, referral organization, discharge medication order type, patient problem assessed in follow up, follow up outcome observation, date/time of follow up
System history and review	Medical/surgical history, personal and family history, immunization history, environmental/food allergies, alcohol/drug use indicators, data source
Nursing	Nursing report, date of report, time of report, considerations/observations of nurse, monitoring vital signs, patient education, education topics
Consultation	Consultant practitioner ID, date/time consultation, date/time consultation starts, date/time consultation stops, type of consultation, request a consultation to assess disease
Death	National code, sex, nationality, occupation, first/last name, newborn's mother, mother's national code, mother's birth certificate number
Anaesthesia	Anaesthetics, supportive therapy (e.g. fluids, oxygen), anaesthesia start time, anaesthesia completion time, type of anaesthesia, date of anaesthesia

GPS: global positioning system.

similar to the data elements of consultation request forms used in the Islamic Republic of Iran.

Eight data elements are suggested for the class of follow-up data. A number of Iranian studies have also used follow-up data (2,18,19).

Although there is a class for discharge data in the administrative section, a separate class is included in the clinical section to record the clinical status of the patient on discharge. The focus of these data elements is on medical recommendations for treatment follow up at the time of discharge.

Problems in completing death certificates have been reported in the Islamic Republic of Iran (40,41). Therefore, the data elements in the class of death include the data available in the certificate of death beyond seven days, stillbirth certificate and death certificate for children aged 0–6 days. We tried to organize the data elements of

this class in accordance with World Health Organization and international death certificates (17).

The last class of the clinical section was transfer which deals with data of patient transfer between health centres, especially hospitals.

## Conclusion

We evaluated the data sets of other countries, medical forms used in Iranian health centres, the SEPAS system, and hospital information system companies (although some hospital information system companies submitted incomplete data elements, which caused some limitations in the study), and the views of experts in the Ministry of Health and Medical Education, and propose 27 classes for the administrative and clinical data. Comparison of the data elements proposed in each class with similar studies showed that our suggested data set is

more comprehensive and could help hospitals and other health care centres to record and report health data efficiently. Incorporation of the data elements proposed in our study into other specialized data sets developed for the Islamic Republic of Iran may be useful to develop an

expanded national health data set. Moreover, our dataset can be used by the Ministry of Health and Medical Education, hospital information system companies and health surveillance centres for more efficient management of health data.

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## Mise au point d'un ensemble de données minimum au niveau national pour les systèmes d'information hospitaliers en République islamique d'Iran

### Résumé

**Contexte :** La collecte de données standardisées facilite la gestion de l'information sur les maladies et se traduit par une meilleure qualité des soins. La République islamique d'Iran ne dispose pas d'un ensemble de données standard permettant de collecter des données dans les hôpitaux.

**Objectifs :** La présente étude avait pour objectif de mettre au point un ensemble de données minimum destiné aux systèmes d'information hospitaliers en République islamique d'Iran.

**Méthodes :** L'étude a été menée en 2015. Les ensembles de données issus d'autres pays, de dossiers hospitaliers, de systèmes d'information hospitaliers et de systèmes de dossiers médicaux électroniques disponibles en République islamique d'Iran ont été passés en revue afin de sélectionner les éléments à inclure dans l'ensemble de données minimum. Les éléments de données ont été collectés à l'aide d'un formulaire d'extraction, puis classés dans des catégories similaires, elles-mêmes divisées en sections administrative et clinique. La liste des éléments de données a été revue par les experts des services techniques du ministère iranien de la Santé et de l'Enseignement médical, et un ensemble de données minimum a été défini.

**Résultats :** Les sections administrative et clinique comportaient neuf et dix-huit catégories de données, avec un total de 166 et de 684 éléments de données respectivement. Suite à un examen par un groupe d'experts, 159 éléments de données administratives et 621 pour la partie clinique ont été retenus pour constituer l'ensemble de données minimum destiné au système d'information hospitalier iranien.

**Conclusion :** Cet ensemble de données peut être utilisé par le ministère susmentionné, les sociétés en charge des systèmes d'information hospitaliers et les centres de surveillance de la santé pour parvenir à une gestion plus efficace des données sanitaires.

تصميم مجموعة دنيا من البيانات الوطنية لنظم معلومات المستشفيات في جمهورية إيران الإسلامية

زهرا رام پيشه، محمد اسماعيل كامل، جواد زارعى، اكرم واحدى برزكى، مرضيه معراجى، على محمدى  
الخلاصة

**الخلفية:** يدعم جمع البيانات القياسية إدارة معلومات الأمراض ويؤدي إلى رفع مستوى جودة الرعاية. ولا تتوافر لدى جمهورية إيران الإسلامية مجموعة بيانات قياسية لجمع البيانات داخل المستشفيات.

**الأهداف:** هدفت هذه الدراسة إلى تصميم مجموعة دنيا من البيانات لتشغيل نظم معلومات المستشفيات في جمهورية إيران الإسلامية.

**طرق البحث:** أُجريت هذه الدراسة في عام 2015. وجرى استعراض مجموعات البيانات لدى بلدان أخرى، وكذلك سجلات المستشفيات، ونظم معلومات المستشفيات ونظم السجلات الصحية الإلكترونية في جمهورية إيران الإسلامية بغرض التوصل إلى عناصر البيانات لإنشاء المجموعة الدنيا من البيانات. وجمعت عناصر البيانات باستخدام نموذج استخلاص البيانات، وصُنفت العناصر إلى فئات متشابهة، ثم قسمت إلى أقسام إدارية وسريية. واستعرض خبراء بالمكاتب التقنية التابعة لوزارة الصحة والتعليم الطبي الإيرانية قائمة عناصر البيانات، ووضعوا مجموعة دنيا من البيانات.

**النتائج:** كان هناك 9 و 18 فئة بيانات في كل من القسمين الإداري والسريي، بمجموع 166 و 684 عنصر بيانات، على التوالي. وبعد انتهاء فريق الخبراء من الاستعراض، استُبقِيَ 159 عنصر بيانات إداري و 621 عنصر بيانات سريي باعتبارها مجموعة البيانات الدنيا اللازمة لنظام معلومات المستشفيات بجمهورية إيران الإسلامية.

الاستنتاج: يمكن لوزارة الصحة الإيرانية وشركات نُظُم معلومات المستشفيات ومراكز التَّردُّد الصحي استخدام مجموعة البيانات الناشئة عن هذه الدراسة من أجل زيادة كفاءة إدارة البيانات الصحية.

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# Life satisfaction and its contributors among noninstitutionalized older people in Tabriz, Islamic Republic of Iran

Akbar Zeinalhajlou,<sup>1</sup> Mahasti Alizadeh,<sup>2</sup> Mohammad Sahebihagh,<sup>3</sup> Asghar Mohammadpoorasl<sup>3</sup> and Hossein Matlabi<sup>4</sup>

<sup>1</sup>Ageing Research Institute; <sup>2</sup>Social Determinants of Health Research Centre; <sup>3</sup>Health Services Management Research Centre; <sup>4</sup>Department of Health Education and Promotion, Tabriz University of Medical Sciences, Tabriz, Islamic Republic of Iran (Correspondence to: Hossein Matlabi: hm1349@gmail.com).

## Abstract

**Background:** With the rising growth of the older population, the well-being of older people is an important objective for both economic and health policy.

**Aims:** This study investigates levels of life satisfaction among older people living at home and the factors that influence it.

**Method:** Applying probability proportional to size, a cross-sectional survey was conducted of 1067 older people living in Tabriz, Islamic Republic of Iran. The Satisfaction with Life Scale and the Multidimensional Scale of Perceived Social Support questionnaires were administered. The data were analysed using chi-squared tests and logistic regression.

**Results:** More than half of the participants were dissatisfied with their lives. Female, educated, and active older people reported greater satisfaction than others.

**Conclusion:** The significant positive effects of perceived social support and physical activity rate indicated that social interaction may be as vital as physical activity for the well-being of older people, and that these qualities should be actively promoted among older people in the Islamic Republic of Iran.

Keywords: life satisfaction, social support, elderly, health policy, Iran

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## Introduction

The spread of healthy lifestyles, public health measures and health care over the past century have increased life expectancy (1). Currently, the world population is rapidly ageing and facing an unprecedented situation. It is expected that during the next few decades the population aged 60 years or older in low and middle-income countries will grow at a rate several times faster than the equivalent rate in the developed countries (2,3).

According to the 1996 census, about 6.6% of the Iranian population was aged 60 or more years; by 2011 the share had increased to 8.2% (4). Comparisons with other countries show that the Islamic Republic of Iran will be among those with the highest rate of ageing and that over the next 3 decades the population pyramid will be inverted (5,6). The changing demographic structure has created new challenges to improving the well-being of individuals in different age groups. Moreover, with increased longevity and the ageing population, paying attention to older people as a vulnerable social group becomes inevitable. Some of the older people live with a sense of satisfaction and stoical realism in the last years of their lives while others find their decreased abilities and lack of social importance unpleasant (7–11).

Life satisfaction is directly related to social vitality and is one of the effective variables and important indices for explaining an older person's mental health status. People

who are more satisfied with life have better physical and mental health than those who are less satisfied (12). People who are satisfied with their lives have more effective and appropriate coping styles, experience deep positive emotions and feelings and have better health. Dissatisfaction with life is correlated with poor health status, depression symptoms, personality problems, inadequate health behaviours and poor social status. This theoretical framework suggests that engagement with the contributors is an important component of successful ageing (13–15).

Over the last 4 decades, the Islamic Republic of Iran has been experiencing rapid sociodemographic and economic changes. Data from population censuses show that rapid urbanization, new patterns of internal migration, declining fertility, the current youth bulge, an upcoming aged population, and the growing number of female-headed households are some of the main population issues to have emerged due to broad socioeconomic changes. The proportion of men and women aged 65 years and over living with their children has decreased (16). Therefore, new research reassessing the well-being challenges for older people is particularly important for understanding the general role that factors such as age, sex, level of education, place of birth, marital status, physical and mental health and family structures play in shaping life satisfaction in rapidly ageing societies. In this study, we aimed to investigate life satisfaction and

its influencing factors among older Iranian people.

## Methods

### Design

The study sampled a representative cross-section of people aged  $\geq 60$  years living in their own homes in Tabriz, Islamic Republic of Iran.

### Participants and sampling

According to data from the Statistical Center of Iran, the population of interest totalled 146 312 in 2011 (4). Individuals aged  $\geq 60$  years were included in the study. Based on Cochran's sample size formula, and considering prevalence of life dissatisfaction = 0.5,  $d = 0.03$  and significance level = 0.95; sample size was estimated at 1060. We recruited 1067 individuals in our sample, 514 males and 553 females.

We used "probability proportional to size", a sampling procedure under which the probability of a unit being selected is proportional to the size of the ultimate unit, giving larger clusters or blocks a greater probability of being selected and smaller clusters or blocks a lower probability (17). In the first stage, and in order to ensure that all units in the population had the same probability of selection irrespective of the size of the cluster, 107 blocks were selected out of 8531 urban blocks in Tabriz.

After calculating the sampling interval by dividing the total population by the number of blocks, the random starting point (first block) was selected in a range between 1 and the sampling interval using a random number table. The succeeding blocks were determined utilizing a randomized systematic sampling process. At the next stage, 10 eligible older people were randomly nominated from each block. People were considered ineligible if they had multiple chronic difficulties or severe cognitive impairment, or were too frail to undertake the survey.

### Measures

The questionnaire included both demographic information and the Farsi version of the Satisfaction with Life Scale standard questionnaire (13). The original scale was designed in 1958 and has been used in many intercultural studies with high reliability and validity. The scale contains 5 items which are evaluated using a 5-point Likert scale from "always dissatisfied" (score 5) to "very satisfied" (score 25). The validity and reliability of the Farsi version of the questionnaire have been evaluated in other studies (18,19).

The perceived social support was assessed using the Multidimensional Scale of Perceived Social Support (20). This tool was developed in 1988 for evaluating the perceived social support provided by relatives, friends and other individuals important in the person's life. The questionnaire has 2 items which are scored using a 5-point Likert scale from "strongly disagree" to "strongly agree" (20,21). The Iranian version of this tool has been used in a domestic study among older people (22). The questionnaires were evaluated among 45 eligible

participants in a pilot carried out before our study. The reliability of the final drafts was accepted using Cronbach's alpha (Satisfaction with Life Scale:  $\alpha = 0.71$  and Multidimensional Scale of Perceived Social Support:  $\alpha = 0.83$ ).

### Data collection and procedures

Since the ability of the participants to complete all of the questionnaires was uncertain, a preliminary pilot study was conducted; the results showed that older people were rather weak in completing the questionnaires by themselves. Among those willing to participate in the study, data collection was conducted by trained interviewers through face-to-face interviews. The place where the interviews were conducted was determined in accordance with the convenience and proclivity of the participants. We performed the majority of interviews in a quiet room in the homes of the participants. Each interview lasted 25–35 minutes. If a potential participant was not available at the relevant address, a replacement was selected from the next household on the right.

For the data analysis, descriptive, inferential statistics, chi-squared tests and logistic regression were used. In order to make the appropriate comparisons, the 5 possible responses were dichotomized into "satisfied" or "dissatisfied".

### Ethical standards

Informed consent was obtained from all the people who participated in the study. All procedures performed in the study were in accordance with the ethical standards of the Ethics Committee of Tabriz University of Medical Sciences (number: 1395.1148).

## Results

The mean age of the participants was 70.19 [standard deviation (SD) 8.2] years [males 71.25 (SD 8.26), females 69.20 (SD 8.05) years]. Table 1 compares the level of life satisfaction scores and sociodemographic variables. Male:female ratio was 0.929. In terms of marital status, the most common was "married" and the least common "never married" ( $n = 7$ ). Around 54% were illiterate, with a strong difference between the sexes, men 37.4%, women 70.2%. More than half of the respondents were born in rural areas and had migrated to Tabriz. In terms of family type, 619 (58%) were living in extended families (with  $> 1$  marriage represented).

The descriptive statistics showed that the mean score for life satisfaction was 14.14 (SD 4.12), with the most prevalent category being "dissatisfied".

Evaluating the simultaneous effect of independent variables on life satisfaction using logistic regression showed that the impact of sex, education, perceived social support and daily walking were statistically significant at the 5% level (Table 2). Assuming other model variables as constant, being female increases the probability of life satisfaction 1.42 times. A higher level of education also had a significant effect on the likelihood of satisfaction with life. Having received elementary, secondary or academic

**Table 1 Comparison of life satisfaction scores and sociodemographic characteristics among noninstitutionalized older people in Tabriz (n = 1067)**

Characteristic	Life satisfaction						P-value
	Dissatisfied		Satisfied		Total		
	No.	%	No.	%	No.	%	
<b>Sex</b>							
Male	289	56.2	225	43.8	514	48.0	0.01
Female	368	66.5	185	33.5	553	52.0	
<b>Age (years)</b>							
60–64	187	55.8	148	44.2	335	31.4	0.01
65–69	126	61.8	78	38.2	204	19.1	
70–74	118	59.6	80	40.4	198	18.6	
75–79	117	72.7	44	27.3	161	15.1	
80–84	68	63.0	40	37.0	108	10.1	
85–89	31	73.8	11	26.2	42	4.0	
90+	10	52.6	9	47.7	19	1.7	
<b>Education level</b>							
Illiterate	428	73.8	152	26.2	580	54.3	< 0.001
Primary	161	55.7	128	44.3	289	27.1	
Secondary	45	34.6	85	65.4	130	12.2	
Higher	23	33.8	45	66.2	68	6.4	
<b>Place of birth</b>							
Village	376	68.1	176	31.9	552	52.0	< 0.001
Town	281	54.6	234	45.4	515	48.0	
<b>Marital status</b>							
Married	434	56.7	332	43.3	766	71.8	< 0.001
Divorceda	18	81.8	4	18.2	22	2.1	
Widowed	205	73.5	74	26.5	279	26.1	
<b>Family structure</b>							
Living alone	90	73.8	32	26.2	122	11.4	0.007
Nuclear	184	57.5	136	42.5	320	30.0	
Extended	383	61.3	242	38.7	625	58.6	
<b>Walking (daily)</b>							
Does not walk	195	73.0	72	27.0	267	25.4	0.001
< 15 minutes	192	66.2	98	33.8	290	27.6	
15–30 minutes	148	52.9	132	47.1	280	26.6	
≥ 60 minutes	109	50.9	105	49.1	214	20.4	
<b>Perceived social support</b>							
Very low	33	100.0	0	0.0	33	3.1	0.001
Low	155	82.0	34	18.0	189	17.7	
Average	38	65.5	20	34.5	58	5.4	
Much	335	57.0	253	43.0	588	55.2	
Very much	95	48.0	103	52.0	198	18.6	

\*This includes 7 people who were never married. Since the numbers were so low, the 2 groups were merged

education compared with being illiterate increased the odds of satisfaction with life 1.82, 3.84 and 2.87 times respectively. Walking was also associated with the increased chance of satisfaction with life compared to no walking: daily walking of ≥ 15 minutes had a statistically significant effect on satisfaction with life compared to no

walking ( $P = 0.004$ ). According to the regression results, perceived social support also had a significant positive effect on satisfaction with life. Assuming that other model variables were constant, an increase of 1 unit in perceived social support increased the chance of satisfaction with life 1.06 times.



**Table 2 Logistic regression: contribution of determinant to variables life satisfaction among noninstitutionalized older people in Tabriz (n = 1067)**

Characteristic	Dissatisfied		Satisfied		OR	95% CI	P-value
	No.	%	No.	%			
<b>Age (years)</b>							
60–64	187	55.8	148	44.2	1.02	1.00–1.04	0.142
65–69	126	61.8	78	38.2			
70–74	118	59.6	80	40.4			
75–79	117	72.7	44	27.3			
80–84	68	63.0	40	37.0			
85–89	31	73.8	11	26.2			
90+	10	52.6	9	47.7			
<b>Perceived social support</b>							
Very low	33	100.0	0	0.0	1.06	1.04–1.08	< 0.001
Low	155	82.0	34	18.0			
Average	38	65.5	20	34.5			
Much	335	57.0	253	43.0			
Very much	95	48.0	103	52.0			
<b>Sex</b>							
Male	289	56.2	225	43.8	1.00		
Female	368	66.5	185	33.5	1.42	1.01–2.00	0.047
<b>Place of birth</b>							
Village	376	68.1	176	31.9	1.00		
Town	281	54.6	234	45.4	1.12	0.83–1.50	0.455
<b>Family structure</b>							
Living alone	90	73.8	32	26.2	1.00	0.44–1.55	0.552
Nuclear	184	57.5	136	42.5	0.83	0.43–1.33	0.338
Extended	383	61.3	242	38.7	0.76		
<b>Marital status</b>							
Divorceda	18	81.8	4	18.2	1.00		
Widowed	205	73.5	74	26.5	2.04	0.55–7.61	0.287
Married	434	56.7	332	43.3	2.98	0.79–11.19	0.106
<b>Education level</b>							
Illiterate	428	73.8	152	26.2	1.00		
Primary	161	55.7	128	44.3	1.82	1.29–2.55	0.001
Secondary	45	34.6	85	65.4	3.84	2.38–6.18	< 0.001
Higher	23	33.8	45	66.2	2.87	1.56–5.28	0.001
<b>Walking (daily)</b>							
Does not walk	195	73.0	72	27.0	1.00		
< 15 minutes	192	66.2	98	33.8	1.30	0.88–1.93	0.190
15–30 minutes	148	52.9	132	47.1	1.82	1.21–2.74	0.004
≥ 60 minutes	109	50.9	105	49.1	1.91	1.22–2.99	0.004

OR = odds ratio; CI = confidence interval.

<sup>a</sup>This includes 7 people who were never married. Since the numbers were so low, the 2 groups were merged.

## Discussion

An understanding of the many determinants of quality of life can serve a number of purposes. One is to identify the most important contributors to quality of life so that they can be targeted for programmes and interventions. Another is to provide a descriptive context for

understanding how to appropriately measure quality of life within a particular study. For example, knowing the range and level of education, literacy, medical problems and living circumstances in a particular sample can aid the selection of an appropriate conceptual and measurement approach, e.g. whether the focus should be on lower

versus higher levels of functioning, or what methods of data collection are optimal. Finally, scores on such determinants can be useful covariates in studies attempting to explain quality of life outcomes, facilitating the isolation of the unique influence of the independent variables of primary interest (23).

Our findings showed significant relationships between satisfaction with life and sex, perceived social support, level of education and daily walking. These findings are consistent with those reported by Borg et al. among older people in Sweden (24) and by Beygzadeh et al. among older people in Shiraz (25).

Old age is the retirement period, which means not only loss of job but also exclusion from social interactions in the workplace (26). Furthermore, the modernization and industrialization of societies is accompanied by changes in the workforce and in family structures that tend to isolate older people, who are increasingly exposed to feelings of loneliness and rejection and psychological risks (27). A reduction in social interactions results in constricted social networks and, consequently, reduced perceived social support. Loneliness can be considered the result of reduced perceived social support. Previous research has demonstrated a significant inverse relationship between loneliness and satisfaction with life (28). Our findings on the significant positive effect of perceived social support and satisfaction with life are consistent with those reported by Adams et al. (29) and

Tamannayeefer et al. (30). In another study, satisfaction with friends showed a significant correlation with life satisfaction among Swedish older people (31). Moreover, the significant positive relationship we found between level of education and life satisfaction replicates the findings of Ho et al. in a study among older people in Hong Kong (32). They also found a significant relationship between physical status and life satisfaction, as did we in Tabriz.

Our study had some limitations. The participants were selected from a group of relatively healthy and younger older people. Although our results were unequivocally positive, the findings may not be representative of the Iranian population as a whole since our sample was selected only among a limited geographical, cultural and religious setting.

## Conclusion

Given the results of the present study, particularly the significantly low satisfaction with life among older women and the strong influence of the perceived social network in generating satisfaction with life, the current perspectives may be reconciled to identify the specific mechanisms that govern the apparent increase in associational involvement with age among older adults. As an example, opening up educational institutions may address the lack of a social network since our research identified this factor as important in life satisfaction.

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**Competing interests:** None declared.

## Niveau de satisfaction dans la vie et facteurs contributifs chez les personnes âgées non institutionnalisées résidant à Tabriz (République islamique d'Iran)

### Résumé

**Contexte :** Compte tenu de l'augmentation croissante de la population âgée, le bien-être de cette tranche d'âge constitue un objectif important pour les politiques économique et sanitaire.

**Objectifs :** La présente étude portait sur les niveaux de satisfaction à l'égard de la vie chez les personnes âgées vivant à domicile et les facteurs qui l'influencent.

**Méthode :** En appliquant une probabilité proportionnelle à la taille, une étude transversale a été menée auprès de 1067 personnes âgées résidant à Tabriz. Les questionnaires correspondant à l'Échelle de satisfaction dans la vie et à l'Échelle multidimensionnelle de soutien social perçu ont été administrés. Les données ont été analysées à l'aide de tests du khi carré et de la régression logistique.

**Résultats :** Plus de la moitié des participants étaient insatisfaits de leur vie. Les femmes âgées, actives et éduquées faisaient état d'un niveau de satisfaction plus élevé que les autres.

**Conclusion :** Les effets positifs significatifs du soutien social perçu et du taux d'activité physique indiquaient que l'interaction sociale peut jouer un rôle aussi essentiel que l'activité physique pour le bien-être des personnes âgées. De ce fait, ces qualités devraient être activement encouragées parmi les personnes âgées en République islamique d'Iran.

## درجة الرضا عن الحياة والعوامل المساهمة في تحقيق ذلك في صفوف السكان الأكبر سنا من غير المقيمين في مؤسسات الرعاية في تبريز، جمهورية إيران الإسلامية

أكبر زين الحاجلو، مهستی علیزاده، محمد صاحبي حق، أصغر محمد بوراصل، حسين مطلبي  
الخلاصة

الخلفية: مع النمو المتزايد للفئات السكانية الأكبر سنا، بات موضوع عافية المسنين يمثل هدفا مهما لكل من السياسات الاقتصادية والسياسات الصحية.

الأهداف: استقصت هذه الدراسة مستويات الرضا عن الحياة في صفوف الأشخاص الأكبر سنا الذين يعيشون في المنزل، والعوامل المؤثرة عليها. طريقة البحث: من خلال تطبيق الاحتمال المناسب مع الحجم، أُجري مسح مقطعي شمل 1067 شخصا من الأشخاص الأكبر سنا الذين يعيشون في تبريز. وطبّق كل من استبيان مقياس الرضا عن الحياة ومقياس الدعم الاجتماعي الملموس المتعدد الأبعاد. وحُللت البيانات باستخدام اختبارات مربع كاي والانحدار اللوجستي.

النتائج: أبدى أكثر من نصف المشاركين عدم رضاهم عن حياتهم. بينما أبدى الأشخاص الأكبر سنا من الإناث، والمتعلمين، والأكثر نشاطا رضا أكثر من سواهم.

الاستنتاج: تشير الآثار الإيجابية المهمة المترتبة على الدعم الاجتماعي الملموس ومعدل النشاط البدني إلى أن التفاعل الاجتماعي قد يكون مهما لتحقيق عافية الأشخاص الأكبر سنا بقدر أهمية النشاط البدني لهم، وأنه يتعين تعزيز تلك الخصائص بصورة فعالة في صفوف الأشخاص الأكبر سنا في جمهورية إيران الإسلامية.

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# Myths about modern and traditional contraceptives held by women in Minia, Upper Egypt

Ehab Eshak<sup>1,2</sup>

<sup>1</sup>Department of Public Health and Preventive Medicine, Faculty of Medicine, Minia University, Minia City, Egypt. <sup>2</sup>Public Health Department of Social Medicines, Graduate School of Medicine, Osaka University, Osaka, Japan. (Correspondence to: Ehab Eshak: ehabsalah1@yahoo.com).

## Abstract

**Background:** Misconceptions about modern contraceptives affect their use in low- and middle-income countries.

**Aims:** This study aimed to determine the prevalence of myths about modern contraceptives and their association with ever and current use of contraceptives by women in Minia, Upper Egypt.

**Methods:** This was a cross-sectional study of 1212 married Egyptian women aged 18–49 years attending urban and rural health centres in Minia. Data were collected using a structured interview questionnaire and analysed by logistic regression analysis; odds ratios (OR) and 95% confidence intervals (CI) were calculated.

**Results:** Most of the women (88.7%) had one or more misconceptions about contraceptives. The most prevalent misconceptions were that birth control pills cause cancer and intrauterine devices (IUDs) can penetrate the uterus and move to the heart. The current use of birth control pills and IUDs was significantly lower in women with misguided beliefs than those without such beliefs; adjusted OR = 0.59 (95% CI: 0.37–0.90) and adjusted OR = 0.50 (95% CI: 0.34–0.76) respectively. Belief in an increasing number of myths was associated with lower odds of ever use of birth control pills: OR = 0.72 (95% CI: 0.57–0.96), OR = 0.61 (95% CI: 0.43–0.91), OR = 0.48 (95% CI: 0.29–0.69) and OR = 0.43 (95% CI: 0.24–0.63) in women with 1, 2, 3 and  $\geq 4$  misconceptions versus those with none.

**Conclusions:** Myths about contraceptives are common in women in Minia and may have a significant effect on their choice and use of contraceptive method. Reproductive health programmes to refute such misguided beliefs are recommended.

Keywords: reproductive health, contraception, prevalence, female, Egypt

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## Introduction

According to the Egyptian Ministry of Health and Population, the proportion of contraceptives users in 2014 was still less than 50% and was far below the corresponding proportion of married women (> 80%) who desire no more children (1). With the rapid growth of the Egyptian population from 20.8 to 98.1 million inhabitants in the past 50 years (2), strenuous efforts have been made to promote maternal and child health through family planning programmes that empower families to make informed decisions on the number of children and interval between children they want and to reduce unintended pregnancies.

The use and type of contraceptives should be guided by women's health status (3). However, in low- and middle-income countries, culture and other non-medical factors have been shown to play an important role in women's decision to use contraceptives (4). Despite evidence on the positive effect of contraceptive use, not only on controlling fertility but also on women's health, family welfare and social life in general (5), myths and misconceptions about modern contraceptives are still prevalent in such communities (6–8) and may prevent their use, which can lower general health of the women

(7–9) and may be obstacles to effective family planning programmes (7,8,10).

Myths and misconceptions about contraceptives are very common in deprived areas and low- and middle-income communities (4,6–8,11,12). In Egypt, especially in rural areas, poverty, illiteracy and misguided religious beliefs have created a culture and environment that have helped spread misinformation about modern contraceptives since their introduction in 1967 (13,14).

Evidence on these issues is from the 1980s and more recent studies are lacking. Furthermore, those earlier studies focused on misconceptions about oral contraceptive pills only. For example, one study showed that 57% and 52% of urban and rural Egyptians respectively believed that using oral contraceptive pills had substantial health risks (15). The most prevalent myths were that contraceptive pills cause severe headache (86% in rural and 95% in urban communities), anaemia (55% and 53%), sterility (20% and 37%), breast cancer (21% and 16%) and birth defects (17% and 11%) (15).

Therefore, the current study aimed to assess the prevalence of myths about various modern contraceptive methods used by women in Minia governorate in Upper Egypt and evaluate their effect on ever and current use of

modern and traditional contraceptives. It is hypothesized that myths about contraceptives in such communities could be influencing women's choice about family planning options.

## Methods

### Study design and place

This was a cross-sectional study of married women aged 18–49 years recruited during their visits to the 10 accredited urban and rural health centres (eight urban and two rural) in Minia. These centres are accredited by the Egyptian Ministry of Health and Population to provide specific maternal and child health services. Minia is an Upper Egypt governorate with about 5.6 million inhabitants and an area of 30 000 km<sup>2</sup>. The fertility rate in Minia according to the most recent census data was 3.8 per 1000 women aged 15–49 years (2). The uptake of contraceptives in Minia in 2015 was 37% for intrauterine devices (IUDs), 31% for oral contraceptives and 20% for injectables, with an overall prevalence of contraceptive use of 53% (4). These rates are comparable to national figures in 2014, which were 30% for the IUD, 16% for oral contraceptives and 9% for injectables, with an overall contraceptive prevalence of 59% (1).

### Study sample

The study population was married women aged 18–49 years. All women visiting the selected health centres seeking maternal and child health services and family planning services from June to December 2015 were approached by trained data collectors from the Public Health Department at Minia University and fourth-year medical students and invited to participate after giving verbal consent. If they agreed, they were interviewed at that time and interviews took about 10–15 minutes. Exclusion criteria were unmarried females, pregnant women, women aged < 18 or > 49 years, women who did not give their consent, and duplicate observations for women who visited the same or other centres more than once in the study period.

### Structured interview questionnaire

Data were collected about the participants' sociodemographic characteristics, reproductive history, ever and current use of modern and traditional contraceptive methods and belief in seven myths about modern contraceptives using a structured interview questionnaire in Arabic (4). We tested the reliability of the questionnaire in a pilot study of 50 women.

Modern contraceptives included oral birth control pills, IUDs and injectables; traditional contraceptives included methods based on fertility awareness, such as calendar and lactational amenorrhea, and the withdrawal method. Due to the small number of participants who reported the use of barrier methods (five for condoms and three for diaphragms), we added these to the traditional methods category and labelled the group "traditional and barrier methods".

## Myths and misconceptions about contraceptives

A pilot study including 50 women from two health centres (one rural and one urban) was carried out to assess the contraceptive prevalence rate and non-medical factors associated with their use. Women were asked to freely report any fears and rumours about contraceptives that they had heard or that were circulating in their communities or families. Based on the myths reported by the women in the pilot study, seven that were frequently reported and related to the three main modern contraceptive methods available in Egypt (oral contraceptives, IUDs and injectables) were included in the main questionnaire. The myths were: oral birth control pills cause cancer, IUDs can penetrate the uterus and travel up to the heart, injectables cause permanent infertility, difficulty in getting pregnant after stopping the use of contraceptives, contraceptives adversely affect women's health, contraceptives are for older women only, and contraceptive use increases the risk of fetal defects.

### Statistical analysis

SPSS, version 20 was used for data entry and analysis. Characteristics of the women who had and did not have misconceptions about contraceptives were expressed as number and percentage or mean and standard deviation (SD). Chi-squared and *t*-tests were used to assess statistically significant differences in characteristics. The frequency of belief each of the seven myths was categorized according to women's use of contraceptives: never (used contraceptives, modern or traditional), ever (used contraceptives at some time), and current users. Multivariable logistic regression analysis was used to assess the association between misconceptions about contraceptives and current and ever use of oral birth control pills, IUDs, injectables and total traditional and barrier methods. Odds ratios (ORs) and 95% confidence intervals (95% CI) were adjusted for: age, age at menarche, at marriage and at first baby, number of children, desired number of children, woman's education and occupation, husband's education and occupation, residence and decision-maker on the use of contraceptives. In addition, the effect of increasing number of myths believed (1, 2, 3 and ≥4 myths versus none) on contraceptive use was evaluated.  $P < 0.05$  was considered statistically significant.

### Ethical considerations

Approvals to conduct the study were obtained from the Egyptian Ministry of Health and Population and the managers of the health centres. The Ethical Committee of Minia University granted ethical approval for this research. Women gave their verbal consent to participate.

## Results

We approached 2021 women at the health centre in the study period; 1504 met our inclusion criteria (married, not-currently pregnant, seeking maternal and child health services and family planning services, aged 18 to 49 years). Of these women eligible for inclusion, 1212

**Table 1 Sociodemographic and reproductive characteristics of the women according to beliefs about contraceptives**

Sociodemographic and reproductive characteristics	Women with false beliefs (n = 1075)	Women without false beliefs (n = 137)	P-value <sup>a</sup>
	No. (%)	No. (%)	
<b>Residence</b>			< 0.001
Rural	531 (92.5)	43 (7.5)	
Urban	544 (85.3)	94 (14.7)	
<b>Education</b>			< 0.001
Illiterate	394 (91.4)	37 (8.6)	
Read and write/primary school	149 (96.1)	6 (3.9)	
Middle/secondary school	422 (82.6)	89 (17.4)	
University or higher	110 (95.7)	5 (4.3)	
<b>Has a paid job</b>			0.04
Yes	106 (93.8)	7 (6.2)	
No	969 (88.2)	130 (11.8)	
<b>Husband's education</b>			< 0.001
Illiterate	268 (92.4)	22 (7.6)	
Read and write/primary school	159 (96.4)	6 (3.6)	
Middle/secondary school	533 (84.3)	99 (15.7)	
University or higher	115 (92.0)	10 (8.0)	
<b>Husband's occupation</b>			0.06
Unemployed	26 (100)	0 (0.0)	
Manual worker	139 (89.1)	17 (10.9)	
Private sector/freelance worker	613 (89.8)	70 (10.2)	
Government employee	297 (85.6)	50 (14.4)	
<b>Decision-maker on use of contraceptives</b>			< 0.001
Woman herself	123 (75.5)	40 (24.5)	
Husband	47 (78.3)	13 (21.7)	
Joint	905 (91.5)	84 (8.5)	
<b>Contraceptive use</b>			< 0.001
Never	96 (100.0)	0 (0.0)	
Ever	979 (87.7)	137 (12.3)	
Current	544 (84.5)	100 (15.5)	
<b>Current use of</b>			< 0.001
Oral pills	166 (83.4)	33 (16.6)	
Intrauterine devices	195 (81.9)	43 (18.1)	
Injectables	116 (89.9)	13 (10.1)	
Traditional and barrier methods	67 (85.9)	11 (14.1)	
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	
<b>Age (years)</b>	29.9 (8.3)	32.0 (7.4)	0.02
<b>Age at menarche (years)</b>	13.0 (1.3)	13.4 (1.0)	0.02
<b>Age at marriage (years)</b>	18.9 (3.0)	19.6 (2.6)	0.19
<b>Age at first birth (years)</b>	20.5 (3.1)	20.3 (2.1)	< 0.001
<b>Number of children</b>	2.5 (1.4)	2.7 (0.9)	0.48
<b>Number of desired children</b>	3.4 (1.3)	3.5 (0.7)	0.12

SD: standard deviation.

<sup>a</sup>Chi-squared test for categorical variables and independent sample t-test for continuous variables.

consented to participate, giving a response rate of 81%. As shown in Table 1, 1075 women (88.7%) believed myths about contraceptives. Women with misconceptions about

contraceptives were younger and had younger age at menarche but were older at the time of the birth of their first child when compared with those without such miscon-

**Table 2 Frequency of misbeliefs about contraceptives in the women according to contraceptive use**

Myths about contraceptives	Total (n = 1212)	Never users (n = 96)	Ever users (n = 1116)	Current users (n = 644)
	No. (%)	No. (%)	No. (%)	No. (%)
Birth control pills cause cancer	926 (76.4)	68 (70.8)	858 (76.9)	479 (74.4)
The intrauterine device can travel up to the heart by penetrating the uterus	568 (46.9)	56 (58.3)	512 (45.9)	293 (45.5)
Injectables cause infertility	335 (27.6)	65 (67.7)	270 (24.2)	167 (25.9)
Contraceptives are for older women only	91 (7.5)	18 (18.8)	73 (6.5)	34 (5.3)
Contraceptives adversely affect women's health	108 (8.9)	5 (5.2)	103 (9.2)	72 (11.2)
It is very difficult to get pregnant after stopping using contraceptives	114 (9.4)	19 (19.8)	95 (8.5)	61 (9.5)
Contraceptives use results in birth defects in babies	85 (7.0)	6 (6.3)	79 (7.1)	45 (7.0)

ceptions. A greater proportion of rural than urban women and women whose husbands were unemployed than whose husbands had a job had misconceptions about contraceptives. Of ever and current users of contraceptives, 137 (12.3%) and 100 (15.5%) respectively reported no misguided beliefs, while all women who had never used contraceptives (96, 100%) reported believing one or more myths about contraceptives. The 96 never users, had a higher mean of number of desired children (3.7 children) compared with ever contraceptive users (3.3 children). In addition, although never users were four years younger than contraceptive users, their mean number of children (2.5 children) did not differ greatly from that of contraceptive users (2.4 children), which suggests repeated pregnancies and deliveries. Eleven women (14.1%) who were currently using traditional or barrier contraceptive methods had no misconceptions about contraceptives compared with 33 (16.6%), 43 (18.1%) and 13 (10.1%) of current users of oral birth control pills, IUDs and injectables, respectively.

Table 2 shows responses to seven myths about contraceptives among never, ever and current contraceptive users and the total sample of women. The most prevalent myth about contraceptives was that birth control pills cause cancer which was expressed by 926 women (76.4% of the total sample), followed by the misconception that IUDs can travel up to the heart by penetrating the uterus – 568 (46.9%) of the women. A greater proportion of never users of contraceptives believed the myths than ever and current users.

The multivariable logistic regression analysis of the association between misconceptions about modern contraception and ever use and current use of modern and traditional contraceptives is shown in Table 3. Women who have ever used any contraceptive method, and specifically birth control pills, were less likely to believe myths about contraceptives (OR = 0.79; 95% CI: 0.65–0.89 and OR = 0.40; 95% CI: 0.26–0.61 respectively). However, women who had ever used traditional and barrier methods had about twice the odds of believing myths than those who had not used these methods, but this difference was not statically significant (OR = 2.32;

95% CI: 0.92–7.47). Among current contraceptive users, women using any method, birth control pills and IUDs were less likely to believe myths about contraceptives, OR = 0.31 (95% CI: 0.20–0.47), OR = 0.59 (95% CI: 0.37–0.90) and OR = 0.50 (95% CI: 0.34–0.76) respectively (Table 3).

The association between believing myths and type of contraceptive used showed a dose-response pattern with belief in an increasing number of myths about contraceptives (Table 4).

## Discussion

To the best of our knowledge, this is the first study to measure the prevalence of myths about contraceptives among women in Upper Egypt, and the first to evaluate the effect of those myths on ever and current use of contraceptives. According to our findings, myths about contraceptives were prevalent; 88.7% of the women had misconceptions, mainly the belief that oral birth control pills caused cancer and that IUDs can penetrate the uterus and move to the heart. Accordingly, the ever use of oral contraceptives and current use of oral contraceptives and IUDs were lower and the ever use of traditional and barrier contraceptives was higher in women who believed in such myths about contraceptives compared with women who did not.

Challenging traditional customs and fertility habits by encouraging people to use contraceptives has always faced resistance (5,6,11–16). Because of the wide gap between scientific evidence and public perception of the safety of contraceptives, one path of resistance to contraceptive use was the ready spread of health-related myths about contraceptives in Egypt (13,14). Similar to our findings, these myths were prevalent and impeded the use of contraceptives in Senegal, Nigeria and Kenya (11), Ghana (12,17), India (18), Malawi (19), Nigeria (20) and many other countries as reported in two previously published reports (7,8).

Ever and current use of oral birth control pills was significantly lower in women in Minia who believed in myths about contraceptives. This is plausible given that the most prevalent myth about contraceptives reported by over three quarters of those women was



**Table 3 Women's belief in myths about contraceptives and current and ever use of contraceptives: multivariable logistic regression analysis**

Contraceptive use	Beta	SE	P-value	OR (95%CI) <sup>a</sup>
<b>Current use of:</b>				
<b>Any contraceptives</b>				
Crude model	-0.97	0.20	< 0.001	0.38 (0.26–0.56)
Adjusted model <sup>b</sup>	-1.17	.224	< 0.001	0.31 (0.20–0.47)
<b>Birth control pills</b>				
Crude model	-0.55	0.22	0.01	0.58 (0.38–0.88)
Adjusted model <sup>b</sup>	-0.52	0.25	0.03	0.59 (0.37–0.90)
<b>Intrauterine device</b>				
Crude model	-0.73	0.20	< 0.001	0.48 (0.33–0.72)
Adjusted model <sup>b</sup>	-0.69	0.24	< 0.001	0.50 (0.34–0.76)
<b>Injectables</b>				
Crude model	0.14	0.31	0.64	1.15 (0.63–2.11)
Adjusted model <sup>b</sup>	0.04	0.34	0.99	1.04 (0.54–2.03)
<b>Traditional and barrier methods</b>				
Crude model	-0.27	0.34	0.42	0.76 (0.39–1.48)
Adjusted model <sup>b</sup>	-0.12	0.38	0.79	0.88 (0.42–1.54)
<b>Ever use of:</b>				
<b>Any contraceptives</b>				
Crude model	-0.19	0.39	0.01	0.82 (0.68–0.91)
Adjusted model <sup>b</sup>	-0.23	0.52	< 0.001	0.79 (0.65–0.89)
<b>Birth control pills</b>				
Crude model	-0.75	0.19	< 0.001	0.47 (0.33–0.68)
Adjusted model <sup>b</sup>	-0.91	0.22	< 0.001	0.40 (0.26–0.61)
<b>Intrauterine device</b>				
Crude model	0.28	0.23	0.22	1.33 (0.85–2.08)
Adjusted model <sup>b</sup>	0.33	0.26	0.19	1.39 (0.88–2.26)
<b>Injectables</b>				
Crude model	-0.08	0.19	0.68	0.92 (0.64–1.35)
Adjusted model <sup>b</sup>	0.09	0.23	0.20	0.91 (0.58–1.42)
<b>Traditional and barrier methods</b>				
Crude model	1.04	0.52	0.05	2.82 (1.02–7.81)
Adjusted model <sup>b</sup>	0.84	0.60	0.18	2.32 (0.92–7.47)

SE: standard error; OR: odds ratio; CI: confidence interval.

<sup>a</sup>The reference category was women who did not believe in myths.

<sup>b</sup>Adjusted for age, age at menarche, at marriage and at first baby, number of children, desired number of children, woman's education and occupation, husband's education and occupation, residence and decision-maker on use of contraceptives.

that oral contraceptives cause cancer. Since they became available in the 1960s, oral contraceptives have been the most stigmatized contraceptive method as result of disinformation and myths. Such falsehoods started in the 1980s with the rumour that oral contraceptives cause “weakness” (13), a non-medical based condition of lethargy, dizziness and fatigue associated with contraceptive pill use, and the myth was prevalent in Egypt (13), Botswana and the Islamic Republic of Iran (21). Other myths reported worldwide include the association between the oral contraceptives and ovarian, endometrial and breast cancer (22).

Despite the scientific evidence that IUDs are one of the

safest forms of contraceptive (23), and its discontinuation rate is the lowest among contraceptive users in Egypt (1,4), the second most prevalent myth about contraceptives in women in Minia was that IUDs can travel up to the heart by penetrating the uterus. The current use of IUDs was 50% lower among women who believed this myth. Similar misrepresentations have been important barriers to IUD uptake in other low- and middle-income countries (7,8,24).

The use of oral birth control pills and IUDs decreased as the number of myths believed by women about contraceptives increased, while the ever use of traditional and barrier contraceptives increased among those who

**Table 4 Effect of belief in an increasing number of myths about contraceptives on current and ever use of contraceptives**

Number of myths	Ever use of contraceptives					Current use of contraceptives				
	Any method aOR (95% CI)	Birth control pill aOR (95% CI)	Intrauterine device aOR (95% CI)	Injectables aOR (95% CI)	Traditional and barrier methods aOR (95% CI)	Any method aOR (95% CI)	Birth control pill aOR (95% CI)	Intrauterine device aOR (95% CI)	Injectables aOR (95% CI)	Traditional and barrier methods aOR (95% CI)
None (n = 137) <sup>a</sup>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 (n = 436)	0.93 (0.81–1.16)	0.72 (0.57–0.96)	0.98 (0.69–1.52)	1.36 (1.12–2.38)	1.13 (0.82–2.64)	0.67 (0.42–0.79)	0.82 (0.63–0.97)	0.84 (0.63–1.04)	1.36 (1.12–2.38)	0.77 (0.56–1.09)
2 (n = 325)	0.81 (0.64–1.03)	0.61 (0.43–0.91)	1.11 (0.88–1.74)	1.08 (0.88–2.19)	1.89 (0.98–3.83)	0.50 (0.32–0.74)	0.76 (0.58–0.92)	0.73 (0.59–0.92)	1.08 (0.88–2.19)	1.03 (0.62–1.64)
3 (n = 204)	0.67 (0.42–0.81)	0.48 (0.29–0.69)	1.63 (0.93–2.37)	0.91 (0.53–1.61)	2.01 (1.32–6.28)	0.33 (0.21–0.49)	0.65 (0.41–0.82)	0.41 (0.29–0.69)	0.91 (0.53–1.61)	0.96 (0.51–3.28)
≥ 4 (n = 110)	0.50 (0.32–0.77)	0.43 (0.24–0.63)	1.51 (0.89–2.68)	0.80 (0.46–1.06)	2.43 (1.16–6.86)	0.30 (0.18–0.57)	0.45 (0.34–0.78)	0.44 (0.24–0.66)	0.80 (0.46–1.06)	1.29 (0.46–3.28)

<sup>a</sup>OR = adjusted odds ratio; CI: confidence intervals.

Odds ratio adjusted for: age, age at menarche, at marriage and at first baby, number of children, number of children women desire, women education and occupation, husband education and occupation, residence and decision-maker regarding use of contraceptives.

<sup>b</sup>Reference category.

believed such myths. Women with lower levels of education also preferred traditional health practices to modern ones, and perception of such modern methods was affected by doubts regarding its safety.

Previous research has pointed to the non-contraceptive health benefits of modern contraceptive use on women's health such as alleviating uncomfortable menstruation symptoms (heavy, painful and irregular periods), improving acne and hirsutism, treating endometriosis and reducing the risk of endometrial and ovarian cancers (5,9), their effect on uncontrolled fertility rates and the resulting improved family welfare (5,9). Unfortunately, the high prevalence of contraceptives myths found in Upper Egypt suggests poorer health status, high fertility rates and other adverse effects on the family of our studied women (7,8). Further research on these effects is needed, especially as the women with misguided beliefs about contraception tended to want a higher number of children.

It is clear that myths were widely circulated and persisted even among women who were using modern contraceptives. All the women who never used contraceptives reported believing in all or some of the myths, but data were not available on when they heard to rumours – before or after marriage for example – and how long they had for believed in them. However, a report from eight low- and middle-income countries, including Egypt, showed no difference in the rate of contraceptive use with different durations of belief in the myths (15). In addition, another study showed that the duration of oral contraceptive use did not influence the prevalence of misconceptions about the birth control pills (21).

This study only included women from one governorate of Upper Egypt which could affect the generalizability of the study findings; however, our sample of urban and rural women was large. A review has shown that male respondents in many studies have reported myths about condoms such as weakening the penis, causing impotence or reducing pleasure (8). We did not look at myths about male contraceptive methods including condoms. Very few participants in the current study reported using condoms as a contraceptive method and such myths might be associated with this low use. Future studies to include the experience of both men and women about male methods of contraception are needed.

### Conclusion

The belief in myths about contraceptives is common in Minia and was associated with lower use of modern contraceptive methods, especially oral contraceptive pills and IUDs, but higher use of traditional methods of contraception. Reproductive health programmes to refute myths and misguided beliefs about modern contraceptives may help increase the use of modern contraceptive methods and are recommended, along with continuous provision of such contraceptives. Suggestions have been made for mass media and family planning health campaigns to improve awareness about the benefits of modern contraceptives and to change social norms about their use (25).

However, training of reproductive health service providers to interact with and respond to incorrect information held by clients is recommended. These health service providers can also involve the community through counsel-

ling sessions and seminars, which include satisfied contraceptive users to share their experiences, to help dispel pervasive myths in their local communities.

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## Mythes concernant les méthodes de contraception modernes et traditionnelles entretenus par les femmes de Minya en Moyenne-Égypte

### Résumé

**Contexte :** Les idées fausses concernant les méthodes contraceptives modernes ont une incidence sur leur utilisation dans les pays à revenu faible et intermédiaire.

**Objectifs :** La présente étude avait pour objectif de déterminer la prévalence des mythes concernant les méthodes contraceptives modernes et leur association avec une utilisation de contraceptifs, antérieure ou au moment de la réalisation de l'étude, par les femmes de Minya en Moyenne-Égypte.

**Méthodes :** Il s'agissait d'une étude transversale portant sur 1212 Égyptiennes mariées, âgées de 18 à 49 ans, fréquentant les centres de santé des zones urbaines et rurales de Minya. Les données ont été recueillies à l'aide d'un questionnaire d'entretien structuré et traitées dans le cadre d'une analyse de régression logistique ; les odds ratios (OR) et les intervalles de confiance à 95 % (IC) ont été calculés.

**Résultats :** La plupart des femmes (88,7 %) avaient une ou plusieurs idées fausses sur les méthodes de contraception. Les idées les plus répandues étaient que la pilule contraceptive provoque des cancers et que les dispositifs intra-utérins (DIU) peuvent perforer l'utérus et migrer vers le cœur. Le taux d'utilisation de la pilule contraceptive et des DIU au moment de l'étude était significativement plus faible chez les femmes ayant des croyances erronées que chez celles qui n'en avaient pas, OR ajusté = 0,59 (IC à 95 % : 0,37 - 0,90) et OR ajusté = 0,50 (IC à 95 % : 0,34 - 0,76) respectivement. La croyance dans un nombre de plus en plus important de mythes était associée à une probabilité plus faible d'un éventuel recours à la pilule contraceptive : OR = 0,72 (IC à 95 % : 0,57 - 0,96), OR = 0,61 ; IC à 95 % : 0,43 - 0,91), OR = 0,48 (IC à 95 % : 0,29 - 0,69) et OR = 0,43 (IC à 95 % : 0,24 - 0,63) chez les femmes ayant un nombre d'idées fausses égal à 1, 2, 3 ou supérieur ou égal à 4 comparativement à celles qui n'en avaient aucune.

**Conclusions :** Les mythes concernant les moyens de contraception sont largement répandus chez les femmes de Minya et peuvent avoir une incidence notable sur le choix et l'utilisation d'une méthode contraceptive. Il est recommandé de mettre en place des programmes de santé génésique permettant de réfuter ces croyances erronées.

### الأساطير حول موانع الحمل الحديثة والتقليدية في صفوف السيدات في محافظة المنيا، صعيد مصر

إيهاب إسحق  
الخلاصة

الخلفية: تؤثر المفاهيم المغلوطة بشأن موانع الحمل على استخدامها في البلدان المنخفضة والمتوسطة الدخل.

الأهداف: هدفت هذه الدراسة إلى تحديد معدل انتشار الأساطير حول موانع الحمل الحديثة واقتنائها بالاستخدام السابق والحالي لموانع الحمل في صفوف السيدات في المنيا، بصعيد مصر.

طرق البحث: شملت هذه الدراسة المقطعية 1212 سيدة مصرية متزوجة تتراوح أعمارهن بين 18 و 49 سنة ممن يترددن على المراكز الصحية الحضرية والريفية في المنيا. وُجمعت البيانات باستخدام استبيان منظم قائم على المقابلات، وحُللت البيانات باستخدام تحليل الانحدار اللوجستي؛ وتم احتساب نسبة الاحتمال وفترات الثقة بنسبة 95%.

النتائج: كان لدى غالبية النساء (88.7%) مفهوما واحدا أو أكثر مغلوطا بشأن موانع الحمل. وكان أكثر تلك المفاهيم المغلوطة شيوعا هو أن حبوب تنظيم النسل تسبب السرطان وأن وسائل منع الحمل الرحمية يمكنها اختراق الرحم والوصول إلى القلب. وتبين أن الاستخدام الحالي لحبوب تنظيم النسل ووسائل منع الحمل الرحمية كان منخفضا بصورة جوهرية في صفوف النساء اللواتي لديهن معتقدات خاطئة أكثر من غيرهن من النساء اللواتي لم تكن لديهن تلك المعتقدات؛  $aOR = 0.50$ ; 95% CI: 0.34-0.76 (( $aOR = 0.59$ ; 95% CI: 0.37-0.90))، على التوالي. وارتبط الاقتناع بعدد أكبر من الخرافات بانخفاض أكبر في احتمالات استخدام السابق لحبوب تنظيم النسل: ( $aOR = 0.61$ ; 95% CI: 0.57-0.96)، ( $aOR = 0.72$ ; 95% CI: 0.57-0.96)، ( $aOR = 0.48$ ; 95% CI: 0.29-0.69) و ( $aOR = 0.43$ ; 95% CI: 0.24-0.63) في صفوف النساء اللواتي لديهن معتقد واحد، واثنين، وثلاثة، وأربعة معتقدات أو

أكثر، في مقابل النساء اللواتي ليست لديهن أية معتقدات مغلوبة على الإطلاق.  
 الاستنتاجات: تشيع المفاهيم المغلوطة حول موانع الحمل بين السيدات في المنيا وقد يؤثر ذلك تأثيراً بالغاً على اختيارهن واستخدامهن لوسيلة منع الحمل. ويوصى بضرورة تنفيذ برامج الصحة الإنجابية لتلك المفاهيم المغلوطة.

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# Impact of the 2017 American College of Cardiology/American Heart Association Hypertension Guideline on the prevalence of hypertension in young Saudi women

Maha Al-Mohaisseen,<sup>1</sup> Qumasha Al-Obaid,<sup>1</sup> Wafa AlGhamdi,<sup>1</sup> Haneen Al-Alyani,<sup>1</sup> Sheima Dahman,<sup>1</sup> Nora Al-Wahhabi,<sup>1</sup> Noura Al-Awaji<sup>1</sup> and Terry Lee<sup>2</sup>

<sup>1</sup>Department of Clinical Sciences, College of Medicine, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia (Correspondence to: Maha Al-Mohaisseen: mahaabdulrahman@hotmail.com). <sup>2</sup>Centre for Health Evaluation and Outcome Sciences, Vancouver, British Columbia, Canada.

## Abstract

**Background:** The diagnostic criteria for hypertension have recently been redefined by the American College of Cardiology/American Heart Association (ACC/AHA). Data on the new prevalence of hypertension in different countries are emerging, but none, to date, from Saudi Arabia.

**Aims:** This study aimed to determine the impact of the 2017 ACC/AHA hypertension guideline on the prevalence and determinants of hypertension in young Saudi women.

**Methods:** 518 female college students, 17–29 years of age were prospectively enrolled in a survey during the period from January 1, 2016, to April 15, 2016 at Princess Nourah University. The participants completed a previously validated questionnaire, that assessed their risk factors for hypertension, and their blood pressure, weight and height were measured.

**Results:** Application of the 2017 ACC/AHA diagnostic criteria resulted in approximately 7-fold increase in the prevalence of hypertension, from 4.1% to 27.1% ( $P < 0.001$ ). At a cut-off value of  $\geq 140/90$ , hypertension was significantly associated with increased age, increased body mass index (BMI), increased heart rate, history of chronic illnesses, prior diagnosis with diabetes mellitus and family history of hypertension. Whereas, with the  $\geq 130/80$  cut-off value, only increased BMI and heart rate were significant predictors ( $P < 0.001$ ).

**Conclusion:** The prevalence of hypertension markedly increased among young adult Saudi women with the 2017 ACC/AHA classification for hypertension, and the main predictors were increased BMI and heart rate. Further studies on the new prevalence and predictors of hypertension in the Saudi population are warranted. This information is important for healthcare authorities to plan cost effective screening, prevention and control programmes.

Keywords: hypertension, ACC/AHA diagnostic criteria, prevalence, predictors, women

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## Introduction

The American College of Cardiology/American Heart Association (ACC/AHA) recently redefined the thresholds for the diagnosis of hypertension in adults. The new diagnostic cut-off value of  $\geq 130/80$  mmHg is to replace the previous JNC7 threshold of  $\geq 140/90$  mmHg for the diagnosis of hypertension (1). While the 2017/ACC/AHA guideline recommends lifestyle modification for all hypertensives, it only recommends blood pressure (BP)-lowering medications for adults with stage 1 hypertension, for secondary prevention in patients with clinical cardiovascular disease or for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease risk of  $\geq 10\%$ , and those with stage 2 hypertension (1).

Accumulating evidence has shown that reduction of systolic BP to a target of  $< 130$  mmHg significantly decreases the risk of myocardial infarction, stroke, heart failure and major cardiovascular events in adults (2).

Implementation of the 2017/ACC/AHA hypertension guideline is, therefore, expected to translate into reduction in cardiovascular mortality and morbidity (3). However, compared to JNC7, the new lower 2017/ACC/AHA diagnostic thresholds will increase the disease burden worldwide, annual costs of antihypertensive treatment, the proportion of uncontrolled hypertensives, (3–6), and likely the number of adverse events among treated patients (3). Decreasing the diagnostic thresholds for hypertension is also expected to increase the number of statin-eligible adults according to the 2016 cholesterol guideline (7). Although not all authorities have adopted the  $\geq 130/80$  mmHg thresholds, their diagnostic cut-off values and goals have been reduced, particularly in high risk patients (8). With the change in hypertension definition, estimation of the new prevalence of hypertension with the lower cut-off values in communities, therefore, becomes paramount and data are accumulating from different sources globally (4–6,9–11).

Studies on the prevalence of hypertension in Saudi Arabia have all used the previous diagnostic thresholds of  $\geq 140/90$  mmHg. A prevalence of 26.1–27.2% among Saudis aged  $\geq 30$  years was found (12,13) and 15.2% in those aged 15 years or older (13). For the 15–24 years age group, a prevalence up to 8.8% was reported (14). These estimates are expected to be higher had the  $\geq 130/80$  mmHg thresholds been used. The magnitude of increase in the prevalence in hypertension in SA with the new ACC/AHA guideline is unknown to date.

In this study we aimed to assess the effect of the 2017/ACC/AHA hypertension guideline on the prevalence of hypertension and predictors of hypertension in young Saudi women.

## Methods

### Study population

We re-analysed the data of 518 adult Saudi females aged 17–29 years who participated in a hypertension survey conducted in 2016 on undergraduate and postgraduate students at Princess Nourah bint Abdulrahman University, Riyadh. We evaluated the change in the prevalence of hypertension among these young women following the introduction of the 2017/ACC/AHA guideline using the new thresholds (15).

The participants were enrolled prospectively during the period from 1 January 2016 to 15 April 2016. The sampling is detailed in the original study (15). With 530 participants, the estimated prevalence would be expected to have a precision of 2% with alpha 0.05 (16). Those diagnosed with cardiac disease and pregnant women were excluded.

### Questionnaire and data collection

The questionnaire and method of data collection has been described previously (15). In brief, following approval of the study by our Institutional Review Board, the students were invited to participate in the study. Participation was voluntary, and the study followed the principles of the Helsinki Declaration. An anonymous self-administered questionnaire was distributed (13) [the questionnaire was part of the Saudi Health Interview Survey (17)]. The final questionnaire comprised 65 questions assessing sociodemographic characteristics, BP history and risk factors for hypertension.

The participants' BP, heart rate, weight, and height were measured and recorded on entry to the study. For BP measurement, we followed The National Health and Nutrition Examination Survey instructions. The Omron M6 Comfort (HEM7223-E) automated BP device was used. Three brachial BP readings were taken at 5 minute intervals for each participant while resting. The first reading was discarded and the second and third readings were averaged and recorded. In cases where only 2 readings were available, the second reading was recorded (18).

## Statistical analysis

Data analysis was performed using SAS, version 9.4. Continuous variables are reported as means and standard deviations (or medians and interquartile ranges as appropriate) and categorical variables as numbers and percentages. Comparisons between the hypertension and normal groups were performed using the Chi-squared test, Fisher's exact test, *t*-test, or the Wilcoxon rank sum test as appropriate. We compared the difference in the prevalence of hypertension as diagnosed via the 2017/ACC/AHA and the JNC7 guidelines using McNemar's test (due to matched pairs of women across the 2 guidelines). A *P*-value  $< 0.05$  was considered statistically significant.

## Results

A total of 530 students were enrolled in the initial survey. Twelve participants (2.3%) had undetermined BP status (BP measurements were taken but they omitted to answer the question regarding being on treatment for hypertension) and were excluded. The baseline characteristics of the remaining 518 participants are displayed in Table 1. Table 2 shows the new analysis of the BP and heart rate results according to the new 2017/ACC/AHA guidelines. All the hypertensives (those on treatment for hypertension or with BP  $\geq 130/80$ ) had elevated their diastolic BP (mean 83.3 mmHg, range 73.5–107.0 mmHg). None of the hypertensive subjects had a systolic BP  $\geq 130$  mmHg.

The prevalence of hypertension in the study population according to the 2017/ACC/AHA and JNC7 guidelines is shown in Table 3. According to the 2017/ACC/AHA classification, 27.1% of participants would be classified as having hypertension, which was significantly higher than the prevalence of 4.1% if the JNC7 classification was applied ( $P < 0.001$ ). We found that 85% of the hypertensives in the study had stage 1 hypertension (systolic BP = 130–139 mmHg and/or diastolic BP = 80–89 mmHg), and 15% had stage 2 hypertension (BP  $\geq 140/90$  mmHg). All of the 119 participants with stage 1 hypertension according to the 2017/ACC/AHA guideline also fulfilled the JNC7 criteria for prehypertension (systolic BP = 120–139 mmHg and or diastolic BP = 80–89 mmHg) (Table 3).

Table 4 shows the predictors of hypertension in the study population according to the JNC7 and 2017/ACC/AHA guidelines. At a cut-off value of  $\geq 140/90$ , significant predictors of hypertension were increased age, body mass index (BMI) and heart rate; known diabetes; and family history of hypertension. Prior diagnosis of chronic disease was more common in the hypertension group, 23.8% vs 10.3% ( $P = 0.05$ ). The percentage of participants who exercised regularly was lower in the hypertension group but this was not statistically significant (23.1% vs 30.0%,  $P = 0.592$ ). None of the dietary constituents had an association with hypertension. When analysed using the 2017/ACC/AHA cut-offs, only BMI and heart rate emerged as statistically significant. There was no association between hypertension and other established risk factors for hypertension, including diabetes mellitus, age,

**Table 1 Baseline sociodemographic characteristics of the study population, Saudi Arabian women aged 17–29 years, 2016**

Characteristic	Total (n = 518)	
<b>Age (years)</b>		
Mean (SD)	20.5 (1.8)	
Range	17–29	
	No.	%
<b>Marital status</b>		
Married	19	3.7
Single	499	96.3
<b>Highest level of education</b>		
High school	502	96.9
Bachelor	16	3.1
<b>College</b>		
Health <sup>a</sup>	179	34.6
Non-health <sup>b</sup>	339	65.4
<b>Family income (Saudi riyals)</b>		
Unknown	152	29.3
< 5 000	33	6.4
5 000–9999	87	16.8
10 000–19 999	135	26.1
≥ 20 000	111	21.4

<sup>a</sup>Participants from the colleges of medicine, nursing, pharmacy, dentistry and health and rehabilitation sciences.

<sup>b</sup>Participants from the faculty of education, college of literature, college of social work, college of languages and translation, college of science, college of computer and information sciences, college of business and management, college of arts and design.

family history, or exercise. None of the studied dietary constituents had an association with hypertension (Table 4).

## Discussion

### Prevalence of hypertension according to the 2017/ACC/AHA guideline

The results of this study show an approximately 7-fold increase in the prevalence of hypertension among young Saudi women with application of the 2017/ACC/AHA thresholds for hypertension diagnosis. A significant absolute increase of 23% is observed using the 2017/ACC/AHA guideline compared with the JNC7 guideline (27.1% vs 4.1% respectively ( $P < 0.001$ )), representing an increase in newly diagnosed stage 1 hypertension cases. As would be expected in a young population, diastolic hypertension predominated, and in our sample, all the hypertension cases were comprised of isolated diastolic hypertension. To our knowledge, this is the first study to report on the new prevalence of hypertension in a subset of the Saudi population following the introduction of the 2017/ACC/AHA guideline and to study hypertension prevalence in this age group.

The magnitude of the increase in the prevalence of hypertension as defined by the 2017/ACC/AHA guideline, varies between countries. In the United States of America, the crude prevalence of hypertension among adults increased to 45.6% with implementation of the 2017/ACC/AHA hypertension guideline, with an absolute increase of 13.7% compared to the JNC7 guideline (6). In India and Canada absolute increases of 14% are expected with the new classification (4,11); and increases of ≈25–50% and 36–58% are anticipated in China and Japan respectively (10,19). To our knowledge, there are no studies to date on the new prevalence of hypertension among young adults to compare our results to. However, we believe that the magnitude of increase we found likely represents a true increase since our finding based on JNC7 criteria was 4.1%, which is within the results reported by other studies involving Saudi youths (2.5–8.8%) (13,14). As the Saudi population currently comprises mainly young individuals (20), these findings may translate into a significant rise in the proportion of hypertensive Saudis. Considering that women are at a lower risk of hypertension (12) compared with males, we expect that these figures will be higher when young male subjects are studied. As a youthful population is expected to be at low cardiovascular risk, it is likely that only a few of the newly diagnosed hypertensives will require antihypertensive therapy (6).

### Predictors of hypertension according to JNC7 and 2017/ACC/AHA classifications

In addition to increasing the prevalence of hypertension, lowering the diagnostic thresholds altered the predictors of hypertension in our study. With application of the JNC 7 classification, significant predictors of hypertension were increased age, increased BMI, increased heart rate, history of diabetes, and family history of hypertension. These findings are in accordance with the known risk factors for hypertension, and their relation to hypertension has been discussed in detail previously (1). However, predictors of hypertension with the lower 2017/ACC/AHA guideline criteria were limited to increased BMI ( $P < 0.001$ ) and increased heart rate only. These 2 risk factors are unique: the association of increasing BMI with hypertension bears a continuous, almost linear, relationship, with no evidence of a threshold (1), while increased heart rate implies dominance of the sympathetic over the parasympathetic nervous systems, a mechanism that leads to both accelerated heart rate and raised BP (21). Increased heart rate often predated the development of hypertension in previous studies (22).

While the number of participants who consumed ≥ 5 servings of fruits and vegetables per day was higher in the no hypertension group in both the 2017/ACC/AHA and JNC7 comparisons [7 (13.2%) vs 20 (17.9%), and 27 (17.0%) vs 0 (0.0%) respectively], this was not statistically significant ( $P = 0.608$  and  $0.670$  respectively). This finding is likely due to the poor accordance with the DASH (Dietary Approaches to Stop Hypertension) diet observed in our population as a whole, as in this dietary pattern 4–5



**Table 2 History of hypertension and measurements of blood pressure and heart rate in Saudi Arabian women aged 17–29 years, 2016**

Characteristic	Hypertension status (n = 518)			
	No hypertension <sup>a</sup> (n = 378)		Hypertension <sup>b</sup> (n = 140)	
	No.c	%c	No.c	%c
<b>Told by a doctor or other health professional they had high BP reading</b>				
Yes	35	9.3	22	15.7
No	307	81.2	108	77.1
<b>Treated for raised BP in the past 2 weeks</b>				
Yes	0	0.0	7	5.0
No	378	100.0	133	95.0
<b>Measurements</b>				
<b>No. of BP measurements</b>				
2	17	4.5	9	6.4
3	361	95.5	131	93.6
<b>No. of heart rate measurements</b>				
2	20	5.3	12	8.6
3	358	94.7	128	91.4
<b>Measured SBP</b>				
<b>Mean (SD)</b>	100.0 (8.8)		109.9 (7.2)	
<b>Range</b>	76.0–129.0		94.0–129.5	
< 130	378	100.0	140	100.0
Normal, < 120	371	98.2	126	90.0
Elevated, 120–129	7	1.8	14	10.0
<b>Measured DBP (mmHg)</b>				
<b>Mean (SD)</b>	71.8 (5.1)		84.3 (4.8)	
<b>Range</b>	55.0–79.5		73.5–107.0	
Normal, < 80	378	100.0	3	2.1
Stage 1 HTN, 80–89	0	0.0	122	87.1
Stage 2 HTN, ≥ 90	0	0.0	15	10.7
<b>Measured heart rate, beats/min</b>				
<b>Mean (SD)</b>	82.6 (10.6)		87.2 (11.3)	
<b>Range</b>	56.5–118.5		64.5–115.5	

BP = blood pressure; DBP = diastolic BP; SBP = systolic BP; SD = standard deviation.

<sup>a</sup>Not on treatment for hypertension and BP < 130/80.

<sup>b</sup>BP ≥ 130/80 or on treatment for hypertension.

<sup>c</sup>Unless otherwise indicated.

servings each of vegetables and fruits are recommended (23). None of the comparisons for the other components of the DASH diet reached statistical significance in our study. More research involving larger samples is necessary to establish the efficacy of the DASH diet in young Saudis with formal calculation of the DASH score. Of interest, it was recently reported that among children and adolescents, despite a significant inverse relationship between the DASH score and systolic BP, there is no significant association between this dietary pattern and diastolic BP (24), which is commonly involved in hypertension in the young. Additionally only a small proportion of the participants had hypertension risk factors, including diabetes, dyslipidaemia and a

positive family history, and only about one-third of the participants exercised 3–5 times/week. These results also require re-evaluation in larger samples to establish their effect on the new hypertension thresholds.

Other potential explanations for the lack of association of the 2017/ACC/AHA stage 1 hypertension with well-established predictors, observed in our study, may be due to the nature of the studied population and the BP cut-off values. Our sample comprised young and mostly healthy females. In such a population, some risk factors may be of greater significance compared to others, obesity particularly. Although multivariate analysis was not performed in our study, Obarzanek et al, evaluating the individual components of multiple behaviour changes,

**Table 3 Cross-tabulation of the blood pressure results among Saudi Arabian women aged 17–29 years, as defined by the JNC7 and 2017/ACC/AHA classifications**

JNC7	2017/ACC/AHA								Total	
	Normal <sup>a</sup>		Elevated BP <sup>b</sup>		Stage 1 HTN		Stage 2 HTN <sup>d</sup>		No.	%
	No.	%	No.	%	No.	%	No.	%		
Normal <sup>a</sup>	371	100	0	–	0	–	0	–	371	71.6
Prehypertension <sup>c</sup>	0	–	7	5.6	119	94.4	0	–	126	24.4
HTN <sup>d</sup>	0	–	0	–	0	–	21	100	21	4.0
Total	371	71.6	7	1.4	119	23.0	21	4.0	518	100

BP = blood pressure; HTN = hypertension.

Numbers in brackets were percentages within the subtotal under JNC7 or percentages within the total of 518 as appropriate.

<sup>a</sup>BP < 120/80.

<sup>b</sup>BP of 120–129/<80.

<sup>c</sup>BP = 130–139/80–89 mmHg and not on treatment for hypertension.

<sup>d</sup>BP ≥ 140/90 or on treatment for hypertension.

<sup>e</sup>BP = 120–139/80–89.

found that while several lifestyle behaviour changes are important for reduction of BP, they were difficult to detect when weight was included in multivariate models (25). It is also important to note that, the “blood pressure zone” termed prehypertension in the JNC7 guideline is currently unequally split in the 2017/ACC/AHA classification between high normal BP and stage 1 hypertension. In our study, 100% of those with stage 1 hypertension according to the 2017/ACC/AHA guide also fulfilled the criteria for prehypertension. Therefore, it is our expectation that many of the pathophysiological processes and clinical characteristics of prehypertension may now be applicable to the 2017/ACC/AHA stage 1 hypertension, which constitutes the majority of hypertensives in our sample. Prehypertension is characterized by autonomic and metabolic dysfunction (26) and has been correlated with the metabolic syndrome, dyslipidaemia, diabetes, obesity (27)/ increased BMI, high visceral adipose index, and increased heart rate (28). Autonomic dysfunction coexists with prehypertension and is closely related to changes in BP and lipid metabolism (26). Increased resting heart rate was associated with higher blood pressure, lower pulse pressure and increased risk of prehypertension and hypertension for males and females, and waist–height ratio, as a measure of abdominal obesity, further increased this association (29). Our results suggest that the autonomic and metabolic dysfunction observed with prehypertension may continue to manifest in the new stage 1 hypertension. Although prehypertension is considered one of the predictors of the development of hypertension (27), not all people with prehypertension progress to develop hypertension as defined by JNC7 (30). The current hypertension classification is based on shared cardiovascular outcomes rather than pathophysiology. Further studies on the associations if hypertension the new classification are warranted.

### Hypertension in young Saudis

Studies from Saudi Arabia have shown a progressive build-up of risk factors for hypertension at an early age. The prevalence of hypertension risk factors among Sau-

di schoolchildren has reached epidemic levels due to the adoption of unhealthy lifestyle habits, particularly sedentary lifestyle and poor diet (31). It is estimated that 34.2% of Saudi schoolchildren have abnormal BMI (32). This figure increases to 48.4% among university students (33), and further increases are expected with time (34). While many prior studies from Saudi Arabia have recommended focusing on the modifiable risk factors for hypertension as a preventive and therapeutic measure (15,31,33,35), this goal remains far from reach due to the huge gap between knowledge and attitudes and practices among young adults. Despite having good knowledge, few young Saudis actually adopt healthy lifestyle measures to reduce their cardiovascular risk (33).

In their recommendations on the management of obesity, the Canadian hypertension guidelines advise approaching weight loss management in a multidisciplinary fashion that includes behavioural intervention in addition to dietary education and promotion of physical activity (8). Concentrated efforts in training on healthy habits should be initiated in early childhood to increase their efficacy (31), improve children’s development, and prevent adulthood disease and disability (36). Parental involvement improves both children’s and parents’ behaviours (37). Development of family-based prevention programmes for obesity in children is therefore important (38).

### Early detection of hypertension in young women

With the evidence showing that lower BP values result in reduced mortality and morbidity (2), establishing the true prevalence of hypertension and its risk factors in the community, particularly among the young, becomes a necessity. This information is important for health care planning including early diagnosis, management and prevention campaigns, with the aim of reducing future hypertension and related complications (15). Women have a greater projected hypertension prevalence compared with men, particularly in the age groups 35–64 years (34), and had a greater risk for stroke compared with men. As

**Table 4 Predictors of hypertension in the study population according to the 2017 ACC/AHA and JNC7 classifications**

Characteristic <sup>a</sup>	2017 ACC/AHA			JNC 7		P
	BP < 130/80 (n = 378)	BP ≥ 130/80 (n = 140)	P	BP < 140/90 (n = 497)	BP ≥ 140/90 (n = 21)	
Age, mean (SD), years	20.5 (1.8)	20.4 (1.7)	0.631	20.4 (1.8)	21.5 (2.1)	0.006
BMI <sup>b</sup> , mean (SD), kg/m <sup>2</sup>	23.5 (4.9)	25.8 (6.7)	< 0.001	24.0 (5.4)	28.0 (7.7)	0.001
Heart rate, mean (SD), beats/min	82.6 (10.6)	87.2 (11.3)	< 0.001	83.5 (10.8)	90.7 (11.7)	0.003
	<b>No. (%)</b>	<b>No. (%)</b>		<b>No. (%)</b>	<b>No. (%)</b>	
Diagnosed with chronic disease	39 (10.3)	17 (12.1)	0.552	51 (10.3)	5 (23.8)	0.050
Diabetes	3 (0.8)	4 (2.9)	0.196	5 (1.0)	2 (9.5)	0.016
Family history (father/mother) of hypertension	176/350 (50.3)	65/125 (52.0)	0.742	224/454 (49.3)	17/21 (81.0)	0.005
Hypercholesterolaemia	19/363 (5.2)	7/137 (5.1)	0.955	25/479 (5.2)	1/21 (4.8)	0.926
Smoking	25/376 (6.6)	10/138 (7.2)	0.971	32/493 (6.5)	3/21 (14.3)	0.319
Exercise <sup>c</sup>	85/283 (30.0)	29/100 (29.0)	0.846	111/370 (30.0)	3/13 (23.1)	0.592
Diet						
<b>Oil/fat used for meal preparation</b>			0.690			0.198
Olive	166 (49.0)	61 (52.6)		219 (50.0)	8 (47.1)	
Butter/ghee/margarine	32 (9.4)	8 (6.9)		38 (8.7)	2 (11.8)	
<b>Milk</b>			0.969			0.240
0	78 (28.2)	31 (28.7)		101 (27.4)	8 (47.1)	
1–2	190 (68.6)	74 (68.5)		255 (69.3)	9 (52.9)	
≥ 3	9 (3.2)	3 (2.8)		12 (3.3)	0 (0.0)	
<b>Yogurt</b>			0.989			0.556
0	93 (38.6)	34 (38.2)		120 (37.9)	7 (53.8)	
1–2	142 (58.9)	53 (59.6)		189 (59.6)	6 (46.2)	
≥ 3	6 (2.5)	2 (2.2)		8 (2.5)	0 (0.0)	
<b>Fruit/vegetable</b>			0.608			0.670
0	9 (17.0)	14 (12.5)		22 (13.8)	1 (16.7)	
1–4	37 (69.8)	78 (69.6)		110 (69.2)	5 (83.3)	
≥ 5	7 (13.2)	20 (17.9)		27 (17.0)	0 (0.0)	
<b>Poultry meat</b>			0.076			0.080
0	13 (5.4)	11 (12.5)		21 (6.6)	3 (25.0)	
1–2	207 (86.3)	72 (81.8)		270 (85.4)	9 (75.0)	
≥ 3	20 (8.3)	5 (5.7)		25 (7.9)	0 (0.0)	
<b>Red meat</b>			0.909			0.590
0	80 (38.6)	32 (41.0)		107 (38.9)	5 (50.0)	
1–2	124 (59.9)	45 (57.7)		164 (59.6)	5 (50.0)	
≥ 3	3 (1.4)	1 (1.3)		4 (1.5)	0 (0.0)	
<b>Fish</b>			0.087			0.749
0	135 (62.2)	59 (72.8)		185 (64.9)	9 (69.2)	
1–2	82 (37.8)	22 (27.2)		100 (35.1)	4 (30.8)	
<b>Sweetened beverage</b>			0.083			0.690
0	93 (38.9)	23 (26.1)		112 (35.7)	4 (30.8)	
1–2	128 (53.6)	55 (62.5)		174 (55.4)	9 (69.2)	
≥ 3	18 (7.5)	10 (11.4)		28 (8.9)	0 (0.0)	
<b>Fast food, days eaten per week</b>			0.432			0.731
0	30 (10.7)	7 (7.1)		36 (9.9)	1 (6.7)	
1–2	144 (51.2)	57 (57.6)		194 (53.2)	7 (46.7)	
≥ 3	107 (38.1)	35 (35.4)		135 (37.0)	7 (46.7)	

Dietary components are average servings per day (unless stated differently).

SD = standard deviation.

P-value was based on Chi-squared test, Fisher's exact test or t-test as appropriate.

<sup>a</sup>For variables with missing data, either the available sample size or the number of missing data was provided.

<sup>b</sup>Data missing for 4 participants.

<sup>c</sup>Vigorous activity for at least 20 minutes 3 times/week or moderate activity for 30 minutes 5 times/week.

hypertension is the most prevalent modifiable risk factor for stroke globally in both sexes (39), efforts should be made to reduce or halt the projected rise in hypertension, particularly among women.

The new diagnostic cut-offs represent a challenge to the health care system in Saudi Arabia considering that with the previous classification, 57.8% of hypertensive Saudis were undiagnosed, and only 45% of treated hypertensives had controlled BP (13). The additional hypertension cases based on the new classification will increase the disease prevalence and management burden on the health care system (4).

### Limitations

Although the majority of the hypertensives in our study had stage 1 hypertension, and were young women, who are expected to have a low risk profile (6), these women will constitute a burden to the health care system as they

will require education on nonpharmacological interventions and regular follow-up (1). Knowing the important predictors of hypertension in this subgroup will help focus the management efforts in a cost-effective manner.

Another limitation in our study is that the questionnaire lacked a question on whether or not the participants had their BP measured recently. In our study, 77.1% of the hypertensives had never been told they had high BP reading. This number is significant considering that these values would have fallen in the prehypertension readings according to the previous JNC classification. One possible explanation may be that these participants (or some of them) were never screened for hypertension.

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**Competing interests:** None declared.

## Impact des lignes directrices 2017 sur l'hypertension de l'American College of Cardiology/American Heart Association sur la prévalence de l'hypertension chez les jeunes femmes saoudiennes

### Résumé

**Contexte :** Les critères de diagnostic de l'hypertension ont récemment été redéfinis par l'American College of Cardiology/American Heart Association (ACC/AHA). Des données sur la nouvelle prévalence de l'hypertension dans différents pays commencent à voir le jour, mais il n'y a, pour l'heure, aucune donnée pour l'Arabie saoudite.

**Objectifs :** La présente étude avait pour objectif de déterminer l'impact des lignes directrices 2017 sur l'hypertension de l'ACC/AHA sur la prévalence et les déterminants de l'hypertension chez les jeunes femmes saoudiennes.

**Méthodes :** 518 étudiantes de l'Université Princesse Nourah, âgées de 17 à 29 ans ont été recrutées de manière prospective pour participer à une enquête entre le 1<sup>er</sup> janvier et le 15 avril 2016. Les participantes ont rempli un questionnaire préalablement validé, qui évaluait les facteurs de risque de l'hypertension et indiquait leur tension artérielle, leur poids et leur taille.

**Résultats :** L'application des critères de diagnostic définis par les lignes directrices 2017 sur l'hypertension de l'ACC/AHA s'est traduite par une multiplication approximative par 7 de la prévalence de l'hypertension, qui est passée de 4,1 % à 27,1 % ( $p < 0,001$ ). À une valeur seuil supérieure ou égale à 140/90, l'hypertension était significativement associée à l'âge, à un indice de masse corporelle (IMC) plus élevé, à une fréquence cardiaque accrue, à des antécédents de maladies chroniques, à un diagnostic antérieur de diabète sucré et à des antécédents familiaux d'hypertension. En revanche, avec une valeur seuil supérieure ou égale à 130/80, seule l'augmentation de l'IMC et de la fréquence cardiaque constituait des facteurs prédictifs significatifs ( $p < 0,001$ ).

**Conclusion :** La prévalence de l'hypertension a nettement augmenté chez les jeunes femmes adultes saoudiennes suite à l'application des lignes directrices 2017 de l'ACC/AHA sur l'hypertension. Les principaux facteurs prédictifs étaient l'augmentation de l'IMC et de la fréquence cardiaque. Des études supplémentaires sur les nouvelles données concernant la prévalence et les facteurs prédictifs de l'hypertension dans la population saoudienne sont nécessaires. Ces informations sont importantes pour les autorités sanitaires afin de prévoir la mise en place de programmes de dépistage, de prévention de l'hypertension et de lutte contre cette affection ayant un bon rapport coût-efficacité.

الأثر الناجم عن المبدأ التوجيهي المعني بارتفاع ضغط الدم الصادر عام 2017 عن الكلية الأمريكية لأمراض القلب / الجمعية الأمريكية للقلب على معدل انتشار ارتفاع ضغط الدم في صفوف الشابات السعوديات

مها المحيسن، قماشة العبيد، وفاء الغامدي، حنين العلياني، شياء دهمان، نورا الوهابي، نورا العوجي، تيري لي  
الخلاصة

الخلفية: قامت الكلية الأمريكية لأمراض القلب / الجمعية الأمريكية للقلب مؤخراً بإعادة تعريف معايير تشخيص ارتفاع ضغط الدم. وأخذت البيانات تظهر حول معدلات الانتشار الجديدة لارتفاع ضغط الدم في بلدان متفرقة، غير أنها لم تتضمن حتى الآن بيانات من المملكة العربية السعودية.

**الأهداف:** هدفت هذه الدراسة إلى تحديد الأثر الناجم عن المبدأ التوجيهي المعني بارتفاع ضغط الدم الصادر عام 2017 عن الكلية الأمريكية لأمراض القلب/ الجمعية الأمريكية للقلب على معدل انتشار ومحددات ارتفاع ضغط الدم في صفوف الشباب السعوديات.

**طرق البحث:** استبقت الدراسة تسجيل 518 طالبة جامعية تتراوح أعمارهن بين 17 و 29 سنة في مسح أُجري في الفترة من 1 يناير/ كانون الثاني 2016 وحتى 15 أبريل/ نيسان 2016 في جامعة الأميرة نورة بنت عبد الرحمن. واستكملت المشاركات استبياناً مجاز مسبقاً هدف إلى تحديد عوامل خطر إصابتهن بارتفاع ضغط الدم، وقياس ضغط الدم لديهن، وكذلك قياس أوزانهن وأطوالهن.

**النتائج:** أسفر استخدام معايير تشخيص الكلية الأمريكية لأمراض القلب/ الجمعية الأمريكية للقلب عن وجود زيادة في معدل انتشار ارتفاع ضغط الدم بمقدار 7 أضعاف تقريباً، إذ ارتفعت النسبة من 4.1% إلى 27.1% ( $P < 0.001$ ). وعند وصول القيمة الحدية إلى 90/140 أو أعلى، بدأ الارتباط واضحاً بين ارتفاع ضغط الدم وتقدم العمر، وزيادة منسب كتلة الجسم، وزيادة سرعة القلب، وتاريخ الإصابة بأمراض مزمنة، والتشخيص المسبق بالسكري، وتاريخ الإصابة بارتفاع ضغط الدم في الأسرة. وعندما بلغت القيمة الحدية 80/130 أو أعلى، كانت زيادة منسب كتلة الجسم وزيادة سرعة القلب العاملين المنبئين المرتبطين بارتفاع ضغط الدم ( $P < 0.001$ ).

**الاستنتاج:** زاد معدل انتشار ارتفاع ضغط الدم بصورة ملحوظة في صفوف الشباب السعوديات البالغات وفق تصنيف الكلية الأمريكية لأمراض القلب/ الجمعية الأمريكية للقلب الصادر عام 2017 بشأن ارتفاع ضغط الدم، وتمثلت العوامل الرئيسية المنبئة في زيادة منسب كتلة الجسم وزيادة سرعة القلب. ويوصى بإجراء مزيد من الدراسات حول معدلات الانتشار الجديدة والعوامل المنبئة بارتفاع ضغط الدم في صفوف السكان السعوديين. وتنطوي تلك المعلومات على أهمية بالنسبة للسلطات الصحية من أجل التخطيط الفعال من حيث التكلفة لبرامج التحري، والوقاية، والمكافحة.

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# Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia

Ahmed Asaad,<sup>1</sup> Rehab El-Sokkary,<sup>1</sup> Mahdi Alzamanan<sup>2</sup> and Maher El-Shafei<sup>1</sup>

<sup>1</sup>Department of Medical Microbiology, Faculty of Medicine, Zagazig University, Zagazig, Egypt (Correspondence to: Rehab El-Sokkary: rehab\_el-sokkary@yahoo.com). <sup>2</sup>College of Medicine, Najran University, Najran, Saudi Arabia.

## Abstract

**Background:** Saudi Arabia is considered the epicentre of MERS-CoV. Since 2012, a total of 1844 cases of MERS-CoV have been reported. A recent cluster, with 8 cases, has been reported in Najran region in the south-western region of the country. This analysis of data from that region on health care workers (HCWs) awareness and attitudes towards the prevention and control of MERS-CoV may be useful when planning health education programmes about this emerging infectious disease.

**Aims:** We aimed to investigate the knowledge and attitude of HCWs toward MERS-CoV in south-western Saudi Arabia.

**Methods:** This cross sectional study was conducted on HCWs in primary health care centres and hospitals at Najran. A questionnaire containing 14 knowledge and 8 attitude items was completed by all 870 participants.

**Results:** Overall, > 80% of HCWs were aware about MERS-CoV etiology, mode of transmission, risk factors, and signs and symptoms. Knowledge scores revealed 51% of participants had sufficient knowledge. Physicians and nurses had significantly better knowledge compared with other HCWs ( $P = 0.001$ ). Participants who worked at institutions with established infection control programme scored significantly better on knowledge questions ( $P = 0.001$ ). Concerning attitude, > 70% of HCWs exhibited a positive attitude toward MERS-CoV.

**Conclusion:** the HCWs in Najran region showed a high level of knowledge and positive attitude toward MERS-CoV. There was a noticeable difference in knowledge level between different professions. Periodic educational interventions and professional campaigns are still needed. Any interventions should be directed towards the non-physician and non-nursing professions.

Keywords: MERS-CoV; health care workers; knowledge; attitudes, infection control

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## Introduction

Two strains of coronavirus have been found to infect humans: severe acute respiratory syndrome-coronavirus, SARS-CoV, and Middle East respiratory syndrome-coronavirus MERS-CoV (1). In September 2012, the first case of MERS (the index case) was reported in Saudi Arabia. Soon afterwards, a patient from Qatar who had visited Saudi Arabia began experiencing acute respiratory symptoms and renal failure. The symptoms and type of virus described in these 2 patients were similar (2).

As of May 2018, a total of 2220 laboratory-confirmed cases, including 790 deaths (case-fatality rate 35.6%), have been reported to the World Health Organization (WHO) from a total of 27 countries. The majority of cases have been reported in the Middle East (3). Transmission has most commonly been associated with nosocomial outbreaks (4–8).

Saudi Arabia is considered the epicentre of MERS-CoV. Since 2012, a total of 1844 cases of MERS-CoV have been reported, with 716 related deaths and a case-fatality

rate of approximately 38.8% (3). Between January through May 2018, the Ministry of Health reported 75 laboratory confirmed cases with 23 deaths occurring in 4 distinct clusters (2 health care and 2 household clusters) in different regions of the country. Among these recent clusters, a household cluster was reported from Najran region with 8 reported cases, and the source of infection is believed to be camels at the initial patient's home (3,9). This epidemiologic pattern poses great public health challenge to the local health authorities and health care sectors in view of the fact that Saudi Arabia traditionally hosts large gatherings such as the Hajj pilgrimage (10–12).

So far, no vaccine has been developed for MERS and no antiviral treatment is specifically recommended. Therefore, applying preventive measures to reduce the spread of the disease is of the utmost importance (13). The WHO and the Centers for Disease Control and Prevention (CDC) have published recommendations for the prevention and control of MERS infection in health care settings (14). This includes hand hygiene, wearing personal protective equipment, and patient placement (15).

Given the mode of MERS transmission, health care workers (HCWs) in contact with MERS patients are expected to be at a high risk of infections. Previous clinical studies have shown that the seroprevalence of MERS-CoV among HCWs who had had contact with MERS patients ranged from 0.3% to 20.9%. Therefore, use of personal protective equipment is crucial to reducing transmission. Gowns and gloves are recommended as a contact precaution, and surgical masks are recommended as a droplet precaution (16–19). However, these effective infection prevention and control practices depend on awareness and compliance among HCWs at all levels (15). A poor level of knowledge has been implicated in the rapid spread of the infection in hospitals (18). Despite many previous Saudi Arabian studies examining the knowledge and practices in regard to MERS among HCWs in different regions of the country (10,11,20,21), data from the south-western region are scarce. In addition, HCWs represent a major section of the Saudi Arabian population and constitute a considerable source of infected cases in the country (16,17). Najran region alone has 7 general hospitals and 55 primary health care centres, with a total of 3320 HCWs, including 784 physicians and 1842 nurses, according to the Ministry of Health statistics (9).

This study aimed to investigate the knowledge and attitude of HCWs toward MERS infection in south-western Saudi Arabia. The findings may be useful in recommending any remedial measures and additional interventions in the study area to improve awareness and attitudes among HCWs.

## Methods

### Sample

This cross-sectional, descriptive study of a representative sample of Saudi HCWs (physicians, dentists, pharmacists, nurses and laboratory staff) in primary health care centres and hospitals in Najran, a city in south-western Saudi Arabia, was conducted from June to October 2016. The study was conducted according to the international guidelines of Strengthening the Reporting for Observational Studies in Epidemiology; STROBE (22). The sample size required for the study was estimated to be 685, based on an average previous estimate of 54% MERS awareness among Saudi HCWs (10), with an absolute precision of 2% and at a 95% confidence interval. To avoid loss of participants, a total sample of 870 HCWs was included in the present study. A stratified proportional allocation random sample was used. The stratification factors taken into consideration were the age, sex, type of health care speciality and relative number and type of health care facility.

The study followed the principles of the Helsinki Declaration and ethical approval was obtained from the ethics and research committee of Najran University. Written consent was obtained from all participants.

### Questionnaire interview

A standardized questionnaire was distributed and completed by all participants inside their health care facilities

(primary health care centres and hospitals) during the first 2-month period of the study. The self-administered questionnaire was developed, with some modifications, using the frequently asked questions from the WHO and the Saudi Ministry of Health websites (9,23).

The questionnaire was initially designed in English and translated into Arabic by experts in infectious diseases and biostatistics to match with the local colloquial Arabic terminology used by physicians and health educators in the community. After translation and back translation (24), the questionnaire was pilot tested on 20 HCWs (7 doctors, 6 nurses and 13 technicians) who are not included among the study participants to determine acceptability and the clarity of the questions, and to confirm its face validity; it was then modified accordingly.

The questionnaire comprised 3 parts addressing knowledge and attitude of HCWs regarding MERS. The first part covered demographic data such as age, sex, current job and participants' source of knowledge on MERS (6 items). The second part assessed the knowledge of HCWs by asking questions about the etiology, incubation period, symptoms, risk group, consequences, source of transmission, prevention and treatment of MERS (11 items). A scoring system was applied to assess the level of knowledge of each subject, as has been previously used (with some modifications) (11): 2 points for each correct answer, 1 point for an incorrect answer. A total of  $\geq 12$  points ( $\geq 60\%$  of total marks) was considered sufficient knowledge. Participants were grouped into 2 categories according to their level of knowledge: insufficient ( $< 12$  points), and sufficient ( $\geq 12$  points). The third part of the questionnaire assessed the attitude of HCWs regarding MERS using a set of 8 yes/no questions.

### Statistical analysis

Data were coded, validated and analysed using SPSS, version 22. Frequencies and proportions were used to present the data. Chi-squared was used as the test of significance at the 5% level.

## Results

A total of 820 HCWs completed the questionnaire, a response rate of 94.3%. The age range of the participants was 23–58 years, median (IQR) 31 (28–38) years and mean 33.7 (standard deviation 8.6) years. Table 1 shows the baseline characteristics of the respondents. More than two-thirds (563) were male. The study group included 200 (24.4%) nurses, 185 (22.6%) physicians and 435 (53.0%) other HCWs; 132 (71.4%) physicians and 124 nurses worked in primary health care centres. More than half of the respondents 476 (58%) perceived that they had sufficient knowledge about MERS. The main sources of MERS information were the Ministry of Health website 410 (50.0%) and social media 296 (36.1%).

Table 2 shows the current status of MERS knowledge among HCWs. The majority, 762 (92.9%), were aware that the disease is a viral infection, 748 (91.2%) were familiar with its mode of transmission and 688 (83.9%) with the signs and symptoms. A majority of participants agreed



**Table 1** Baseline characteristics of health care workers, Najran, 2016

Characteristic	Participants (n = 820) No. (%)
<b>Sex</b>	
Male	563 (68.7)
Female	257 (31.3)
<b>Age (years)</b>	
21–30	338 (41.2)
31–40	326 (39.8)
41–50	120 (14.6)
50	36 (4.4)
<b>Occupation</b>	
Nurse	200 (24.4)
Physician	185 (22.6)
Pharmacist	148 (18)
Technician	105 (12.8)
Dentist	102 (12.4)
Laboratory worker	60 (7.3)
<b>Do you have sufficient knowledge about MERS-CoV?</b>	
Yes	476 (58.0)
No	322 (39.3)
Don't know	22 (2.7)
<b>Source of knowledge about MERS-CoV</b>	
Ministry of Health website	410 (50.0)
Social media	296 (36.1)
Newspaper	72 (8.8)
TV	42 (5.1)

that patients with chronic diseases [760 (92.7%)] and HCWs [692 (84.4%)] are at a higher risk of infection. However, the participants' knowledge about questions related to MERS vaccination, treatment by antibiotics, diarrhoea as a possible symptom, and the incubation period was poor.

The knowledge scores were correlated against the baseline characteristics of the respondents (Table 3). Females had statistically significantly better knowledge than males ( $P = 0.002$ ). Sufficient knowledge was significantly correlated with age ( $P = 0.001$ ). Moreover, physicians and nurses had significantly better knowledge compared with other HCWs ( $P = 0.001$ ). As expected, HCWs at institutions with established infection control programmes scored significantly better ( $P = 0.001$ ).

Over 70% of HCWs exhibited a positive attitude toward MERS. The majority of participants (79%) knew that MERS infection could be prevented by using isolation and standard precautions. Besides, 88.4% felt that the information in Saudi society was sufficient to deal with MERS and 95.7% that their institutions would be able to control any emerging MERS epidemic (Table 4).

## Discussion

Currently, MERS is a daily discussion topic in the media and among the public, especially among patients and HCWs. This analysis of data from south-western Saudi Arabia tries to inform on awareness and attitudes towards the prevention and control of MERS among HCWs: our findings may be useful when planning health education programmes about this emerging infectious disease.

We found that 50% of the participants depended on the Ministry of Health website as a main source of information about MERS. This differs from the findings of previously published studies, where social media and television were the main sources of information (11,13,19–21,25). This indicates that the educational materials posted online by the Ministry of Health encouraged the busy HCWs to use them. At the same time, it sets a great responsibility on health care authorities to increase the accessibility of such materials by varying the means of information delivery, aiming to improve knowledge levels. A finding of considerable concern is that 36% of HCWs used social media as a source of information. Because of the difficulty in determining the validity and scientific content of information sources as well as the possibility of misinformation being presented, HCWs should practice careful evaluation of MERS-related educational materials (1).

The findings of this study suggest a good relationship between information available in the media about MERS and the depth of knowledge among HCWs. For example, about 97% of the participants knew about the preventive measures, 92.9% about the causative agent of the disease, 91% about the mode of transmission, and 83.9% about the clinical symptoms. These results are consistent with findings from previous studies (11,13,25,26). On the other hand, fewer participants were knowledgeable about diarrhoea as a symptom of disease, vaccine availability and the incubation period.

As per CDC recommendations, Saudi Arabia has led the relevant authorities to initiate educational campaign targeted towards HCWs. These mainly focused on the prevention, treatment and symptoms of MERS (9,15). Nevertheless, greater encouragement is needed for HCWs to refer to the Ministry of Health websites.

In this study, only 51% of participants had sufficient knowledge about MERS. Such unsatisfactory results highlight the need for greater efforts to raise general awareness among HCWs about MERS. As expected, age was significantly associated with higher proportions of sufficient knowledge. A number of previous studies also found that older HCWs showed higher rates of knowledge and awareness (11,20,27).

We found that there was variability among HCWs in their knowledge level. For example participants who worked in places where a preventive programme and infection control policies are applied had greater levels of sufficient knowledge than those working in places without an infection control programme. Physicians

**Table 2 Knowledge about MERS-CoV among health care workers, Najran, 2016**

Question (correct answer)	Correct answer No. (%)
MERS-CoV is a viral infection (Yes)	762 (92.9)
MERS-CoV is transmitted by close contact with infected person or animal (Yes)	748 (91.2)
Fever, cough and shortness of breath are symptoms of MERS (Yes)	688 (83.9)
Diarrhoea is a possible symptom of MERS (Yes)	504 (61.5)
The incubation period is 2–4 weeks (No)	484 (59.0)
MERS-CoV vaccine is available in markets (No)	564 (68.8)
Antibiotics are the first-line treatment (No)	588 (71.7)
Washing hands with soap and water can help in prevention of disease transmission (Yes)	796 (97.1)
Patients with underlying chronic diseases are at a higher risk of infection (Yes)	760 (92.7)
Health care workers are at a higher risk of infection (Yes)	692 (84.4)
MERS could be fatal (Yes)	666 (81.2)

**Table 3 Distribution of knowledge scores among health care workers in Najran, 2016**

Characteristic	Sufficient knowledge (n = 416) No. (%)	Insufficient knowledge (n = 404) No. (%)	Total (n = 820)	P-value
<b>Sex</b>				
Male	216 (38.4)	247 (60.7)	463	0.002
Female	200 (77.8)	57 (22.2)	257	
<b>Age (years)</b>				
21–30	84 (24.9)	254 (75.1)	338	0.001
31–40	214 (50.2)	112 (48.8)	326	
41–50	96 (80)	24 (20)	120	
> 50	26 (72.2)	10 (27.8)	36	
<b>Occupation</b>				
Nurse	158 (79)	42 (21)	200	0.001
Physician	146 (78.9)	39 (21.1)	185	
Pharmacist	70 (47.3)	78 (52.7)	148	
Dentist	6 (5.9)	96 (94.1)	102	
Technician	36 (34.3)	69 (65.7)	105	
Laboratory worker	0	60 (100)	60	
<b>Presence of animals</b>				
Yes	124 (58.5)	88 (41.5)	212	0.117
No	292 (48.8)	306 (51.2)	598	
Don't know	0	10 (100)	10	
<b>Do you have sufficient knowledge about MERS-CoV?</b>				
Yes	324 (68.1)	152 (31.9)	476	0.082
No	82 (25.5)	240 (74.5)	322	
Don't know	10 (16.1)	52 (83.9)	62	
<b>Have you had previous contact with MERS patients?</b>				
Yes	76 (52.1)	72 (47.9)	148	0.428
No	340 (53.3)	298 (46.7)	638	
Don't know	0	34 (100)	34	
<b>Presence of prevention programme</b>				
Yes	386 (88.5)	284 (70.3)	670	0.001
No	16 (3.8)	36 (8.9)	52	
Don't know	14 (3.4)	84 (20.8)	98	

**Table 4 Attitude of health care workers toward MERS-CoV, Najran, 2016**

Item (correct answer)	Response No. (%) <sup>a</sup>
Are you worried one of your family members may get an infection?	
Yes	570 (69.5)
Transmission of MERS can be prevented by using standard and isolation precautions given by CDC, WHO, APIC, etc? (Yes)	
Yes	647 (78.9)
Prevalence of MERS can be reduced by active participation of health care worker in hospital infection control programme? (Yes)	
Yes	605 (73.8)
If a MERS-CoV vaccine were available, would you have it?	
Yes	638 (77.8)
Intensive treatment should be given to diagnosed patients? (Yes)	
Yes	778 (94.9)
Health care workers must avail themselves of all information about the virus? (Yes)	
Yes	762 (92.9)
Is the available information about MERS-CoV in Saudi society sufficient?	
Yes	725 (88.4)
Are the government institutions able to control the epidemic?	
Yes	785 (95.7)

CDC = Centers for Disease Control and Prevention, WHO = World Health Organization, APIC = Association for Professionals in Infection Control and Epidemiology.

<sup>a</sup>All respondents answered either yes or no. There were no missing values or don't know responses.

and nurses had better knowledge levels than other professions, as seen elsewhere (20,28,29). Any upcoming educational programmes could be designed to target those professions which demonstrated a greater incidence of insufficient knowledge level, i.e. in our study this included dentists, pharmacists, technicians and laboratory personnel.

Those HCWs who had previous contact with infected patients showed a high level of insufficient knowledge, which is an unexpected result and points to the importance of health care authorities setting up awareness campaigns for patient contacts which also include their managing health team.

Generally, most participants had a positive attitude towards active participation in infection control programmes and the role of guidelines in prevention of the infection. They believed in the ability of the government to control an epidemic. However, 22.2% showed negative attitudes towards vaccination. This could be explained by a lack of proper knowledge about the preventive role of active immunization.

Although the majority of respondents were not able to determine their actual knowledge level, about 93% believe that HCWs must avail themselves of all information about the virus. The majority agreed that patients infected with MERS should be intensively treated. Moreover, almost 70% of our participants were worried about MERS infection for their family. Similar findings have been reported in many previous studies (20,26,27).

This study had some limitations. Firstly, the questionnaire data may have been subject to recall bias and misclassification. However, we can expect that HCWs have the necessary medical knowledge to correctly respond to all items of the questionnaire tool. Secondly, our study was limited to the south-western region of Saudi Arabia, thus the results presented here may not be generalizable to the rest of the country. Finally, the lack of detailed information about the attitude of HCWs towards MERS is a potential limitation. Therefore, carrying out further large-scale studies from other regions in Saudi Arabia is important to further explore awareness and attitude of HCWs at the national level.

## Conclusion

The HCWs in Najran region showed a high level of knowledge and positive attitudes towards MERS. However, there is a noticeable difference in knowledge level between the professions. Periodic educational interventions using locally-adjusted methods are indicated as these could contribute to improving any deficiencies in knowledge, e.g. the incubation period, and diarrhoea as a possible symptom. Greater educational efforts about prevention should be directed to dentists, technicians, pharmacists and laboratory workers, and patient contacts (including the treating team) should be more involved in the process of education about infectious diseases.

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## Connaissances et attitudes vis-à-vis du coronavirus du syndrome respiratoire du Moyen-Orient (MERS-CoV) parmi les agents de santé dans le sud-ouest de l'Arabie saoudite

### Résumé

**Contexte :** L'Arabie saoudite est considérée comme étant l'épicentre du MERS-CoV. Depuis 2012, un total de 1844 cas de MERS-CoV ont été déclarés. Récemment, un groupe de huit cas a été notifié dans la région de Najran dans le sud-ouest du pays. La présente analyse des données de cette région portant sur le niveau de sensibilisation et les attitudes des agents de santé vis-à-vis de la lutte contre le MERS-CoV et de sa prévention peut être utile dans le cadre de la planification des programmes d'éducation sanitaire concernant cette maladie infectieuse émergente.

**Objectifs :** Notre objectif était d'examiner les connaissances et les attitudes des agents de santé vis-à-vis du MERS-CoV dans le sud-ouest de l'Arabie saoudite.

**Méthodes :** La présente étude transversale a été menée auprès d'agents de santé dans les centres de soins de santé primaires et les hôpitaux de Najran. Un questionnaire contenant 14 items sur les connaissances et 8 items sur les attitudes a été rempli par les 870 participants.

**Résultats :** Globalement, plus de 80 % des agents de santé avaient des connaissances sur l'étiologie, le mode de transmission, les facteurs de risque ainsi que sur les signes et les symptômes du MERS-CoV. Les scores de connaissance ont montré que 51 % des participants avaient un niveau suffisant. Les médecins et les personnels infirmiers présentaient un niveau de connaissance significativement plus élevé que les autres aux agents de soins de santé ( $p = 0,001$ ). Les participants qui travaillaient dans des institutions dotées d'un programme de lutte contre les infections bien établi obtenaient des scores significativement plus élevés aux questions portant sur les connaissances ( $p = 0,001$ ). S'agissant des attitudes, plus de 70 % des agents de santé ont montré une attitude positive vis-à-vis du MERS-CoV.

**Conclusion :** les agents de santé de la région de Najran faisaient preuve d'un niveau élevé de connaissances et avaient une attitude positive vis-à-vis du MERS-CoV. On a observé une différence non négligeable concernant le niveau de connaissances entre les différentes professions. Des interventions éducatives et des campagnes périodiques à l'intention des professionnels demeurent nécessaires. Toute intervention devrait cibler les membres du personnel soignant qui ne sont ni médecins ni infirmiers.

### معلومات واتجاهات العاملين في مجال الرعاية الصحية تجاه فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية في جنوب غرب المملكة العربية السعودية

أحمد أسعد، رحاب السكري، مهدي الزمانان، ماهر الشافعي  
الخلاصة

**الخلفية:** تُعدُّ المملكة العربية السعودية بؤرة لفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية. ف منذ عام 2012، بلغ عدد الحالات الإجمالية المبلغ بها والمصابة بفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية 1844 حالة. وأبلغ مؤخرًا عن مجموعة تضم 8 حالات في منطقة نجران جنوب غربي البلاد. وقد يكون هذا التحليل للبيانات المستمدة من تلك المنطقة عن وعي عاملي الرعاية الصحية ومواقفهم تجاه الوقاية من فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية ومكافحته مفيدًا في التخطيط لبرامج التنقيف الصحي المعنية بهذا المرض المعدي.

**الأهداف:** هدفنا استقصاء معلومات واتجاهات العاملين في مجال الرعاية الصحية في جنوب غربي المملكة العربية السعودية نحو فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية.

**طرق البحث:** أجريت هذه الدراسة المقطعية على العاملين في مجال الرعاية الصحية في مراكز ومستشفيات الرعاية الصحية الأولية في نجران. واستُكمل استبيان يتألف من 14 بندًا للمعلومات و 8 بنود تتعلق بالاتجاهات بواسطة جميع المشاركين في الاستبيان البالغ عددهم 870 مشاركًا.

**النتائج:** بصورة عامة، تجاوزت نسبة العاملين في الرعاية الصحية الملمين بسبب الإصابة بفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية، وطريقة انتقاله، وعوامل الخطر المرتبطة به، وعلاماته، وأعراضه نسبة 80%. وأوضحت الدرجات المعرفية أن 51% من المشاركين كانت لديهم معلومات كافية عن الفيروس. وكان لدى الأطباء وطواقم التمريض معلومات أفضل بكثير مقارنة بسائر العاملين في الرعاية الصحية ( $p = 0.001$ ). وحقق المشاركون الذين عملوا في مؤسسات بها برامج راسخة لمكافحة العدوى درجات أفضل بكثير فيما يتعلق بأسئلة المعلومات ( $p = 0.001$ ). وفيما يتعلق بالاتجاهات، فقد أظهر ما يزيد عن 70% من العاملين في الرعاية الصحية موقفًا إيجابيًا إزاء فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية.

**الاستنتاج:** أظهر العاملين في الرعاية الصحية في منطقة نجران مستوى معلومات مرتفعًا واتجاهات إيجابية تجاه فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية. كانت هناك اختلافات ملحوظة في مستوى المعلومات بين مختلف المهن. ولا تزال الحاجة ماسة إلى القيام بتدخلات تنقيفية دورية وحملات للتوعية المهنية. وينبغي توجيه أي تدخل نحو باقي المهن غير الطبية والتمريضية.

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# Complementary and alternative medicine use for weight management among females in Jordan: a community-based survey

Mayadah Bashir Shehadeh,<sup>1</sup> Ghadeer Suaifan,<sup>1</sup> Alaa Abu-Odeh<sup>2</sup> and Rula Darwish<sup>3</sup>

<sup>1</sup>Department of Pharmaceutical Sciences. <sup>2</sup>School of Pharmacy, University of Jordan, Amman, Jordan (Correspondence to: Mayadah Shehadeh: m.shehadeh@ju.edu.jo). <sup>3</sup>Department of Pharmaceutics and Pharmaceutical Biotechnology, University of Jordan, Amman, Jordan.

## Abstract

**Background:** The relationship between obesity and various chronic diseases is well documented. In Jordan, the prevalence of overweight (30.0%) and obesity (38.8%) among females is on the rise, encouraging many adults to rely on alternative health care methods to manage their weight.

**Aims:** We explored the status of complementary and alternative medicine use for weight management among adult females in Jordan and the possible relationship between complementary and alternative medicine use and body mass index.

**Methods:** An interviewer-administered, structured questionnaire was used to collect data on the use and safety of complementary and alternative medicine for weight management from 858 women in 2015. Responses were coded and analysed using SPSS, version 20.

**Results:** Around 40% of the respondents reported using some form of complementary and alternative medicine for weight management. Commercial dietary supplements (31.2%), herbal remedies (26.7%) and folk remedies (18.0%) were commonly used. Green tea and fibre tablets were the most widely used herbal supplements. Logistic regression analysis indicated that overweight participants are more frequent complementary and alternative medicine users compared to obese. Relatives and friends were the main sources of information about complementary and alternative medicine. Only 31.9% of women believed that complementary and alternative medicine modalities were safe; around half believed they were not safe during pregnancy (52.5%) and lactation (48.0%). Only 49.7% were aware of side-effects and 41.5% of drug interactions.

**Conclusion:** This study revealed that complementary and alternative medicine is often used for weight management. Awareness of the safe use of complementary and alternative medicine with other medications and during pregnancy and lactation should be addressed.

Keywords: alternative medicine, dietary supplements, weight management, women, Jordan

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## Introduction

Despite recent advances in care and management, the obesity epidemic has reached an alarming level worldwide in both developing and developed countries. Globally, one billion adults have been identified as being overweight and 300 million as obese (1). Jordan is ranked 25th among countries suffering from obesity, with a prevalence of 49.7% (2). Overweight and obesity among women in Jordan has reached alarming levels (30.0% and 38.8% respectively). Changes in physical activity, lifestyle, socioeconomic status and dietary habits are factors which have been found to be associated with precipitating obesity (3–5).

Obesity causes substantial morbidity, mortality and chronic complications. Recent research has highlighted it as a risk factor for coronary heart disease. In addition, obesity is associated with hypertension, diabetes, dyslipidaemia, cancer, osteoarthritis of weight-bearing joints and deteriorating quality of life (3,6).

Enormous advances have been accomplished in modern medicine, however, complementary and

alternative medicine (CAM) still interests people greatly. In many developing countries, traditional medicine is the primary health care system, with about 70–80% of the population relying on it (7). One-third of adults in the United States of America have used some form of CAM according to the 2002 National Health Interview Survey and several population-based studies (4,5,7,8). Herbs (35.5%) and *hijama* (cupping) (20.4%) are the most widely used forms of CAM in Jordan for cancer patients and the chronically ill (9). Other commonly used CAM therapies include herbal products, deep breathing exercises, meditation, chiropractic, yoga, massage and diet-based therapies (4,10,11). Complementary and alternative medicine encompasses various ancient and new approaches which are not taught widely in medical schools and are not generally used in hospitals for the purpose of preventing or treating disease. By definition, complementary practices are used together with conventional medicine, while alternative methods are used instead of conventional therapy (4,10,11).

“Back to nature” is one of several aspects that have encouraged the expansion of CAM use: it adds to the

perception among consumers that these practices are natural and therefore safe and cannot cause harm. The high cost of conventional therapies and the trend towards self-medication also have contributed to the expansion in use. In particular, individuals who are obese are seeking alternative practices for weight management due to the poor compliance with conventional weight-management programmes, indicating that there is a need for safe, effective and acceptable therapeutic options (5,10,12,13).

Our objectives were to determine the status and perception of safety of CAM use as a weight control or weight reduction intervention among a sample of normal, overweight and obese females in Jordan and to examine any possible relationship between body mass index (BMI) and such use.

## Methods

### Study population and study tool

A face-to-face (participants completed the questionnaire in front of the distributor), anonymous, structured questionnaire was administered to a sample of adult women (any woman who appeared to be 18 years old or older; target sample was set at 1000) after obtaining verbal informed consent to participate in the study (the consent statement was clearly printed at the top of the questionnaire and was recited to each prospective participant. The study was carried out in various community settings to ensure sample representativeness (5 health care centres, 5 shopping malls, 10 supermarkets, the University of Jordan main cafeteria, 3 fitness centres and 10 female beauty centres).

The questionnaire was developed by the researchers and structured to cover commonly used CAM modalities in Jordan. It was approved by an expert panel comprising 2 nutritionists, 3 pharmacists and a statistician. To ensure validity and to facilitate data collection, the questionnaire was constructed in English first, then translated into Arabic and back to English. Back translation was undertaken by a bilingual speaker to ensure translation validity. The sample size of 600 participants was computed using the sample size calculator (surveysystem.com) with confidence interval of 4, confidence level of 95% based on the females population aged 18+ years, at the end of 2014 this was 2 667 640 (data from the Department of Statistics, Jordan DOS 2014).

A preliminary trial was conducted on a sample of around 25 females (4.2% of the target sample) to address any ambiguity in the questions. Data collected during this pilot study was excluded from the final data analysis. All feedback received was incorporated into the final amended Arabic version of the questionnaire, which was then distributed to the research assistants and then to the respondents. The questionnaire comprised 25 questions divided into 4 sections. The first section collected demographic data, the second was about health status (if the participant had any chronic disease), the third section addressed different types of CAM and the last section focused on CAM safety.

As in many research studies, participant recruitment was a major challenge. This is because recruitment includes the identification of participants eligible for the study goals and design, the proper explanation of the study to potential participants, informed verbal consent and ethical standards being maintained. Accordingly, fifth-year pharmacy students were trained to ensure efficient communication with potential participants. The average interview time was 20–30 minutes.

Data were collected between February and June 2015. Respondents were categorized according to the internationally defined BMI categories: normal (18.5 to < 25 kg/m<sup>2</sup>); overweight (25.0 to < 30 kg/m<sup>2</sup>); obese (≥ 30 kg/m<sup>2</sup>).

### Data analysis

Data were coded, entered and analysed using SPSS, version 20. The analysis involved descriptive quantitative statistics, e.g. frequency and percentage. Binary stepwise logistic regression analysis was used to determine the associations between CAM modalities used and respondents' BMI status. Using the forward Wald method, odds ratios (ORs) and their 95% confidence intervals (CIs) were computed. *P*-value ≤ 0.05 was considered to be statistically significant. The chi-squared test was performed to explore the differences in health habits between CAM users and nonusers.

### Compliance with ethical standards

Informed consent was obtained from all individuals included in the study. No financial incentive was offered. This study was approved by the Scientific Research Committee at the Faculty of Pharmacy and the University of Jordan and the institutional review board of Jordan University Hospital.

## Results

We recruited 858 women to participate in the study. Participants with a BMI below 18.5 kg/m<sup>2</sup> (4.7%) were excluded from the data analysis. Data collected from 818 females were subjected to analysis (95.3%). The majority of respondents were young (423 aged 18–25 years), university graduates (507), single (449) and had a medium monthly income (500–1500 Jordanian dinars/month) (Table 1). Nearly half (42.2%) the respondents were classified as overweight (BMI ≥ 25–29.9 kg/m<sup>2</sup>) or obese (BMI ≥ 30 kg/m<sup>2</sup>). Overweight was very common (9.8%) among the youngest age group (18–25 years) while obesity (7.1%) was common in the oldest group (≥ 46 years); 8% of obese respondents considered their weight to be normal.

Use of CAM was reported by participants in all BMI categories. Several strategies had been adopted to maintain or lose weight. Overall, 54.3% of our participants tried to reduce or control their weight in the previous year. Only, 38.9% reported the use of at least one form of CAM therapy for weight reduction or weight control (Table 2). However, more of those in the obese group tended to rely on CAM modalities to reduce their weight (63.3%) compared to overweight (46.1%) and normal



**Table 1 Demographic characteristics of our sample of Jordanian women participants**

Characteristic	Overall	Normal weight		Overweight		Obese	
		No.	%	No.	%	No.	%
<b>Sample size</b>	818	471	57.6	219	26.8	128	15.6
<b>Age (years)</b>							
18–25	423	330	78.0	80	18.9	13	3.1
26–30	78	46	59.0	22	28.2	10	12.8
31–35	69	34	49.3	22	31.9	13	18.8
36–40	56	18	32.1	27	48.2	11	19.6
41–45	74	22	29.7	30	40.5	22	29.7
≥ 46	114	19	16.7	37()	32.5	58	50.9
No answer <sup>a</sup>	4	2		1		1	
<b>Education level</b>							
Primary school	28	7	25.0	4	14.3	17	60.7
High school	98	30	30.6	35	35.7	33	33.7
Community college	113	45	39.8	33	29.2	35	31.0
University graduate	507	345	68.1	130	25.6	32	6.3
Postgraduate	59	37	62.7	13	22.0	9	15.3
No answer <sup>b</sup>	13	7		3		2	
<b>Income (JOD/month)<sup>b</sup></b>							
Less than 500 (low)	156	73	46.8	44	28.2	39	25.0
500–1500 (medium)	420	262	62.4	105	25.0	53	12.6
More than 1500 (high)	217	122	56.2	62	28.6	33	15.2
No answer <sup>a</sup>	25	14		8		3	
<b>Marital status</b>							
Single	449	341	75.9	91	20.3	17	3.7
Married	328	121	36.9	116	35.3	91	27.4
Divorced	17	8	47.0	6	35.3	3	17.6
Widowed	22	1	4.5	5	22.7	16	72.7
No answer <sup>a</sup>	2	0		1		1	
<b>Occupation</b>							
School student	18	14	77.8	1	5.6	3	16.7
University student	336	262	78.0	67	19.9	7	2.1
Business owner	22	8	36.4	8	36.4	6	27.3
Private sector employee	84	57	67.9	18	21.4	9	10.7
Public sector employee	117	54	46.2	45	38.5	18	15.4
Housewife	188	53	29.2	66	35.1	69	36.7
Retired	13	2	15.4	2	15.4	9	69.2
Unemployed	23	11	47.8	8	34.8	4	17.4
Other	4	2	50.0	1	25.0	1	25.0
No answer <sup>a</sup>	13	8		3		2	

<sup>a</sup>Not included in statistical analysis.

<sup>b</sup>US\$ 1 = JOD 0.71 (Jordanian dinars).

Normal weight (18.5 to < 25 kg/m<sup>2</sup>); overweight (25.0 to < 30 kg/m<sup>2</sup>); obese (< 30 kg/m<sup>2</sup>).

weight (28.9%) (Table 3).

Commercial dietary products (29.5%), herbal remedies (24.7%) and herbal dietary supplements (16.9%) were the most commonly used CAM modalities (Figure 1). Non-prescription medications (77; 9.4%), massage (28; 3.4%), aromatherapy (25; 3.1%), yoga (25; 3.1%) and acupuncture

(12; 1.5%) were less popular among participants ( $P < 0.05$ ) (Figure 1).

The main source of information about herbal dietary products (19.4%) and herbal remedies (25.8%) was relatives and friends, followed by the herbalist (*attar*) (10.1% and 11.0% respectively), pharmacists (9.0% and 7.0%,

**Table 2** Distribution of health habits of our sample of Jordanian women participants according to body mass index

Health habit	Overall sample	Normal weight		Overweight		Obese	
		No.	%	No.	%	No.	%
<b>Sample size</b>	818	471	57.6	219	26.8	128	15.6
<b>Physical activity</b>							
Yes	381	183	38.9	120	54.8	78	60.9
No	437	288	61.2	99	45.2	50	39.1
<b>Any chronic disorder</b>							
Yes	116	21	4.5	39	17.8	56	43.8
No	701	450	95.5	180	82.2	71	55.5
No answer <sup>a</sup>	1	0		0		1	
<b>Use complementary and alternative medicine for chronic disorder</b>							
Yes	117	31	6.6	53	24.2	33	25.8
No	680	426	90.2	161	73.5	93	72.7
No answer <sup>a</sup>	21	15		5		2	
<b>Weight reduction or control in previous 12 months</b>							
Yes	444	202	42.9	148	67.6	94	73.4
No	369	268	56.9	67	30.6	34	26.6
No answer <sup>a</sup>	5	1		4		0	
<b>Using CAM for weight reduction or control</b>							
Yes	318	136	28.9	101	46.1	81	63.9
No	500	335	71.1	118	53.9	47	36.7

<sup>a</sup>Not included in statistical analysis.

respectively), nutritionists (16.9% and 17.8%, respectively), health food stores (10.5% and 11.3%, respectively), physicians (13.4% and 12.5% respectively) and others (14.6% and 9.9%, respectively).

Prescription medications (77; 10.0%), massage (28; 3.6%), aromatherapy (25; 3.3%), yoga (25; 3.3%) and acupuncture (12; 1.6%) were less popular among participants (Figure 1) ( $P < 0.05$ ). Commercial dietary supplements and herbal remedies were the most widely used CAM modalities. Green tea was the most commonly used herbal drink (Figure 2), while ginger was the most widely used home remedy (Figure 3). Fat metabolizers and fibre tablets were the most widely used folk remedies among normal weight females (Figures 2,3).

Lifestyle habits and health status of the participants are summarized in Table 2. Lack of physical activity was common (437; 53.4%). Utilization of CAM was greater among the chronically ill overweight and obese (72.8%). Chronically ill overweight and obese women were more likely to use CAM (6.5% and 4.0% respectively;  $P < 0.05$ ) to treat their conditions.

Logistic regression analysis showed that BMI has no effect on the tendency of participants to rely on a specific type of CAM to maintain or reduce weight. (Table 4). Bivariate analysis did not reveal any statistically significant association between the CAM type used and BMI ( $P \geq 0.05$ ). However, it was observed that overweight respondents (BMI  $\geq 25$ –29.9 kg/m<sup>2</sup>) were more likely to use aromatherapy (OR 12.17; 95% CI: 0.96–153.58) in attempting to reduce weight (Table 4).

Table 4 summarizes the sociodemographic characteristics of CAM users compared to nonusers. In general, there were significant differences in the characteristics of CAM users compared with nonusers in terms of education and occupation. Four in 10 working females were overweight and around 15% were obese. Obesity (30%) and overweight (37%) were more common among housewives (Table 1).

A third of the respondents (31.9%) believed that CAM is generally safe (Table 5). However, half of the participants (49.7%) agreed that CAM modalities might induce side-effects, 35.5% thought it might cause allergy and 41.5% that drug interactions were possible. Almost half of the participants opposed CAM use by pregnant (52.5%) or lactating mothers (48%).

## Discussion

In Jordan, obesity among women of reproductive age is on the rise as indicated in the Jordan Population and Family Health Survey: the prevalence of overweight was 27% while obesity was 20% (15). In our sample, 42.4% of the respondents did not have ideal body weight and were either overweight (26.8%) or obese (15.6%). Our findings are in line with a 2014 survey which reported 30.0% of females in Jordan are overweight and 38.8% are obese, reflecting the lack of appropriate knowledge of what constituted a healthy weight (2). Over the past decade, Jordan has witnessed rapid changes towards a sedentary lifestyle, and a high-fat diet is common (14).

The high prevalence of CAM use among our

**Table 3 Comparison of sociodemographic characteristics of complementary and alternative medicine users and nonusers in a sample of Jordanian women (n = 818)**

Characteristic	CAM user		CAM non-user		P-value
	No.	%	No.	%	
<b>BMI</b>					
Normal	136	28.9 <sup>a</sup>	335	71.1 <sup>a</sup>	< 0.001
Overweight	101	46.1 <sup>a</sup>	118	53.9 <sup>a</sup>	
Obese	81	63.3 <sup>a</sup>	47	36.7 <sup>a</sup>	
<b>Age (years)</b>	318				
18–25	145	45.6	278	55.0	< 0.05
26–30	31	9.7	47	9.4	
31–35	24	7.5	45	9.0	
36–40	23	7.2	33	6.6	
41–45	36	11.3	38	7.6	
≥ 46	56	17.6	58	11.6	
<b>Income (JOD/month)<sup>b</sup></b>					
Less than 500 (low)	57	7.0	99	12.1	0.145
500–1500 (medium)	154	18.8	266	32.5	
More than 1500 (high)	100	12.2	117	14.3	
No answer <sup>c</sup>	7		18		
<b>Education</b>					
Primary school	6	0.7	22	2.7	0.024
High school	42	5.1	56	6.8	
Community college	55	6.7	58	7.1	
University graduate	184	22.5	323	39.5	
Postgraduate	27	3.3	32	3.9	
No answer <sup>c</sup>	4		9		
<b>Occupation</b>					
School student	3	0.4	15	1.8	< 0.001
University student	107	13.1	229	28.0	
Business owner	11	1.3	11	1.3	
Private sector employee	30	3.7	54	6.6	
Public sector employee	47	5.8	70	8.6	
Housewife	96	11.8	92	11.3	
Retired	8	1.0	5	0.6	
Unemployed	10	1.2	13	1.6	
Other	0	0.0	4	0.5	
No answer <sup>c</sup>	5		7		

<sup>a</sup>Calculated from the corresponding group.

<sup>b</sup>US\$ 1 = JOD 0.71 (Jordanian dinars).

<sup>c</sup>Not included in statistical analysis.

P-value was based on chi-squared test,  $P < 0.05$ ;  $P < 0.001$ .

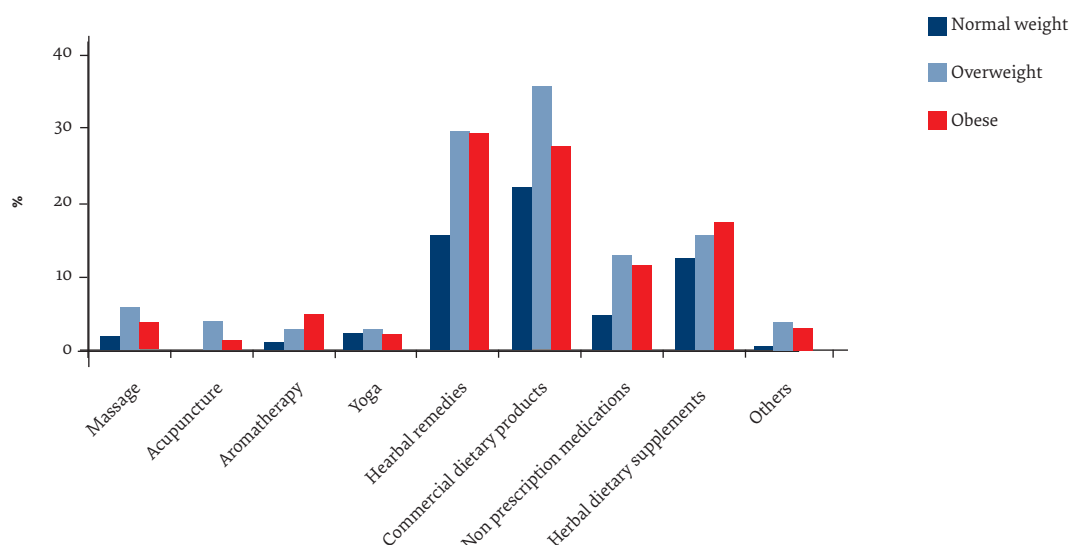
Body mass index (BMI): normal (18.5 to < 25 kg/m<sup>2</sup>); overweight (25.0 to < 30 kg/m<sup>2</sup>); obese (≥ 30 kg/m<sup>2</sup>).

participants, mainly among those who were overweight, may be attributed to several factors. According to previous studies, influencing factors might include; the accessibility and availability of CAM products; the discrepancy between the expectations of the participants and the results achieved with conventional calorie reduction plans leading to a negative perception for their weight loss pattern; believing that CAM modalities are safe; difficulty in maintaining a healthy lifestyle; and

the low rate of fulfilment of the objectives of a weight management nutrition plan (5,16,17).

Our study indicated that both young females (18–25 years old) 45.6% and older individuals (≥ 46 years old) 17.6% were more likely to use CAM. Green tea is the second most popular beverage worldwide after water (18) and we found it to be the most commonly used herbal drink by normal, overweight and obese participants

**Figure 1** Prevalence of complementary and alternative medicine modality utilization according to weight category in a sample of Jordanian women (n = 818), 2015



complementary and alternative medicine modality

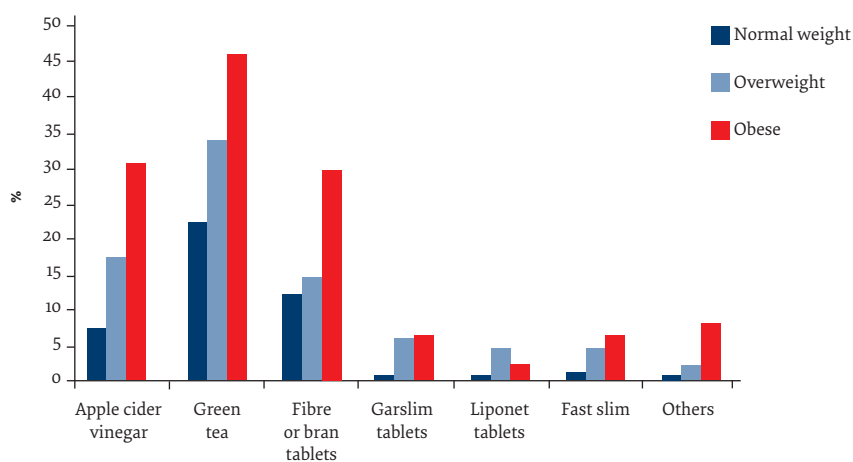
in our study. This may be explained by the influence of media hype on the benefits of green tea, according to Sae-Tan et al. (19). Another potential explanation for the popularity of green tea and similar herbal and home remedies is that dietary supplements are not perceived as medicines and this means that individuals do not have to add a new medication to their drugs list, an important issue for older individuals who are already taking several medications (20).

The high rate of CAM utilization by chronically ill participants (100%) in our study to treat their chronic illness may be explained by the belief that natural is safe and the concerns and dissatisfaction for CAM use among

clinicians as previously reported (11). Less than half of our participants (41.5%) agreed about potential drug interactions with CAM modalities. In general, awareness needs to be raised in regard to the potential adverse effects (especially during pregnancy and lactation) and proven benefits of various types of CAM.

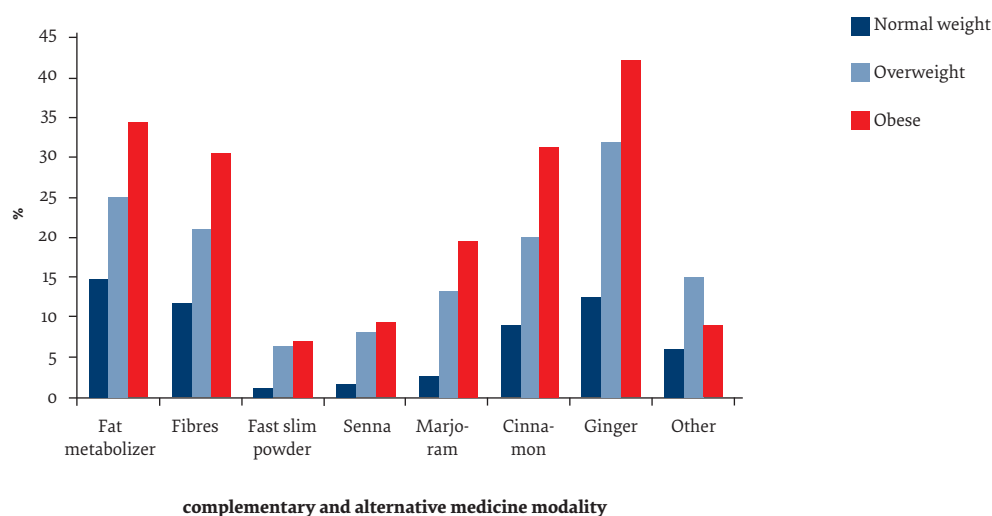
Education level, income, health status, occupation, personality variables, cultural and social beliefs are all factors that can contribute to increased use of CAM (10,21). Women are more likely to use CAM than men (22), however, different patterns of use have been noted in previous research and this indicates how important it is to establish the relationship between a respondent's

**Figure 2** Prevalence of complementary and alternative medicine modalities utilization according to weight category in a sample of Jordanian women (n = 818): herbal dietary supplements and nonprescription medication (Liponet® is chitosan and ascorbic acid; Garslim® is *Garcinia cambogia* extract), 2015



complementary and alternative medicine modality

**Figure 3** Prevalence of complementary and alternative medicine modality utilization by weight category in a sample of Jordanian women (n = 818): commercial dietary supplements, 2015



baseline characteristics and utilization of CAM therapy (21). For example, in Hispanic women, CAM use is more common among those whose income, education level, and proficiency in English are low (23,24). In our study, university students and housewives were more likely to use CAM compared with other categories.

Almost third of the participants (31.9%) think that CAM is safe, only 41.5% think that herbs might interact

with medications and almost half (49.7%) were aware of possible side-effects induced by CAM. These beliefs need to be addressed, especially since many overweight and obese participants have chronic disorders as seen from Table 2. Knowledge regarding the potential harm of CAM use during pregnancy and lactation was reported by almost half of the women in our study. These findings are similar to the data reported by Low Dog (25). Maternity

**Table 4** Binary logistic regression analysis of selected complementary and alternative medicine modalities used in relation to body mass index (BMI) among a sample of Jordanian women (n = 818)

complementary and alternative medicine modality	$\beta$	P-value	OR (95% CI)	%
<b>Herbal remedies</b>				
Overweight	-0.48	0.70	0.60 (0.05-6.95)	55.00
Obese	-1.24	0.32	0.30 (0.03-3.26)	14.50
Normal (R)	-	-	-	-
<b>Commercial dietary products</b>				
Overweight	-0.42	0.68	0.6 (0.09-4.80)	39.76
Obese	-0.69	0.50	0.5 (0.07-3.65)	20.30
Normal (R)	-	-	-	-
<b>Acupuncture</b>				
Overweight	-16.19	0.99	0.00 (-)	5.91
Obese	-18.48	0.99	0.00 (-)	0.69
Normal (R)	-	-	-	-
<b>Aromatherapy</b>				
Overweight	2.50	0.06	12.20 (0.96-153.58)	96.00
Obese	1.50	0.23	4.50 (0.39-52.11)	97.60
Normal (R)	-	-	-	-
<b>Herbal dietary supplements</b>				
Overweight	-0.18	0.89	0.80 (0.07-9.43)	62.57
Obese	-0.35	0.78	0.70 (0.06-7.92)	49.93
Normal (R)	-	-	-	-

OR= odds ratio; CI= confidence interval using forward Wald method; R = reference group.  
 BMI: normal = 18.5 to < 25 kg/m<sup>2</sup>; overweight = 25.0 to < 30 kg/m<sup>2</sup>; obese = ≥ 30 kg/m<sup>2</sup>.

**Table 5 Awareness of complementary and alternative medicine safety among a sample of Jordanian women, (n = 818)**

Question	Yes		No		Don't know	
	No.	%	No.	%	No.	%
CAM is safe	261	31.9	251	30.6	271	33.1
CAM might interact with medications	340	41.5	153	18.7	289	35.3
CAM might be allergenic	291	35.5	182	22.2	306	37.4
CAM might have side effects	407	49.7	157	19.2	217	26.5
CAM is safe during pregnancy	60	7.3	430	52.5	289	35.3
CAM is safe during lactation	55	6.7	393	48.0	294	35.9

*CAM complementary and alternative medicine*

care providers and health care professionals need to address the safety of CAM use among females through health awareness campaigns.

Biomedical maternity care providers and complementary medicine health care professionals can use this information to inform their best practice and care when working with pregnant and breastfeeding women.

This study had several limitations which should be considered for interpretation purposes. First, because of the limited number of participants and the relative homogeneity of our sample, causal associations could not be established. It was very difficult to apply a random sampling method in this study as this requires a means of naming and/or numbering the target population, which was not easy to achieve. Second, we relied on self-reported data; some participants did not adequately identify their answer 'no answer' and this limited our ability a detailed

review. Third, given the low number of participants with mild, moderate and extreme obesity, we were unable to detect differences in CAM use among obese categories.

## Conclusion

Our findings indicated that CAM use rates are similar for weight control or reduction and these could be attained by a variety of alternative modalities. In addition, participants use CAM in combination with other practices involving the restricted calories intake and/or medications for weight reduction. Awareness about the safety of CAM modalities utilization concurrently with medications and during special physiological conditions, pregnancy and lactation should be addressed. Healthy diet and lifestyle public programs need to be initiated and encouraged by decision makers and authorities in order to limit the rising percentage of overweight and obesity among university students and unemployed.

## Acknowledgements

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**Competing interests:** None declared.

## Recours aux médecines complémentaires et alternatives dans le cadre de la gestion du poids chez les femmes en Jordanie : enquête communautaire

### Résumé

**Contexte :** Le lien entre obésité et plusieurs maladies chroniques est clairement attesté. En Jordanie, la prévalence du surpoids (30,0 %) et de l'obésité (38,8 %) chez les femmes est en augmentation, incitant ainsi de nombreux adultes à se tourner vers les méthodes de soins alternatives en vue de gérer leur poids.

**Objectifs :** La présente étude visait à examiner le statut du recours aux médecines complémentaires et alternatives (MCA) dans le cadre de la gestion du poids chez les femmes adultes en Jordanie et le lien possible entre cette pratique et l'indice de masse corporelle (IMC).

**Méthodes :** Un questionnaire structuré, administré par un enquêteur, a été utilisé en 2015 auprès de 858 femmes pour recueillir des données sur l'utilisation et la sécurité des MCA en vue de la gestion du poids. Les données ont été codées et analysées à l'aide du logiciel SPSS, version 20.

**Résultats :** Près de 40 % des femmes interrogées indiquaient avoir recours à certaines formes de MCA en vue de gérer leur poids. Les suppléments alimentaires commercialisés (31,2 %), les remèdes à base de plantes (26,7 %) et les remèdes populaires (18,0 %) étaient couramment utilisés. Le thé vert et les comprimés de fibres étaient les compléments à base de plantes les plus largement utilisés. L'analyse de régression logistique indiquait que les participantes en surpoids recouraient plus fréquemment aux MCA que celles qui étaient obèses. En ce qui concerne les MCA, les proches et les amis

constituaient les principales sources d'information. Seuls 31,9 % des femmes estimaient que les modalités du recours aux MCA étaient sûres ; près de la moitié pensaient que ces types de médecines n'étaient pas recommandées pendant la grossesse (52,5 %) et l'allaitement (48,0 %). Seulement 49,7 % avaient connaissance des effets secondaires et 41,5 % des interactions médicamenteuses.

**Conclusion :** Cette étude a révélé que les MCA sont souvent utilisées dans la cadre de la gestion du poids. Il convient d'augmenter la sensibilisation à l'égard de cette pratique en association avec d'autres médicaments et pendant la grossesse et l'allaitement.

## استخدام الطب التكميلي والبديل للتحكم بالوزن بين الإناث في الأردن: مسح مجتمعي

ميادة بشير شحادة، غدير اسعيفان، آلاء أبو عودة، رلى درويش

### الخلاصة

الخلفية: هناك توثيق جيد للعلاقة بين البدانة والإصابة بمختلف الأمراض المزمنة. وفي الأردن، يزداد معدل انتشار زيادة الوزن (30.0%) والبدانة (38.8%) بين الإناث على نحو مطرد، الأمر الذي دفع الكثير من البالغين إلى الاعتماد على وسائل الرعاية الصحية البديلة من أجل التحكم في أوزانهم. الأهداف: هدفت الدراسة إلى الكشف عن مدى وضع استخدام الطب التكميلي والبديل من أجل التحكم في الوزن بين الإناث البالغات في الأردن والعلاقة المحتملة بين استخدام الطب التكميلي والبديل ومؤشر كتلة الجسم.

طرق البحث: استُخدم استبيان قائم على إجراء المقابلات بصورة منظمة من أجل جمع بيانات من 858 سيدة في عام 2015 حول استخدام الطب التكميلي والبديل ومأمونيته فيما يتعلق بالتحكم في الوزن. ورُمّزت استجابات المشاركين وخضعت للتحليل باستخدام الإصدار 20 من برنامج SPSS.

النتائج: أبلغ 40% من المشاركات باستخدامهن نوعاً من أنواع الطب التكميلي والبديل للتحكم في أوزانهم. وتبين شيوع استخدام المكملات الغذائية التجارية (31.2%)، والعلاجات العشبية (26.7%) والعلاجات الشعبية (18.0%). وكان الشاي الأخضر وأقراص الألياف هي الأكثر استخداماً من بين المكملات العشبية الأخرى. وأوضح تحليل الانحدار اللوجستي أن المشاركات ذوات الوزن الزائد هن أكثر المستخدمات للطب التكميلي والبديل، مقارنة بالمشاركات البدينات. وكان الأقارب والأصدقاء هم المصدر الرئيسي للمعلومات بشأن الطب التكميلي والبديل. واعتقد 31.9% فقط من النساء أن الأساليب المتبعة في الطب التكميلي والبديل مأمونة؛ بينما اعتقد نحو نصف النساء أن تلك الأساليب غير مأمونة أثناء الحمل (52.5%) وأثناء الإرضاع (48.0%). وكان 49.7% فقط على وعي بالآثار الجانبية، و 41.5% على وعي بالتفاعلات الدوائية.

الاستنتاج: كشفت هذه الدراسة عن استخدام الطب التكميلي والبديل في كثير من الأحيان بغرض التحكم في الوزن. ولذا، يتعين التصدي لإذكاء الوعي بالاستخدام الآمن للطب التكميلي والبديل مع الأدوية الأخرى وأثناء الحمل والإرضاع.

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# Baseline survey for malaria prevalence in Khyber Pakhtunkhwa Province, Pakistan

Humera Qureshi,<sup>1,2</sup> Muhammad Imran Khan,<sup>1,2</sup> Henock Ambachew,<sup>3,4</sup> Hai-Feng Pan<sup>1,2</sup> and Dong-Qing Ye<sup>1,2</sup>

<sup>1</sup>Department of Epidemiology and Biostatistics, School of Public Health, Anhui Medical University, Hefei, Anhui, China. <sup>2</sup>Anhui Province Key Laboratory of Major Autoimmune Diseases, Hefei, Anhui, China. <sup>3</sup>Department of Clinical Laboratory Diagnostics, First Affiliated Hospital, Anhui Medical University, Hefei, Anhui, China. <sup>4</sup>School of Medical Laboratory Sciences, College of Medicine and Health Sciences, Hawassa University, Hawassa, Ethiopia. (Correspondence to: Dong-Qing Ye: ydq@ahmu.edu.cn, ydqahmu@126.com).

## Abstract

**Background:** *Plasmodium falciparum* and *P. vivax* are prevalent in Pakistan. Data on the epidemiology of *Plasmodium* infections in Khyber Pakhtunkhwa province are lacking.

**Aims:** This study aimed to: 1) determine the malaria prevalence in three districts of Khyber Pakhtunkhwa province with endemic malaria (Bannu, Dera Ismail Khan and Lakki Marwat); 2) determine household ownership of long-lasting insecticidal bed nets in the districts; and 3) assess malaria services in health facilities in the districts, in order to provide baseline information for malaria control in these areas.

**Methods:** A cross-sectional study was conducted. In total, 31 041 individuals were selected for the malaria prevalence survey, 864 households for the insecticidal net ownership survey and 98 health facilities for malaria services. Rapid diagnostic tests were used to test for malaria.

**Results:** Overall, 4297 (13.8%) people tested positive for malaria. The prevalence of *P. vivax*, *P. falciparum* and mixed infection was 92.4%, 4.7% and 2.9%, respectively. The prevalence of malaria infection differed significantly between districts ( $P < 0.05$ ). Prevalence was higher in people over 14 years and in women for *P. vivax* and *P. falciparum* malaria ( $P < 0.05$ ). Only 44.1% of households owned one or more insecticidal nets. The most common drugs used to treat malaria were primaquine (62.5% of cases) and chloroquine (36.1%).

**Conclusions:** The prevalence of malaria infection was high in the three districts. Malaria services in the health facilities were weak. Household ownership of long-lasting insecticidal nets was low. Malaria control or elimination strategies should be strengthened in these districts.

Keywords: malaria, prevalence, rapid diagnostic tests, Khyber Pakhtunkhwa, Pakistan

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## Introduction

Malaria is still an important global public health problem. It is estimated that about three billion people are at risk of acquiring malaria and 212 million cases and 429 000 related deaths occurred in 2015 (1). Malaria is one of the most devastating parasitic diseases in Pakistan, with a higher malaria death rate compared with any other country in Asia. *Plasmodium falciparum* and *P. vivax* are two widespread species that cause a high rate of morbidity and mortality (2). According to the World Health Organization's (WHO) 2013 malaria report, the prevalence of *P. vivax* and *P. falciparum* was 88% and 12% respectively in Pakistan (3). An estimated 500 000 cases of malaria and 50 000 deaths attributed to malaria occur annually in Pakistan (4,5), with a 37% malaria incidence reported along the borders of Afghanistan and the Islamic Republic of Iran. In the past few decades, malaria transmission has been highest in the northern part of Pakistan, especially in Khyber Pakhtunkhwa province (6,7).

Malaria transmission is seasonal and Pakistan is susceptible to epidemic outbreaks in certain geographical

areas, predominantly Khyber Pakhtunkhwa, Sindh and Balochistan provinces. In Khyber Pakhtunkhwa province, the three malaria-endemic districts are Bannu, Dera Ismail Khan and Lakki Marwat (8). The peak season of *P. vivax* transmission is from June to September and again from April to June when relapses of *Plasmodium* infections developed from the previous season are observed (9). The main *P. falciparum* transmission period in Pakistan is between August and December (10).

Cross-sectional surveys on malaria transmission were conducted in five Afghan refugee camps between 24 June and 19 September, 2010, to evaluate malaria infection (11). The prevalence of malaria infection in the camps ranged from 0–0.2% for *P. falciparum* and 0.4–9% for *P. vivax* using rapid diagnostic tests and 0–1.39% for *P. falciparum* and 5–15% for *P. vivax* using polymerase chain reaction techniques. The prevalence of antimalaria antibodies to *P. falciparum* and *P. vivax* antigens was 3–11% and 17–45% respectively (11). A cross-sectional study of households in four geographically and sociodemographically distinct areas around Mumbai, India, found that most

households were familiar with bed nets as an essential control strategy, but only 30% used them and only 4% used insecticide-treated bed nets. Prevention practices and knowledge differed across the four areas (12). A study in the Federally Administrated Tribal Areas of Pakistan reported that, 626 of 691 patients of all age groups and both sexes were positive for malaria using polymerase chain reaction. Among these positive cases, *P. vivax* (81.1%), *P. falciparum* (13.8%) and mixed infections (4.9%) containing both *P. falciparum* and *P. vivax* were reported (11).

An epidemiological study was conducted in some areas of Pakistan but investigation of malaria transmission on a nationwide scale has been hindered by the shortage of data from several areas (10). Surveillance of and reporting methods for *Plasmodium* infections are weak and epidemiological data inadequate.

It is most important to understand the burden of malaria in a specific area to obtain usable information for different stakeholders involved in prevention and control of malaria. Therefore, the present study aimed to determine the baseline burden of malaria and health facilities providing malaria services in three endemic districts of Khyber Pakhtunkhwa, Pakistan.

## Methods

### Study design, area and period

This was a cross-sectional study conducted in three districts of Khyber Pakhtunkhwa with endemic malaria: Bannu, Dera Ismail Khan and Lakki Marwat districts. The estimated total population in the study area was 3 634 186 (1 218 416 in Bannu, 1 239 247 in Dera Ismail Khan, and 1 176 523 in Lakki Marwat). The study was done between August and October 2015, which is the peak season for malaria transmission.

Before the survey, in 2014, the prevalence of malaria had peaked for several reasons, mainly socioeconomic as a result of an unstable political environment and the migration of people from North Waziristan to neighbouring districts in Khyber Pakhtunkhwa. A total of 950 000 people were displaced (73% women and children) and were resettled in local communities and camps (13).

### Sample selection

All 98 health care centres offering rapid diagnostic testing for malaria were surveyed in the three endemic districts (36 in Bannu, 37 in Dera Ismail Khan and 25 in Lakki Marwat). Epidemiological data were obtained using a multistage cluster sampling technique: health care centres were first selected followed by simple random selection of households in urban and rural areas of the three districts. A total of 31 041 individuals and 864 households were included in this study. The strata were urban and rural locations. The data were categorized according to sex, age and *Plasmodium* species.

### Rapid diagnostic test

Malaria rapid diagnostic tests detect evidence of malaria

parasites in human blood. These tests allow reliable detection of malaria infections especially in remote areas with limited access to good quality microscopy services. Rapid diagnostic tests are comparatively easy to perform and interpret; they rapidly provide results, require limited training and allow malaria diagnosis by the public. These tests detect specific antigens produced by malaria parasites that exist in the blood of an infected individual. Some rapid diagnostic test kits detect a single species, either *P. vivax* or *P. falciparum*, some detect multiple species (*P. vivax*, *P. falciparum*, *P. ovale* and *P. malariae*) and some can differentiate between *P. falciparum* and non-*P. falciparum* infections. For rapid diagnostic tests, blood is usually obtained from a finger-prick and results are available within 15–30 minutes.

### Data collection

The main data collection tool used in this study was a survey questionnaire, which consisted of three parts: registration form for the rapid diagnostic test, malaria facility service form for the health care centres and a long-lasting insecticidal nets (LLINs) form for households. Demographic data including age, sex, place of residence, the name of the health care centre, individual identification code were incorporated in the database for the rapid diagnostic test examination. The form on LLINs comprised questions on the family size and the total number of LLINs. The malaria facility service form comprised information on malaria diagnosis, treatment and LLIN distribution at the health care centre.

To assure the quality of data collected, a variety of quality control activities were implemented. Data collectors were trained, rapid diagnostic tests were rechecked (10% positive and 20% negative), experienced professionals provided supervision, and the integrity and completeness of the data were monitored.

### Data analysis

SPSS, version 23 was used for data analysis. Means and standard deviations (SD) were calculated for continuous variables and frequencies and percentages for categorical variables. The chi-squared test was used to explore the relationship between categorical variables.  $P \leq 0.05$  was considered statistically significant.

### Ethical considerations

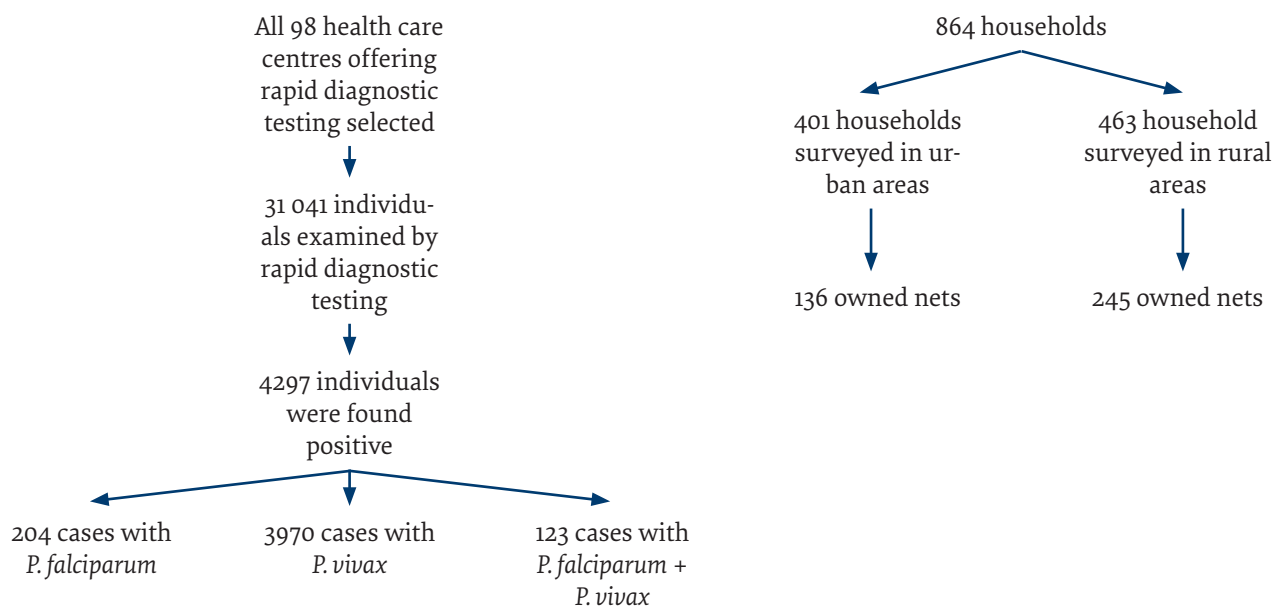
Ethical clearance for the study was obtained from the Institutional Review Board of Anhui Medical University, China. Permission to conduct the research and relevant information was obtained from the Directorate of the Malaria Control Programme, Pakistan.

For the LLIN survey, we obtained verbal consent from the householders who filled the questionnaires and were interviewed.

## Results

Figure 1 shows the overall rate of malaria diagnosis at health centres and net ownership in households.

Figure 1 Flow chart of malaria diagnosis at health centres and net ownership in households



### Characteristics of the sample

A total of 31 041 individuals with malaria symptoms attending the health centres (9117 individuals from Bannu, 13 659 from Dera Ismail Khan, and 8265 from Lakki Marwat) were surveyed. The male to female ratio was 1.17 and 60% were under 15 years of age (Table 1). A total of 864 households (286 households from Bannu, 312 from Dera Ismail Khan, and 266 from Lakki Marwat) were interviewed on LLIN ownership. Information on diagnosis, reporting and treatment facilities for malaria and the system for distribution of LLINs was obtained from the 98 health care centres. The services are provided by the government while international nongovernmental organizations provide the nets.

### Prevalence of malaria infection

A total of 4297 (13.8%) people were positive for malaria using the rapid diagnostic test, of which 3970 (92.4%) were positive for *P. vivax*, 204 (4.7%) for *P. falciparum* and 123 (2.9%) showed mixed infection (*P. vivax* and *P. falciparum*). The average malaria prevalence in the three districts was 13.8%, while the average ratio of *P. vivax*/*P. falciparum* in the three districts was 0.05. The prevalence of malaria in Bannu district was higher than Lakki Marwat and Dera Ismail Khan districts, and the difference in malaria prevalence between the three districts was statistically significant ( $\chi^2 = 594.74$ ,  $P < 0.001$ ). Table 2 shows the prevalence of malaria infection in the three districts according to *Plasmodium* species.

The prevalence of malaria in children under five years and 5–14 years, and those more than 14 years was 5.2%, 10.5%, and 22.6% respectively (Table 3). The prevalence was higher in individuals more than 14 years than the

other age groups ( $\chi^2 = 1670.01$ ,  $P < 0.001$ ) (Table 3). The prevalence of malaria was higher in females than males: *P. falciparum* 0.7% versus 0.6% ( $\chi^2 = 11.87$ ,  $P = 0.003$ ) and *P. vivax* 14.2% versus 11.5% ( $\chi^2 = 39.71$ ,  $P < 0.001$ ). For mixed infections no difference was found between males and females (0.4% each).

### Malaria treatment in health care centres

The main treatment used for malaria infection reported by the health centres in all the districts was primaquine, followed by chloroquine (Table 4). In Bannu district, primaquine was used to treat 60.7% of the cases of malaria in the 36 health centres performing rapid diagnostic tests, followed by chloroquine in 37.2%. In Dera Ismail Khan district, 62.7% of cases of malaria in the 37 health centres performing rapid diagnostic tests were treated with primaquine and 36.2% with chloroquine. In Lakki Marwat district 64.2% of cases of malaria in the 25 health centres performing rapid diagnostic tests were treated with primaquine and 34.7% with chloroquine. Only a small number of cases were treated with artesunate + sulfadoxine-pyrimethamine and only 3 cases were treated with artemether + lumefantrine. In addition, only a small proportion of cases were treated with quinine. The chloroquine and primaquine usage ratio was 0.58 across all health centres.

### Household net ownership

No mosquito nets were re-treated with insecticide in the three endemic districts. Fewer than half of the households (44.10%) owned one or more LLINs. All the LLINs had been distributed by The Global Fund (LLINs were introduced in 2004–2005 by The Global Fund). There were slight differences between the three districts: LLIN own-

**Table 1 Demographic characteristics of residents surveyed for malaria in three endemic districts in Pakistan, 2015 (n = 31 041)**

Characteristics	Bannu (n = 9117)	Dera Ismail Khan (n = 13 659)	Lakki Marwat (n = 8265)	Total (N = 31 041)
	No. (%)	No. (%)	No. (%)	No. (%)
<b>Age (years)</b>				
0–5	2523 (27.7)	3702 (27.1)	2461 (29.8)	8 686 (28.0)
5–14	1809 (19.8)	5543 (40.6)	2569 (31.1)	9 921 (32.0)
> 14	4785 (52.5)	4414 (32.3)	3235 (39.1)	12 434 (40.1)
<b>Sex</b>				
Male	4949 (54.3)	7665 (56.1)	4112 (49.8)	16 726 (53.9)
Female	4168 (45.7)	5994 (43.9)	4153 (50.2)	14 315 (46.1)

ership in Bannu was higher than Dera Ismail Khan and Lakki Marwat ( $\chi^2 = 7.11$ ,  $P = 0.029$ ) (Table 5).

## Discussion

Malaria incidence and prevalence can be effectively reduced through active and passive diagnosis (14). Accurate evaluation of malaria infection can also be useful in scaling up control interventions and malaria surveillance in Pakistan (15). Thus, to accomplish and continue the malaria eradication operation in Pakistan, the prevalence of *Plasmodium* species was determined in three endemic districts of Khyber Pakhtunkhwa using rapid diagnostic tests.

Since the late 1970s, the annual incidence rates of malaria reported by the health departments of four provinces have gradually increased. Punjab province reported a rapid increase until the mid-1980s, a slow decrease in the late 1980s and a rise in the 1990s. The current malaria prevalence in Punjab province is very low; the prevalence ranged from 1.7% in Lahore to 5.5% in Bhakkar districts. Khyber Pakhtunkhwa and Sindh provinces reported increases in malaria prevalence in all areas, while Baluchistan province reported an increase in the 1990s (10,16). In the 1980s, the malaria burden was mostly in the northern and southern regions of Khyber Pakhtunkhwa province but this moved to western areas in the 1990s. By the end of the 1990s, a band of relatively high malaria prevalence extended from Swat and Chitral in the north to Mardan, Malakand, Swabi, and Khyber and Mohmmmand along the western border with Afghanistan (7).

Our study provides baseline information for malaria control in the three endemic districts of Khyber Pakhtunkhwa province. We found that in people with malaria symptoms, the overall prevalence of malaria was 13.8%, of which *P. vivax* and *P. falciparum* accounted for 92.4% and 4.7% respectively. The predominance of *P. vivax* is consistent with studies conducted in other parts of Pakistan (10,17–19), but our findings differ from another study in East Balochistan (20). Another study also described a high prevalence (10.8%) of *Plasmodium* infection and a high proportion of cases attributed to *P. falciparum* in Bannu, Hangu and Thall districts of Khyber Pakhtunkhwa province (10). In other highly endemic districts of Khyber Pakhtunkhwa province (that were not part of our study), a comparatively high prevalence of *P. falciparum* was found, ranging from 16% in Buner (21) to 25% in Bannu and Abbottabad (22,23). Cross-border migration may have contributed to the surge or maintenance of *Plasmodium* infections in these areas. From 1979 to 1982, refugees from Afghanistan fled across the border into Balochistan and Khyber Pakhtunkhwa provinces (24).

Our study also shows a high prevalence of malaria in the age group > 14 years, which is consistent with other studies in Pakistan and India (25,26). We also found a higher prevalence of malaria among females than males, which is similar to another study (27), but differs from other studies (28,29). The risk factors and reasons for the sex difference could not be explained because no data were provided on the behaviour of the study participants. In future, such data should be included as a study parameter. The average ratio of *P. falciparum*/*P. vivax* in all

**Table 2 Prevalence of malaria infection in three endemic districts in Pakistan according to *Plasmodium* species, 2015**

District	No.	Total	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. falciparum</i> + <i>P. vivax</i>	<i>P. falciparum</i> : <i>P. vivax</i>
		No. (%)	No. (%)	No. (%)	No. (%)	
Bannu	9 117	1735 (19.0)	112 (1.2)	1567 (17.2)	56 (0.6)	0.07
Dera Ismail Khan	13 659	1245 (9.1)	73 (0.5)	1111 (8.1)	61 (0.4)	0.07
Lakki Marwat	8 265	1317 (15.9)	19 (0.2)	1292 (15.6)	6 (0.1)	0.01
Total	31 041	4297 (13.8)	204 (0.7)	3970 (12.8)	123 (0.4)	0.05

**Table 3 Prevalence of malaria infection by age and sex and *Plasmodium* species in three endemic districts in Pakistan, 2015**

Characteristic	No.	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. falciparum</i> + <i>P. vivax</i>	Total	<i>P. falciparum</i> : <i>P. vivax</i>
		No. (%)	No. (%)	No. (%)	No. (%)	
<b>Age (years)</b>						
0–< 5	8 686	99 (1.1)	336 (3.9)	13 (0.2)	448 (5.2)	0.29
5–14	9 921	49 (0.5)	933 (9.4)	58 (0.6)	1040 (10.5)	0.05
> 14	12 434	56 (0.4)	2701 (21.7)	52 (0.4)	2809 (22.6)	0.02
Total	31 041	204 (0.7)	3970 (12.8)	123 (0.4)	4297 (13.8)	0.05
<b>Sex</b>						
Male	16 726	101 (0.6)	1930 (11.5)	64 (0.4)	2095 (12.5)	0.05
Female	14 315	103 (0.7)	2040 (14.2)	59 (0.4)	2202 (15.4)	0.05
Total	31 041	204 (0.7)	3970 (12.8)	123 (0.4)	4297 (13.8)	0.05

three districts was 0.05.

LLINs have played an important role in reducing malaria transmission over the past few decades. In the initial stage, LLINs were introduced in Pakistan, including in Khyber Pakhtunkhwa, and implemented by The Global Fund in Pakistan. Different approaches were used for distribution of the nets including the use of community health workers, campaigns to raise people's awareness about LLINs and their importance, and private outlets. In 2012, the procedure was reformed and a comprehensive LLIN distribution strategy was developed and implemented in endemic districts of Pakistan with the support of The Global Fund (30,31).

Household ownership of LLINs in the three endemic districts was very low (44.1%); large numbers of LLINs should be disseminated freely to the residents to protect them from *Plasmodium* infection. During the household survey, it was noted that some people had not used the LLINs distributed three years before. Malaria health education should be provided in schools to encourage the use of LLINs (30–32). In the three endemic districts, comprehensive interventions should be provided, such as antimalarial drugs, bed nets and malaria health education.

Malaria control needs an integrated approach, including prevention (mainly vector control) and early treatment, with effective antimalarial agents. In 2010, all countries in which *P. falciparum* malaria is endemic have progressively updated their treatment policy from use of monotherapy with drugs such as chloroquine,

amodiaquine and sulfadoxine-pyrimethamine to the currently recommended artemisinin-based combination therapies. The combination therapies are generally highly effective and well tolerated. This has contributed significantly to reductions in worldwide mortality and morbidity from malaria. Unfortunately, resistance to artemisinin has arisen recently in *P. falciparum* in south-east Asia, which threatens these gains (33).

According to our results, the main treatment used for malaria infection in the health centres in all the districts was primaquine, followed by chloroquine. Overall in the three districts, primaquine was used to treat 62.5% of the cases of malaria in the 98 health centres performing rapid diagnostic tests, followed by chloroquine in 36.1%. Only a small number of cases were treated with artesunate + sulfadoxine-pyrimethamine while only three cases were treated with artemether + lumefantrine. In 2004, the cure rate with chloroquine treatment was reported to be 58% in Punjab and only 17% in Sindh and Balochistan (4). While the effectiveness of sulfadoxine-pyrimethamine and amodiaquine in Balochistan resulted in a treatment success rate of 44% and 47% respectively. The treatment rate with artesunate + sulfadoxine-pyrimethamine in the Federally Administered Tribal Areas in 2004 was 97%. Similarly, the tested efficiency of artesunate + sulfadoxine-pyrimethamine in Sindh, Balochistan and the Federally Administered Tribal Areas provided a treatment success rate of 100% in 2008. Likewise in 2009, the treatment rate with artemether and lumefantrine in the Federally Administered Tribal Areas, Balochistan, Khyber Pakhtunkhwa and Sindh was also 100% (4).

**Table 4 Malaria treatment in health centres performing rapid diagnostic tests in three endemic districts in Pakistan, 2015**

District	Health centres	ACT (AS+SP)	Chloroquine	Primaquine	ACT (ART+LF)	Tab quinine	Total	Chloroquine: primaquine
	No.	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Bannu	36	120 (0.3)	13 810 (37.2)	22 494 (60.7)	1 (0.0)	644 (1.7)	37 069	0.61
Dera Ismail Khan	37	133 (0.5)	9992 (36.2)	17 320 (62.7)	0 (0.0)	182 (0.7)	27 627	0.58
Lakki Marwat	25	19 (0.1)	11 935 (34.7)	22 110 (64.2)	2 (0.0)	352 (1.0)	34 418	0.54
Total	98	272 (0.27)	35 737 (36.1)	61 924 (62.5)	3 (0.0)	1178 (1.2)	99 114	0.58

ACT (AS+SP): artemisinin combination therapy (artesunate+sulfadoxine-pyrimethamine); ACT (ART+LF): artemisinin combination therapy (artemether + lumefantrine)

**Table 5 Household ownership of long-lasting insecticidal nets in three districts with endemic malaria in Pakistan according to area, 2015**

District	No. households surveyed		No. households owning nets		Ownership rate (%)		Total (%)
	Urban	Rural	Urban	Rural	Urban	Rural	
Bannu	135	151	46	89	34.1	58.9	47.2
Dera Ismail Khan	147	165	49	81	33.3	49.1	41.7
Lakki Marwat	119	147	41	75	34.4	51.0	43.6
Total	864		381		44.1		

In 1981, antimalarial drug chloroquine resistance was first identified in Sheikhpura district of Punjab. A study by the National Institute of Malaria Research and Training with analysis from 1977 to 1995 showed considerable R1 level chloroquine resistance (initial response good to the drug but parasitaemia returns within one month of cure) in Pakistan, with a frequency ranging from 30% to 84%. From 2004 to 2009, programme assessments of antimalarial drug's efficacy documented that resistance to chloroquine was common in falciparum malaria in all parts of the country, while resistance to sulfadoxine-pyrimethamine was 100%. Furthermore, artemisinin-based combination therapy has been found to be 100% effective in treating uncomplicated falciparum malaria cases; which is why this combination therapy was officially adopted as the first-line treatment for uncomplicated confirmed falciparum malaria (4).

The study has some limitations. It was conducted in the three endemic districts of Khyber Pakhtunkhwa province (Bannu, Dera Ismail Khan, and Lakki Marwat);

thus, the findings cannot be generalized to the whole country. Furthermore, due to the cross-sectional nature of the study, causality cannot be assumed in the association between risk factors and malaria prevalence. To determine the seasonal variation and other risk factors for malaria prevalence in these three districts another study should be done for a longer period.

The findings of our study indicate that the prevalence of malaria in the three endemic districts of Khyber Pakhtunkhwa is high. Bannu district had the highest prevalence of malaria. Individuals in the age group > 14 years were more affected by malaria. In all districts, the health care facilities for malaria services appeared weak. In addition, household LLIN ownership was also low. Special attention should be given to those living in these districts and malaria control or elimination strategies should be strengthened.

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**Competing interests:** None declared.

## Enquête initiale sur la prévalence du paludisme dans la province de Khyber Pakhtunkhwa au Pakistan

### Résumé

**Contexte :** Le *Plasmodium falciparum* ainsi que le *P. vivax* sont prévalents au Pakistan. Il n'existe pas de données disponibles sur l'épidémiologie des infections à *Plasmodium* dans la province de Khyber Pakhtunkhwa.

**Objectifs :** La présente étude avait pour objectifs i) de déterminer la prévalence du paludisme dans trois districts de la province de Khyber Pakhtunkhwa touchés par le paludisme endémique (Bannu, Dera Ismail Khan et Lakki Marwat) ; ii) de déterminer la proportion de ménages disposant de moustiquaires imprégnées d'insecticide à effet rémanent dans les districts ; et iii) d'évaluer les services de lutte antipaludique dans les établissements de santé de ces districts afin de fournir des informations de base permettant de lutter contre cette maladie dans ces zones.

**Méthodes :** Une étude transversale a été menée. Au total, 31 041 individus ont été sélectionnés pour l'enquête sur la prévalence du paludisme, 864 ménages pour l'enquête sur la possession de moustiquaires et 98 établissements de santé pour les services de lutte antipaludique. Des tests diagnostiques rapides ont été utilisés pour le dépistage du paludisme.

**Résultats :** Au total, 4297 personnes (13,8 %) ont été testées positives pour le paludisme. La prévalence de l'infection à *P. vivax*, à *P. falciparum* ou par les deux espèces était respectivement de 92,4 %, 4,7 % et 2,9 %. On a observé des différences importantes en ce qui concerne la prévalence de l'infection palustre entre les districts ( $p < 0,05$ ). La prévalence de l'infection à *P. vivax* et à *P. falciparum* était plus élevée chez les personnes de plus de 14 ans et chez les femmes ( $p < 0,05$ ). Seulement 44,1 % des ménages possédaient une ou plusieurs moustiquaires imprégnées d'insecticide. Les médicaments antipaludiques les plus couramment utilisés étaient la primaquine (62,5 % des cas) et la chloroquine (36,1 %).

**Conclusions :** La prévalence de l'infection palustre était élevée dans les trois districts endémiques du Khyber Pakhtunkhwa. Les services de lutte antipaludique des établissements de santé étaient déficients. Le taux de possession par les ménages de moustiquaires imprégnées d'insecticide à effet rémanent était bas. Les stratégies de lutte antipaludique ou d'élimination de cette maladie doivent être renforcées dans ces districts.

## مسح مرجعي لمعدل انتشار الملاريا في إقليم خيبر باختونخوا، باكستان

حميرا قورشبي، محمد عمران خان، هينوك أمباتشو، هاي فينج بان، دونج كينج بي  
الخلاصة

الخلفية: تنشر كل من المتصورة المنجلية والمتصورة النشيطة في باكستان. ويتعذر الحصول على بيانات السمات الوبائية لحالات العدوى التي تسببها المتصورة في إقليم خيبر باختونخوا.

الأهداف: هدفت هذه الدراسة إلى تحديد معدل انتشار الملاريا ومعدل امتلاك الأسر للناموسيات المتينة المعالجة بمبيد الحشرات وتقييم خدمات الملاريا في المرافق الصحية في ثلاث مناطق بالإقليم مستوطنة بالملاريا (وهي بانو، وديرا إسماغيل خان، ولاكي مروات) من أجل توفير المعلومات الأساسية لمكافحة الملاريا في تلك المناطق.

طرق البحث: أجريت دراسة مقطعية باستخدام أسلوب المعاينة العنقودية. وإجمالاً، فقد اختير 31041 فرداً لمسح معدل انتشار الملاريا، و 864 أسرة لمسح امتلاك الناموسيات، و 98 مرفقاً صحياً لمسح خدمات الملاريا. واستخدمت الاختبارات التشخيصية السريعة لاختبار الملاريا.

النتائج: من بين الأفراد الخاضعين للاختبار والبالغ عددهم 31041 فرداً، جاءت نتيجة اختبار الملاريا إيجابية لدى 4297 فرداً (13.8%). وبلغ معدل انتشار العدوى بالمتصورة النشيطة، والمتصورة المنجلية، والعدوى المشتركة بينهما 92.4%، و 4.7%، و 2.9% على التوالي. وكانت هناك اختلافات جوهرية بين معدل انتشار العدوى بالملاريا بين المناطق الثلاثة ( $P < 0.05$ ). وكان معدل الانتشار أعلى في تلك المناطق دون سواها على امتداد 14 عاماً ( $P < 0.05$ )، وفي صفوف النساء بالنسبة للعدوى بالمتصورة النشيطة والمتصورة المنجلية ( $P < 0.05$ ). ولم يمتلك ناموسية واحدة أو أكثر معالجة بمبيدات الحشرات سوى 44.1% من الأسر. وكانت الأدوية الأكثر شيوعاً المستخدمة في علاج الملاريا البريماكين (في 62.5% من الحالات) والكلوروكين (36.1%).

الاستنتاجات: كان معدل انتشار الملاريا مرتفعاً في المناطق الثلاثة المستوطنة بالمرض في إقليم خيبر باختونخوا. واتسمت خدمات الملاريا في المرافق الصحية بالضعف. وكان معدل امتلاك الأسر للناموسيات متينة معالجة بمبيدات الحشرات منخفضاً. لذا، ينبغي تعزيز استراتيجيات مكافحة الملاريا أو القضاء عليها في تلك المناطق.

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# Prevalence of hepatitis B and anti-hepatitis C virus antibody among people who inject drugs in the Lebanese population

Antoine Abou Rached,<sup>1,2</sup> Mary Nakhoul,<sup>1</sup> Carine Richa,<sup>1</sup> Afif Jreij,<sup>1</sup> Pierre Abi Hanna<sup>1</sup> and Walid Ammar<sup>2</sup>

<sup>1</sup>Faculty of Medical Science, Lebanese University, Hadath, Lebanon (Correspondence to: Abou Rached Antoine: abourachedantoine@gmail.com). <sup>2</sup>Ministry of Public Health, Beirut, Lebanon.

## Abstract

**Background:** People who inject drugs (PWIDs) are prone to a number of blood-borne viral infections. Hepatitis B virus (HBV) and hepatitis C virus (HCV) constitute an important public health concern in this high risk group.

**Aims:** We aimed to determine the prevalence of HBV and HCV antibody among PWIDs in Lebanon.

**Methods:** We conducted a prospective cross-sectional study between June 2015 and June 2016 on PWIDs recruited through Lebanese nongovernmental organizations in collaboration with the Lebanese Ministry of Public Health. The participants were tested for HBs antigen and HCV antibody using rapid test kits. The prevalence of each virus was then calculated. The correlation between both infections and other possible risk factors was also analysed.

**Results:** A total of 250 people were included in our study, of whom 98% were males. Mean age was 31.9 (standard deviation 8.7) years. The prevalence of HBsAg and anti-HCV among PWIDs was 1.2% and 15.6%, respectively. Older age, longer duration of drug use and lack of awareness were significantly correlated with a higher rate of HCV infection ( $P < 0.01$ ). The high rate of needle sharing among our PWIDs significantly affected the prevalence of anti-HCVAb.

**Conclusion:** PWIDs remain the subpopulation most affected with chronic HCV in Lebanon.

Keywords: HPV, HCV, people who inject drugs, Lebanon

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## Introduction

The World Health Organization (WHO) estimates that in 2015, 257 million persons, 3.5% of the world population, were living with chronic HBV infection. The African and Western Pacific regions accounted for 68% of those infected. Also, it is estimated that 71 million persons were living with HCV infection in 2015, i.e. 1% of the world population (1). In 2015, viral hepatitis was responsible for 1.34 million deaths. Mortality from viral hepatitis has increased by 22% since 2000 (1).

Transmission of HBV and HCV has been causally associated with injection drug use by people who inject drugs (PWIDs) due to sharing of needles and injection equipment contaminated with infected blood. Seroprevalence rates for HBV and HCV vary considerably among PWIDs depending on the geographic region and time period for the PWID populations tested.

Injection drug use, unsafe sex and unsterile tattoos are the main modes of transmission of HBV in patient not vaccinated. Injection drug use remains the main mode of transmission in industrialized countries, whereas unsterile tattoos and piercings in nonprofessional settings might play an increasing role in young populations (2).

Unsafe therapeutic injection practices and blood transfusions are also important routes of infection (3). Unsafe health care practices (including unsafe health care

injections) and injection drug use remain the leading modes of transmission of HCV. Areas with high rates of infection are located in the Eastern Mediterranean Region and the European Region. In the Eastern Mediterranean Region, the most common cause of transmission of infection is unsafe health care injections (4,5). In the European Region, injection drug use accounts for a substantial proportion of infections (6).

According to the latest United Nations Office on Drugs and Crime report, around 16.5 million people (0.4% of the total world population) aged 15–64 years use heroin or opium (7).

Lebanon is ranked among the countries with a low endemicity profile for both viruses having a prevalence of 1.74% for HBV and 0.21% for HCV (8); HCV genotype 3 is the most prevalent genotype in the Lebanese PWID population followed by genotype 1 (9). The prevalence of these infections among PWID in Lebanon has previously been estimated at 2.5–5% for HBV and more than 50% for HCV, based on small scale reports (10).

The aim of this study was to determine the prevalence of both infections in PWIDs in the Lebanese population based on a screening strategy applied by a number of nongovernmental organizations and to establish the correlation between both infections and other possible underlying factors within this high-risk group.

## Methods

### Study design

We carried out this cross sectional study between June 2015 and June 2016 on injection drug users recruited through the Middle East and North Africa Harm Reduction Association (MENAHRRA) in collaboration with many other nongovernmental organizations throughout Lebanon.

### Study conduct and data collection

As part of a strategy to control blood-borne viral infections such as HIV and viral hepatitis in high risk groups by the Lebanese Ministry of Public Health, screening for HCV antibodies and HBs antigen and HIV in the PWID population was carried out followed by a vaccination protocol against HBV in seronegative patients. This work was done in collaboration with nongovernmental organizations throughout Lebanon. These organizations were registered in Beirut and their geographic distribution covered Lebanese territory from north to south, Beqaa and Beirut. They included ESCALE, SIDC, SKOUN, AJEM, the nongovernmental organization platform of SAIDA, Oum el Nour, Jeunesse contre la drogue, Cenacle de la lumiere, Nusroto and Bonheur du ciel. The PWIDs presenting to these organizations were from different regions in Lebanon.

All the PWIDs patients presented to the aforementioned nongovernmental organizations were included in our study, after a clear explanation of the aims of the study, independently of their age, sex or duration of drug use. There were no exclusions.

All participants were able to read, 95% signed a consent form in Arabic. Their agreement was guided by the responsible person in the nongovernmental organization. At the time of the study, participants were not under the effects of drugs. They were tested for HBs Ag and HCV Ab using rapid test kits: RDT HEPATITIS B (SD Bioline HBsAg-01FK10W), HBsAg, RDT HEPATITIS C (SD Bioline HCV-02FK10), HCVAb, which are based on enzyme immune assay. None of the PWIDs included were prisoners but some had a previous history of incarceration that is not reported here.

Data collection included age, sex, nationality, presence of any other predisposing factor for viral hepatitis acquisition, other high risk behaviours such as sharing needles, men who have sex with men, sex working, living with someone infected with HBV and/or HCV, sex with a person infected with HBV/HCV, history of blood transfusion, the presence of piercings and tattoos. Further inquiry included the level of awareness and education, which were assessed by asking participants if they had ever heard about HBV/HCV, viral transmission through contaminated blood and unsafe sexual practices or about the existence of HBV vaccination for prevention. They were also asked about any previous HBV vaccination.

All these data were gathered by the responsible person in each nongovernmental organization and were registered in an Excel document.

### Statistical analysis

The prevalence of HBV and anti-HCV antibody among the PWIDs in the study was calculated.

The correlation between the age of participants and test positivity was calculated. The impact of viral hepatitis risk factors of on the prevalence of HBV and anti-HCV antibody was also analysed. The prevalence of needle-sharing between the PWIDs as well as the duration of drug injection were specifically addressed in addition to their association with serologic positivity of HBV and HCV. Similarly, we investigated the knowledge of participants about viral hepatitis and mode of transmission and how it could affect their life. The proportion of participants vaccinated for HBV was also calculated to inform a future viral prevention programme.

The statistical analysis on these associations was done using the Chi-squared ( $\chi^2$ ) test;  $P$ -value  $< 0.01$  was considered the threshold for statistically significant correlation.

## Results

A total of 250 people were included in our study, representing 95% of the total number of PWIDs recruited during the period of the study by the different nongovernmental organizations.

Male sex was predominant, representing 98% of the studied population; only 5 women participated (2% of the population). The majority of PWIDs were adolescents and young adults, with 75% aged under 35 (mean = 31.9; standard deviation 8.7) years. There were 9 Palestinians and 1 Afghan participant; the remaining 240 were Lebanese

Only 3 participants were positive for HBs Ag, prevalence 1.2%. All of the HBV-positive PWIDs were male and Lebanese. Their mean age was 29.7 years. Although they appeared to be younger compared to other PWIDs seronegative for HBV (mean age = 31.91 years), the difference in age was not statically significant ( $P = 0.66$ ).

We found 39 patients were positive for HCV antibody, prevalence 15.6%. One individual was co-infected with HBV. All were males, 3 were Palestinians and the remaining 36 were Lebanese. The mean age was 35.8 years. They were significantly older than the PWID population seronegative for HCV included in this study ( $P = 0.01$ ).

The association between men who have sex with men, sex working, living with someone infected with HBV/HCV, sex with a person infected with HBV/HCV, history of blood transfusion, history of tattoos or piercings and the frequency of HBV and HCV in our PWIDs population showed that none of these risk factors significantly affected the prevalence of either infection (Table 1).

Among the study population, 83 participants reported sharing needles (33.2%). Two of the 3 HBV positive (66.7%) and 21 of the 39 HCV positive (53.8%) individuals had a history of sharing needles. We noted a significant association between needle sharing and the occurrence

**Table 1 Association between risk factors for viral hepatitis and the frequency of hepatitis B virus (HBV) and hepatitis C virus (HCV) in the intra-venous drug user (IVDU) population, Lebanon, 2015–2016 (n = 250)**

Risk factor	HCV			HBV		
	Frequency		Correlation with HCV in IVDU population	Frequency		Correlation with HBV in general population
	No.	%	P-value**	No.	%	P-value*
Men who have sex with men	0	0.0	–a	0	0.0	–a
Sex worker	2	5.1	0.579	0	0.0	0.738
Living with someone infected with HBV/HCV	0	0.0	0.333	0	0.0	0.804
Sex with a person infected with HBV/HCV	0	0.0	0.456	0	0.0	0.848
History of blood transfusion	4	10.2	0.13	0	0.0	0.710
History of sharing needles	21	53.8	0.0029	0	0.0	0.221
Never heard of HBV/HCV or its mode of transmission	9	23.0	0.01	3	100	0.20
Presence of piercing	4	10.2	0.110	0	0.0	0.370
Presence of tattoos	17	43.5	0.570	0	0.0	0.170

\*\*Significant at the 0.01 level (2-tailed).

<sup>a</sup>Cannot be computed (at least 1 of the variables is constant). There were no men who have sex with men among participants

of HCV infection ( $P = 0.0029$ ), but for HBV it was not significant ( $P = 0.22$ ).

The mean duration of drug use was 125.0 weeks among our PWID population and 240.5 weeks among the HCV-positive participants, with a statistically significant association between longer duration of injection drug use and positive HCV serology ( $P = 0.001$ ).

Concerning awareness of viral hepatitis, 54 PWIDs (21.6%) had never heard about HBV/HCV and the risk of transmission through contaminated blood or needle stick or unsafe sexual practices. These groups have a significant risk for infection with HCV ( $P = 0.01$ ). Additionally, 164 PWIDs (65.6%) had never heard that HBV can be prevented by vaccination.

Only 45 PWIDs (18%) had received the HBV vaccine prior to our study. None of them tested positive for HBV.

## Discussion

Our study has provided an updated evaluation for HBV and HCV prevalence among PWIDs in Lebanon, i.e. 1.2% and 15.6%, respectively.

The prevalence of hepatitis B in this group of the population is lower than among the general population overall (1.74%) (8), but when compared to the same age group in the general population it is higher. Data on other high risk groups in Lebanon give a prevalence of 1.6% in haemodialysis patients (11), 0.99% in men who have sex with men (12), 0.28% in thalassaemic patients (13), 2.4% among prisoners secondary to unprotected sexual intercourse and tattooing as well as PWIDs (14), and 6.9% in HIV patients (15). A previous study on PWIDs in Lebanon found a prevalence of 0–5% for HBV infection (10).

This prevalence of HBV in the PWID population was lower than figures reported in the surrounding Middle Eastern countries (10). The prevalence of surface HBV

antigen in a European review for PWIDs was available for 21 of the 34 countries; this ranged from 0% to 21.3% (16). In 10 countries it exceeded 10% (10). The HBs Ag prevalence in PWIDs was on average 9 times higher than in the general population (in 6 of the 8 countries that had both estimates available). In Romania and Ireland, HBs Ag estimate among the general population was higher (5.6% vs 4.7%, 0.1% vs 0.0%, respectively) (16).

In our study, only 18% of PWIDs were actually vaccinated against HBV while 65% did not know that HBV can be prevented by vaccination. Knowing the importance of vaccination in HBV prevention, these findings reflect a significant lack of education and awareness programmes for PWIDs in our country as well as an inefficient strategy for reaching and vaccinating this group.

The prevalence of anti-HCV antibody in our PWIDs was significantly higher than among the general Lebanese population and among haemodialysis patients and prisoners, making injection drug users the population group most affected. Mahfoud et al. reported a higher anti-HCV antibody prevalence reaching 52.8% in 106 Lebanese PWIDs (17). These individuals appeared to be older than our participants (mean age 40 years); more than 75% of the infected subjects had tattoos and almost all of them had a history of imprisonment. These factors may explain the higher results. Another study found that 27.6% of 309 PWIDs in Lebanon were anti-HCV positive and this was associated with incarceration, sharing/reusing needles and a history of sexually transmitted disease in the previous year (Table 2). Both of these studies were conducted using the respondent driven sampling method, which can reach hidden populations such as PWIDs but at the expense of a somehow lower data accuracy in comparison with population based-surveys.

**Table 2 Association between risk factors and HCV infection among people who inject drugs, Lebanon, 2015–2016 (n = 250)**

Risk factor	Odds ratio	95% confidence interval	
		Lower	Upper
Sex worker	1.575	0.315	7.881
History of blood transfusion	3.331	0.926	11.976
History of blood donation	0.894	0.250	3.191
History of sharing needles	2.803	1.398	5.6223
Presence of piercing	0.378	0.128	1.116
Presence of tattoos	1.265	0.634	2.526
Ever heard of hepatitis B virus	0.904	0.400	2.040
Ever heard that HBV can be transmitted through contaminated blood or unsafe sexual practices	0.904	0.400	2.040
Ever heard that HBV can be prevented by a vaccine	0.712	0.336	1.512

Table 2 Seroprevalence rates for HCV among most PWID populations worldwide have often been reported to be higher than 50% (18); PWIDs are at high risk of HCV infection and are the key affected community globally. Prevalence and incidence of HCV up to 95% and 45/100 person-years respectively have been reported in PWIDs (19–23).

In a European review, an estimate of HCV Ab prevalence in PWIDs was available for 29 of the 34 countries covered, and ranged from 5.3% to 90%, on average 47 times higher than in the general population (in 13 countries that had both estimates available) (16). In 26 countries, there was a 60–80% prevalence of antibodies for HCV (anti-HCV) in PWIDs, while in 12 countries it was > 80% (10).

Based on our results, Lebanon is among the areas with the lowest prevalence for HBV and HCV in PWIDs compared with the surrounding countries in the Middle East and North Africa, where the rate of HBV and HCV infection has reached extremely high levels, e.g. in Libya and Egypt (10). Although it may reflect the low baseline endemicity in the general Lebanese population, other factors may be related to such a low rate such as the current drug and harm reduction policies. Lebanon is one of the 5 Arab countries providing a needle and syringe exchange programme along with Egypt, Morocco, Palestine and Tunisia (24). On the other hand, what characterizes Lebanon from the majority of Arab countries is that the Lebanese court imposes dependence treatment besides sanction for incarcerated drug users, thus, reducing their future risk of viral exposure (25). Furthermore, opioid substitution therapy (OST) was implemented in Lebanon in 2011 along with only 4 other Middle Eastern countries, Bahrain, Islamic Republic of Iran, Morocco and the United Arab Emirates. According to Lebanese Ministry of Public Health reports, the prevalence of HCV was reduced from 27% to 16% in 2014, although a clear causal correlation could not be confirmed between the reduction and OST implementation (24). Harm reduction strategies for PWIDs such as needle and syringe programmes and OST had limited impact on HCV prevention; a combination of interventions is often needed (26).

Studies of the effects of exposure to preventive interventions, including drug treatment (27), needle and syringe distribution (28), harm reduction and education programmes (29), and bleach disinfection (30), have failed to provide conclusive evidence of efficacy. While a recent Dutch study showed significant protective effects of comprehensive harm reduction (needle and syringe distribution and methadone treatment) on HIV and HCV incidence (31), a peer education intervention randomized controlled trial found reductions in risk behaviour but no difference in HCV incidence (18.4/100 person-years) between the intervention and control groups (32). These data suggest that further decreases in incidence are unlikely to be achieved without large scale and effective biomedical interventions, notably preventive vaccines (33).

In our study, sharing needles was significantly associated with a higher rate of infection. In a review and meta-analysis of the association between self-reported sharing of needles/syringes and hepatitis C virus prevalence and incidence among people who inject drugs, pooled prevalence and incidence of HCV was 59% and 11% among PWIDs who reported never and not recently sharing needles/syringes, respectively, with odds ratio 3.3 (95% CI: 2.4–4.6), comparing HCV infection among those who ever (or recently) shared needles/syringes relative to those who reported never (or not recently) sharing (34).

Programmes to provide PWIDs with access to sterile needles and syringes (NSPs) are generally considered to be among the most effective means of reducing HIV and HCV transmission among PWIDs (35).

A minimum of 20 to 30 syringes per PWID annually may be needed to affect HIV and/or HCV transmission in a population of PWIDs. Reaching high coverage levels (20–30 syringes per PWID per year and at least 50% of the PWIDs population) for NSP is very likely to be followed by reductions in HIV and/or HCV infection in the local population of PWIDs (36).

In this study, HCV positive PWIDs were found to be significantly older than the general PWID population. Similarly, we noted a strong correlation between the

duration of their drug injection practices and anti-HCV positivity. Backmund et al. reported a correlation between older age, longer duration of drug use and positivity of HCV serology among drug users (37).

Further analysis of the study population has showed that a low index of awareness of HCV and mode of transmission was associated with a higher prevalence of infection. As limiting exposure to HCV is the only way of preventing viral transmission, it is of extreme importance to implement targeted educational programmes for all PWIDs in Lebanon and to inform them about the different modes of transmission as well as the possible methods of prevention.

Our study has some limitations. As the estimated

drug user population in Lebanon is about 10 000–15 000 individuals (38), of whom 35% are PWIDs (39); our study population provides an estimation of HCV and HBV serology in this population group followed by the nongovernmental organizations and it could result in an underestimate of the exact prevalence of HCV and HBV in this population. Furthermore, illicit drug users are a hard to reach population as they tend to deny and hide their practices, which may be a basis for contempt in Lebanese society. Nor did we report on whether our PWIDs had a history of imprisonment, where viral spread may occur more frequently.

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**Competing interests:** None declared.

## Prévalence des virus de l'hépatite B et de l'hépatite C chez les consommateurs de drogues injectables dans la population libanaise

### Résumé

**Contexte :** Les consommateurs de drogues injectables sont exposés à un certain nombre d'infections virales transmises par le sang. Les virus de l'hépatite B (HBV) et de l'hépatite C (HCV) constituent une préoccupation de santé publique majeure dans ce groupe à risque élevé.

**Objectif :** La présente étude avait pour objectif de déterminer la prévalence du HBV et du HCV chez les consommateurs de drogues injectables au Liban.

**Méthodes :** Entre juin 2015 et juin 2016, nous avons mené une étude transversale prospective sur des consommateurs de drogues injectables recrutés par l'intermédiaire d'organisations non gouvernementales libanaises, en collaboration avec le ministère de la Santé publique libanaise. Les participants ont été soumis à des tests de dépistage des antigènes de surface de l'hépatite B et des anticorps anti-HCV à l'aide de kits de dépistage rapide. La prévalence de chaque virus a ensuite été calculée. La corrélation entre les deux infections et d'autres facteurs de risque possibles a également été examinée.

**Résultats :** Au total, 250 personnes ont été incluses dans l'étude, dont 98 % d'hommes. L'âge moyen était de 31,9 ans (écart type 8,7). La prévalence des antigènes de surface du virus de l'hépatite B et des anticorps anti-HCV, parmi les consommateurs de drogues injectables, était respectivement de 1,2 % et de 15,6 %. On a observé une corrélation significative entre l'âge, une durée plus longue de consommation de drogue, le manque de sensibilisation et le taux plus élevé d'infection à HCV ( $p < 0,01$ ). Le taux élevé de partage de seringues chez les consommateurs de drogues injectables avait une incidence significative sur la prévalence des anticorps anti-HCV.

**Conclusion :** Les consommateurs de drogues injectables restent la sous-population la plus touchée par l'hépatite C chronique au Liban.

معدل انتشار فيروس التهاب الكبد B وفيروس التهاب الكبد C في صفوف الأفراد الذين يتعاطون المخدرات حقنا في الفئات السكانية في لبنان

أنطوان أبو راشد، ماري نخول، كارين ريكا، عفيف جريج، بيير أبي حنا، وليد عمار  
الخلاصة

الخلفية: إن الأشخاص الذين يتعاطون المخدرات حقنا معرضون للإصابة بعدد من العداوى الفيروسية المنقولة عن طريق الدم. ويشكل فيروس التهاب الكبد B وفيروس التهاب الكبد C مصدرا للقلق البالغ على مستوى الصحة العامة ضمن هذه الفئة المعرضة لخطر مرتفع.

الأهداف: هدفتنا إلى تحديد معدل انتشار فيروس التهاب الكبد B وفيروس التهاب الكبد C في صفوف الأشخاص الذين يتعاطون المخدرات حقنا في لبنان.

طرق البحث: أجرينا دراسة استباقية مقطعية بين يونيو/ حزيران 2015 و يونيو/ حزيران 2016 على الأشخاص الذين يتعاطون المخدرات حقنا، والذين حشدتهم المنظمات غير الحكومية اللبنانية بالتعاون مع وزارة الصحة العامة في لبنان. وخضع المشاركون في اختبار لمستضدات التهاب الكبد B وأضداد فيروس التهاب الكبد C باستخدام عتائد الاختبار السريع. ثم تم احتساب معدل انتشار كل فيروس على حدة. كما جرى تحليل العلاقة الارتباطية بين كلا النوعين من العدوى وعوامل خطر أخرى محتملة.

**النتائج:** ضمت الدراسة عدداً إجمالياً بلغ 250 شخصاً، 98% منهم من الذكور. وكان متوسط العمر 31.9 سنة (بانحراف معياري 8.7). وبلغ معدل انتشار مستضدات التهاب الكبد B وأضداد فيروس التهاب الكبد C في صفوف الأشخاص الذين يتعاطون المخدرات حقناً 1.2% و15.6% على التوالي. وظهر ارتباط قوي بين كل من تقدم العمر، واستطالة مدة تعاطي المخدرات، ونقص الوعي بارتفاع معدل الإصابة بعدوى فيروس التهاب الكبد C ( $P < 0.01$ ). وأدى ارتفاع معدل التشارك في استخدام الإبر في صفوف الأشخاص الذين يتعاطون المخدرات حقناً في لبنان إلى التأثير بصورة يُعتدُّ بها على معدل انتشار أضداد فيروس التهاب الكبد C.

**الاستنتاج:** يظل الأشخاص الذين يتعاطون المخدرات حقناً هم الفئة الفرعية من السكان الأشد تضرراً بالتهاب الكبد C المزمن في لبنان.

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# The public health care system and primary care services in Saudi Arabia: a system in transition

Mushabab Al Asmri,<sup>1</sup> Mohammed J. Almalki,<sup>2</sup> Gerry Fitzgerald<sup>3</sup> and Michele Clark<sup>4</sup>

<sup>1</sup>Asser Health Affairs, Ministry of Health, Riyadh, Saudi Arabia. <sup>2</sup>Faculty of Public Health and Tropical Medicine, Jazan University, Jazan, Saudi Arabia. <sup>3</sup>School of Public Health, Faculty of Health, Queensland University of Technology, Brisbane, Australia. <sup>4</sup>School of Clinical Sciences, Queensland University of Technology, Brisbane, Australia. (Correspondence to: Mohammed Almalki: mjalmalki@jazanu.edu.sa).

## Abstract

**Background:** Saudi Arabia has invested heavily in its health care system by establishing health care infrastructures to improve health of the nation. However, it remains to be seen whether it is efficient and effective in providing health care services needed. Primary health care, which is the basis of universal health coverage, needs to be assessed on its performance, challenges and future opportunities to serve the Saudi Arabian population.

**Aims:** This review aimed to identify challenges within the Saudi Arabian health care system with a focus on primary health care services, and to analyse the interrelated factors in order to suggest remedial reforms to further strengthen and improve the health care system.

**Methods:** A narrative review of previous studies and governmental reports was undertaken to extract, analyse, synthesize and report the findings.

**Results:** The review found a number of key areas for improvement in the primary health care system. These areas include: the scope, structure, infrastructure, financing, increased demand, increased costs and workforce capacity. Other critical challenges include inequitable access to health services, quality and safety of services, the growing burden of chronic diseases, lack of an effective information system, management and leadership issues, and gaps in the referral system.

**Conclusion:** The Saudi Arabian health care system needs comprehensive reform with a focus on primary health care.

Keywords: delivery of health care, health services, primary health care, Saudi Arabia

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## Introduction

In spite of substantial improvements in the Saudi Arabian health services sector in the past few decades, the country is facing a number of challenges in its primary health care system. These challenges include increased demand because of rapid population growth, high costs of health care services, inequitable access, concerns about the quality and safety of care, a growing burden of chronic diseases, a less than effective electronic health system (eHealth), poor cooperation and coordination between other sectors of care, and a highly centralized structure (1–5). The government has developed and implemented a number of initiatives which include the Strategic Plan of the Ministry of Health 2010–2020 to effectively tackle these challenges (6). These initiatives resulted in the replacement of seven ministers of health in almost two years, which indicates the serious administrative and practical difficulties in tackling these challenges in the health care system.

Most review papers in Saudi Arabia have focused on hospital-based medical services with limited consideration of primary health care services, which are the first point of access to health care in the Saudi Arabian health care system. The primary health care sector provides essential health care services to Saudi Arabians and to expatriates

working in the public sector (7). No reform of the Saudi Arabian health care system can be complete without first considering the primary health care services at the heart of the health care system.

This narrative review aimed to explore the challenges facing the Saudi Arabian health care system with a focus on primary health care services. It further discusses and analyses the barriers to and drivers of health sector reforms, including the effect of demographic and economic factors on the health care system. The review also recommends mechanisms for effective reform of primary health care services as the nucleus of overall health care system.

## Methods

Data relating to the Saudi Arabian health care system were extracted from published literature in the following databases: PubMed, MEDLINE, CINAHL, Saudi Medical Journal, Eastern Mediterranean Health Journal, and the portal of the Ministry of Health in Saudi Arabia. A further search using Google Scholar search engine was carried out to identify other relevant papers and documents, government reports and information published in Arabic. All the studies and documents were analysed for their content and the relevant information was synthesized and reported.



## Results and discussion

Saudi Arabia is a country with a culture and traditions rooted in Islamic teachings and Arab customs (8). Saudi Arabia is a kingdom with an integrated system of government based on the principles of justice, consultation and equality in accordance with Islamic law (9). Therefore, to some extent, the principles of Islam and Saudi Arabian traditions influence the culture of organizations within the country. The centralized tradition of Saudi Arabian society is also embodied in the health care service (10,11). In other words, the structure and functioning of the health care organizations, including primary health care, are strongly influenced by the society's norms and traditions.

### Demographic impacts

The population of Saudi Arabia was estimated to be about 30 million in 2014 with expatriates comprising about 31% of the total population (7). The population growth rate was 2.81% from 2010 to 2015 (12), which has driven demand for more health care. Although increased financial resources have been allocated to the health sector, the population is growing faster than the health services made available. This indicates an urgent need to tackle this important challenge (Table 1) (13–17).

### Economic impacts

Saudi Arabia is a leading oil exporter; oil exports account for almost 69% of the country's exports (18). According to the World Bank, Saudi Arabia is classified as a high-income country (19). The strong oil-based economy has facilitated the development of local public and private organizations, creating new jobs and raising the socio-economic status of Saudi Arabian citizens (20). The Saudi Arabian government provides free public services including health care to its population (21). However, the global instability of oil prices in the past few years has affected public and private services and encouraged the Saudi Arabian Government to explore alternate sources for revenue. The 2030 National Vision for Saudi Arabia seeks

long-term sustainability of living standards by diversifying the country's income sources in the future, rather than relying only on oil revenue (22).

### Saudi health care system

The Ministry of Health is responsible for public health care services (23). A number of semi-independent bodies, the private sector and nongovernmental organizations also provide health care services. The Ministry of Health provides 60% of health services while the private sector provides 23% and other government health sectors provide 17% (17).

### Levels of care in the Saudi health care system

There are three levels of health care services in Saudi Arabia: primary, secondary and tertiary. However, in reality, there are four levels of care as shown in Figure 1. The primary health care services are the focus of the following discussion.

### Primary health care in Saudi Arabia

Primary health care is the first level of health care service (6). It is provided by the Ministry of Health through a network of primary health care centres. However, primary health care services face many challenges in terms of the patterns of disease, workforce, information systems, financial support and accessibility.

### Historical issues of primary health care

In accordance with the Alma-Ata declaration, Saudi Arabia has committed to develop its primary health care services (24). The Ministry of Health integrated both preventive and basic curative health care services in 1984. These services targeted individuals, families and the community, and provided a range of health care services including maternal and child health, immunization for communicable diseases, follow-up for patients with chronic diseases, dental care services, health education and essential drugs (24,25).

**Table 1 Health care resources and population in Saudi Arabia, 2006–2014**

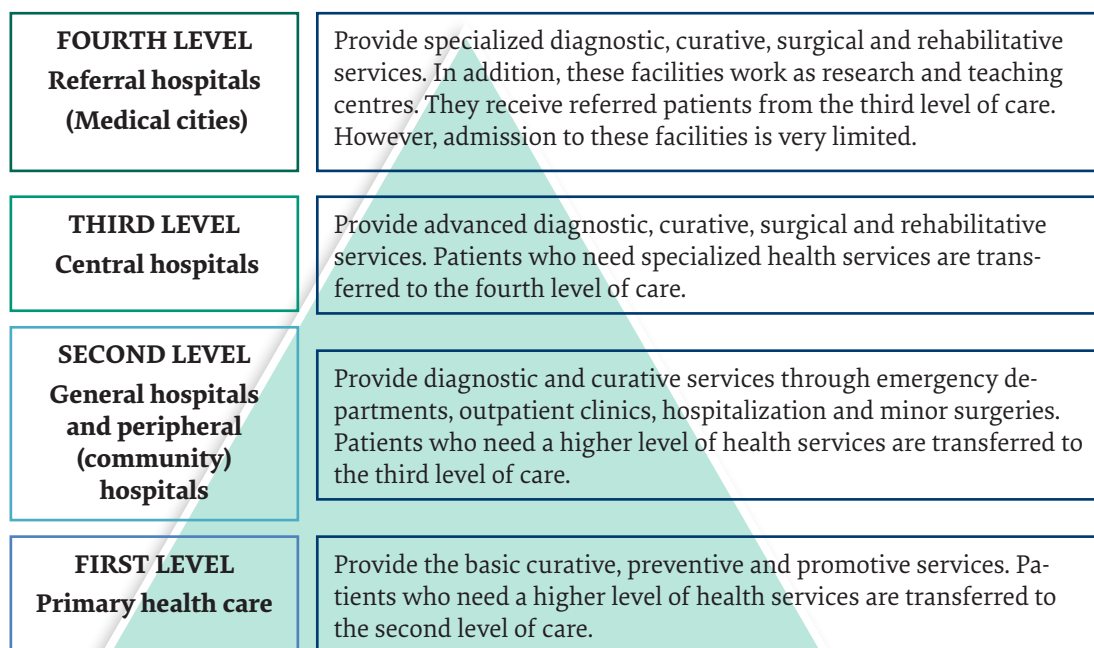
Year	Health resources indicators					Population growth rate (%)	Estimated population
	Hospital beds <sup>a</sup> (government and private)	Primary health care centres <sup>a</sup>	Physicians and dentists <sup>a</sup>	Nurses and midwives <sup>a</sup>	Allied health professionals <sup>a</sup>		
2006	23.0	0.81	20.4	35.4	19.0	2.32	23 678 849
2007	22.1	0.79	21.0	38.7	20.0	2.28	24 242 578
2008	21.7	0.80	21.5	40.8	20.8	2.23	24 807 273
2009	22.0	0.80	21.8	43.3	23.5	2.20	25 373 512
2010	21.4	0.77	24.3	48.0	25.0	3.19	27 136 977
2011	20.7	0.74	24.4	47.4	27.8	3.19	28 376 355
2012	20.9	0.77	27.8	47.8	26.3	3.19	29 195 895
2013	21.6	0.75	26.8	51.5	30.6	2.70	29 994 272
2014	22.1	0.74	26.5	53.7	30.9	2.55	30 770 375

<sup>a</sup>Per 10 000 population.

The red arrows show the decreasing number of in beds and primary health care centres per 10 000 population; the green arrow shows the increasing total population.

Source: Health statistics annual books (13–17).

Figure 1 Levels of care in the Saudi Arabia health care system



Primary health care services have improved considerably in the past four decades which has resulted in better health outcomes, for example a lower infant mortality rate, lower incidence of communicable diseases and an increase in average life expectancy (6). According to the Ministry of Health, there were 2281 public primary health care centres across the country in 2014 (17).

Saudi Arabia has seen changes in disease patterns with a shift away from communicable diseases to chronic diseases which are becoming more prevalent (6). These diseases place an increased burden on existing health care services (1,6,26–28). This change in disease pattern suggests that primary health care services, including patient follow-up strategies and preventive and health education activities, are insufficient. Recent data from the Saudi Health Information Survey show high rates of diabetes – 14.8% for males and 11.7% for females. Diabetes prevalence was 19.9%, almost double in those who were obese in comparison with non-obese (28). There is a real need to develop primary health care services directed to patients with chronic diseases and people who are most at high risk of these diseases.

### Health system financing and expenditure

Saudi Arabian citizens have free access to all levels of public health care services available in the country, which is funded by the central government. The Ministry of Health expenditure per capita has increased substantially by 0.41% (17), which is equivalent to US\$ 299 per capita (13–17,29–32). However, Saudi Arabia still spends less per capita on health than a number of industrialized nations (Figure 2) (33).

Ministry of Health planners and leaders focus primarily on hospitals rather than primary health care

centres. According to one report, more than 90% of the Ministry of Health budget allocated for infrastructure and development projects was spent on hospitals (21). Low expenditure on primary health care centres has resulted in 80% of primary health care buildings being rented; as such they are not specifically designed to provide health care services and they lack the necessary structural features to provide primary care (21,34).

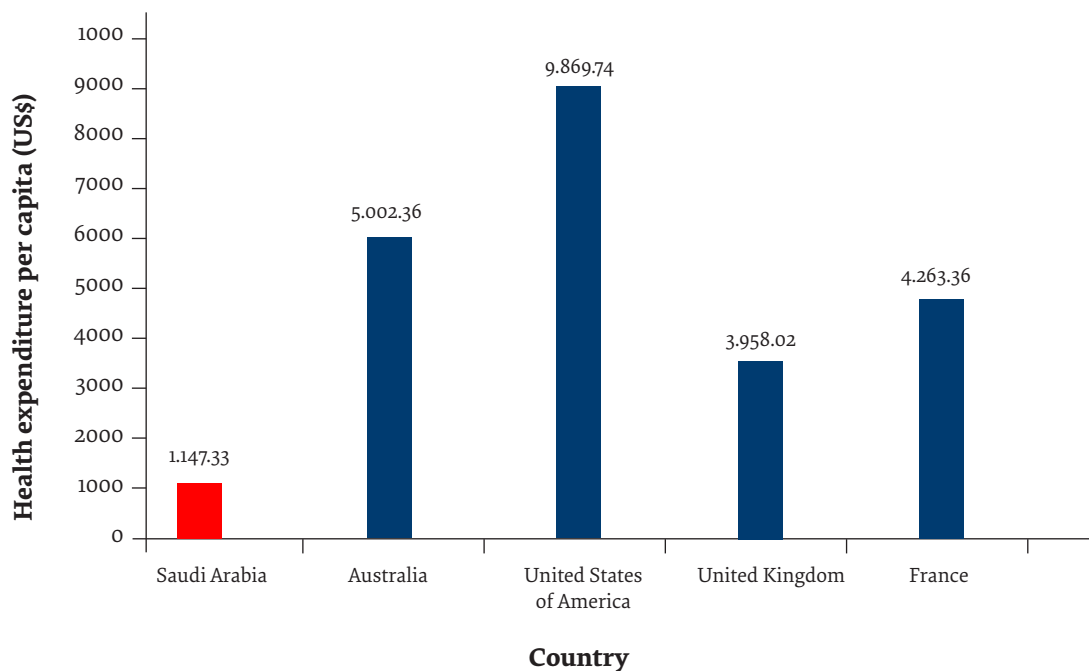
According to government regulations, the budget for the Ministry of Health is released after approval of the Ministry of Finance. This practice may influence the performance and efficiency of the Ministry of Health and delay its work in all sectors including the primary health care services.

A comparison of the primary health care systems in Saudi Arabia and Cuba shows that health leaders and the government in Cuba saw primary health care as the cornerstone of successful health care together with a focus on the social determinants of health. Cuba's approach has contributed to making its primary health care among the best in the world (35). The Saudi Arabian Ministry of Health should shift the focus of the health system from hospital-based health care services to the primary preventive and promotive health care services to deal effectively and efficiently with the increasing burden of chronic diseases.

### Workforce of primary health care

Shortage of health care professionals is a global concern (36). The Saudi Arabian health care system is not immune to this challenge, and most health care professionals in Saudi Arabia are expatriates (1). In 2014, the primary health care workforce included 9304 physicians and dentists (3 per 10 000 inhabitants), 18 136 nurses (5.9 per

Figure 2 Health expenditure per capita in various countries, 2016 (33)



10 000 inhabitants), and 9690 allied health workers (17). The health care workforce for primary health care services has increased with nurses outnumbering physicians and allied health workers between 2010 and 2014 (Figure 3) (13–17).

Many health care professionals, particularly nurses, move to management or other non-nursing departments within their organizations (37). This trend is also seen among physicians. A ministerial committee review found that the number of primary health care physicians was 40% less than the required (21). In 2013 the total number

of physicians (excluding dentists) per 10 000 population in Saudi Arabia was 2.3 (16). The scarcity of physicians in Saudi Arabia is high compared with other countries (Figure 4) (16,38).

Despite the shortage of physicians, they continue to dominate because they hold key positions within the health care system (39,40). Physicians occupy a number of management and leadership positions at central and regional levels of the health authorities, which makes shortages of primary health care physicians worse.

Figure 3 Total number of primary health care professionals in Saudi Arabia, 2010–2014 (13–17)

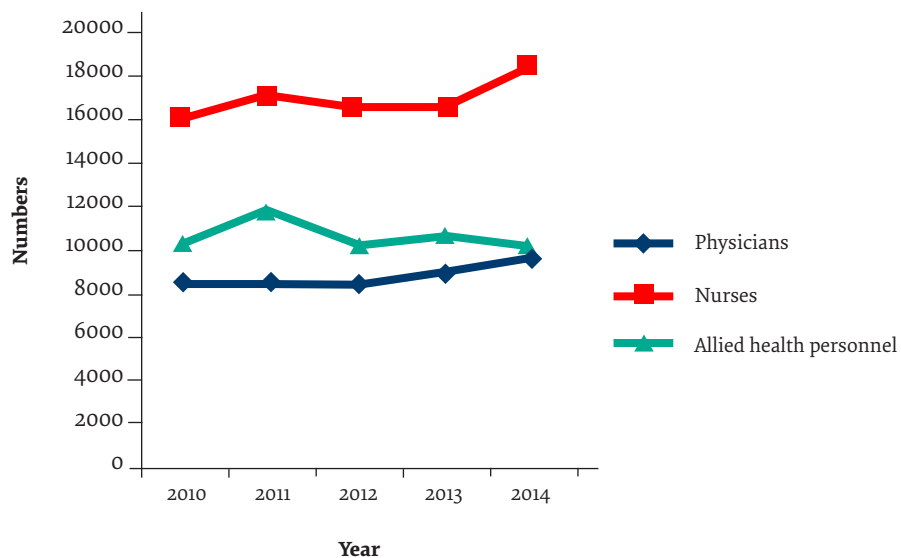
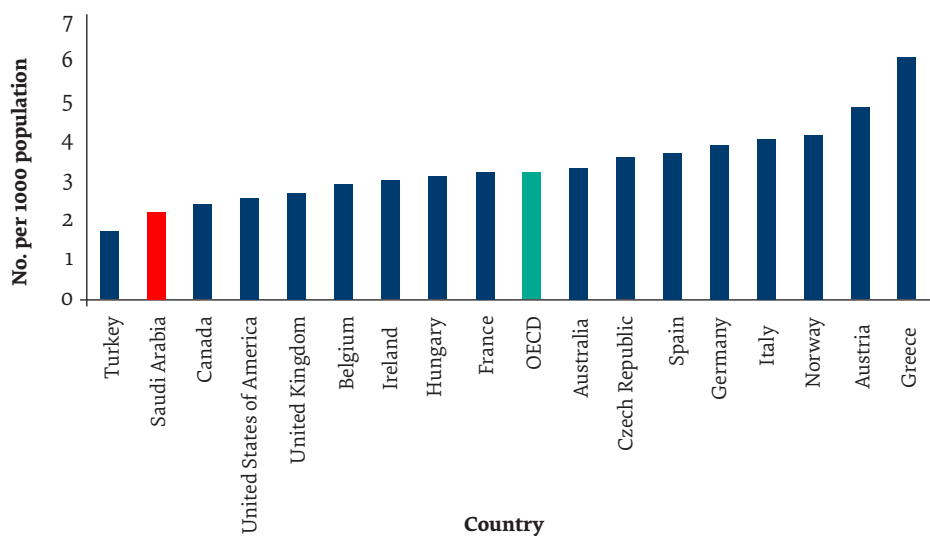


Figure 4 Practising physicians per 1000 population in various countries, 2013 (16,38)



### Human resources' development

The Ministry of Health has invested in training its employees and developing their skills (41). However, the large number of workers, differences in their educational and cultural background and the limited resources allocated for training have affected the number, type, and quality of available training programmes. The Ministry of Health has given local and international study scholarships to many employees. In addition, many training courses in different specialities have been launched in collaboration with the Saudi Commission for Health Specialties.

Despite these efforts, the Ministry of Health lags behind other countries in training funds for its workforce. For example, the ministries of health in both the United Kingdom and Malaysia allocate 5% of the total budget to training; in contrast, Saudi Arabia allocates only 0.4% (6).

The Ministry of Civil Service and the Ministry of Finance strictly control recruitment activities for health care jobs, which adversely affects the available health care workforce. These ministries must approve and oversee the creation of new jobs and the recruitment of new employees or professionals to the Ministry of Health. Such policies limit the flexibility and autonomy of the Ministry of Health if it needs to update its workforce.

### Acceptability of and accessibility to primary health care

Acceptability of and accessibility to the primary health care services are central to the performance and evaluation of health care systems. Acceptability is the willingness of people to seek services (42). Acceptability decreases when people perceive health services to be ineffective or when cultural and social factors (e.g. language, age, sex, ethnicity or religion) of the health care provider discourage the consumer from using services (42). Patient satisfaction studies have been used to determine the ac-

ceptability of health services among populations as well as the effectiveness of the services provided (43–46). Findings from patient satisfaction surveys have been found to play a key role in reforming health care systems (45,46).

A number of older studies of local health services concluded that patients in Saudi Arabia were not satisfied with primary health care services (47–51). The main reasons for dissatisfaction included the physical environment, waiting times, confidentiality measures, the location of centres, working hours, absence of speciality clinics, language and communication barriers, and the structure of the waiting area. Despite these findings, the past decade has seen a growing acceptance of primary health care services by the Saudi Arabian population. This acceptance is reflected in the total number of visits to primary health care centres during 2014, which was about 51.26 million. The average number of visits per primary health care centre was 22 473, while the average number of daily visits per centre was 90 (17). Non-availability of alternative services may lead the Saudi Arabian to accept primary care services despite their dissatisfaction. However, recent studies indicate an increased level of satisfaction with primary care services compared with previous studies (52–55).

Access to health services was been defined as “the opportunity to identify health care needs, to seek health care services, to reach, to obtain or use health care services and to actually have the need for services fulfilled” (56). The Ministry of Health identified the barriers to accessing health care services as environmental, social and economic conditions (e.g. geographical location, education level, income level and nutrition) (6). A 2014 study in Hail city, Saudi Arabia, found that the lowest level of satisfaction among primary health care users was accessing medical care and the availability of doctors (53). Another structural barrier to access to health care services is the weakness in the current referral system between the various levels of health care (57). While

general, central and specialized public hospitals accept only referred cases, private hospitals are free to accept patients without referral. Furthermore, there is no system for sending patients back to primary health care services from general, central or specialized hospitals. More efforts are needed to reform this gap and to ensure a better continuity of primary care.

A study in Riyadh, Saudi Arabia, examined the factors influencing access to and use of primary health care centres in urban and rural areas (55). The findings highlighted important differences between urban and rural populations. For rural patients these factors included the distance to the primary health care centre, cleanliness of the centre, understanding the treatment and receiving health prevention and promotion services. Urban respondents were shown to want increased opening hours particularly in the evenings (55).

According to the World Health Organization (WHO), “The role of government with regard to sustainable health systems is to guarantee equity of access and to ensure that essential health system functions are maintained.” (58). As a first level of contact between people and the health care system, primary health care services of good quality should be accessible and available to the whole population.

### **Primary care health information system**

The Ministry of Health in Saudi Arabia developed a four-year (2008–2011) project to improve eHealth in health care organizations and facilities (59,60). However, the eHealth strategy was first implemented during 2011 in the hospitals in major cities (60). A study in 2013 aimed to identify the information needs and information-seeking behaviour of primary care physicians in Saudi Arabia (61). The findings indicated that the absence of an electronic system was a main contributor to the weaknesses of primary health care services. Primary health care physicians did not have up-to-date patient information. High-quality computing services, including electronic health records and clinical decision-making support tools, are essential to a good-quality health care service (62). Such initiatives can help deliver effective patient-centred care (63). Therefore, providing eHealth facilities within the current primary health care services is crucial to serve patients’ needs and to enhance the knowledge base of physicians and other health care professionals.

### **New primary health care reform**

To improve the quality of primary health care services, it is important to identify gaps in existing systems through review of the literature and existing health care policies and observations, and then develop and implement appropriate reforms in order to fill the gaps. This means the focus should be on primary health care structure, infrastructure, financing, management and leadership. The Ministry of Health has tried to reform the health system including primary health care services through its new reform strategy for 2010–2020 (6). The new strategy calls for the establishment of more primary health care cen-

tres to meet the growing need for health services. In addition, it calls for the establishment of planned institutional work and the strengthening of monitoring of quality and performance.

Another objective of the strategy is to develop an accurate database to integrate primary health care centres. The strategy also includes the decentralization of management and empowerment of the administrative, technical and finance sectors within each level of health care. The implementation of an effective referral system from primary health care to the next level and back to primary health care is also an important objective in the proposed strategy. The development of the primary health care workforce through further education and training and new recruitment and retention strategies to address workforce shortages is also part of the reform strategy.

Although it is almost six years since the strategy was publicly announced, few changes have been introduced (personal observation). To ensure the success of this strategy, the Ministry of Health in collaboration with regional directorates must set operational plans for its implementation. In addition, a substantial portion of the Ministry of Health budget should be directed to primary health care services in order to promote population health in Saudi Arabia. The importance of such changes has increased because the Ministry of Health has recently decided to provide paid primary health care services to expatriates who work in the private sector (64), thus potentially placing an even greater burden on the primary health care system. To support this trend and promote population health, upcoming programmes and initiatives of the Saudi Vision 2030 for health should focus more on public health and primary health care services.

### **Conclusion**

The Saudi Arabian health care system is going through a period of evolution. This has been brought about by the new vision of the Ministry of Health and the development of a national health strategy to meet the challenges. There is an urgent need to take new initiatives to improve the health care services in Saudi Arabia with a focus on reforms of primary health care services. Such reforms require the challenges in many areas of health and health to be tackled including: scope, structure, infrastructure, financing, increased demand, increased costs, workforce, inequitable access to the services, quality and safety of services, growing burden of chronic diseases, information systems, management and leadership issues, and the referral system.

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**Competing interests:** None declared.

## Analyse

# Système de santé public et services de soins de santé primaires en Arabie saoudite : un système en transition

## Résumé

**Contexte :** L'Arabie saoudite a investi massivement dans son système de soins de santé en créant des infrastructures de soins de santé en vue d'améliorer la santé de la nation. Cependant, il reste à voir si ce système est efficace et efficient pour la prestation de services de soins de santé nécessaires. Les soins de santé primaires, qui constituent la base de la couverture sanitaire universelle, devraient être évalués en termes de résultats, de défis et d'opportunités pour l'avenir afin de répondre aux besoins de la population saoudienne.

**Objectifs :** La présente analyse avait pour objectif d'identifier les défis à relever au sein du système de santé saoudien en mettant l'accent sur les services de soins de santé primaires et d'examiner les facteurs interdépendants afin de proposer des réformes correctives visant à renforcer et à améliorer le système de santé.

**Méthodes :** Un examen narratif d'études précédentes et des rapports gouvernementaux a été réalisé afin d'extraire, d'analyser, de synthétiser les résultats et d'en rendre compte.

**Résultats :** L'analyse a mis en évidence plusieurs domaines clés nécessitant des améliorations concernant le système de soins de santé primaires ; il s'agit notamment du champ d'application, de la structure, des infrastructures, du financement, de la demande accrue des soins, de l'augmentation des coûts et des capacités du personnel de santé. Parmi les autres défis majeurs, on mentionnera les inégalités d'accès aux services de santé, la qualité et la sécurité des services, la charge croissante des maladies chroniques, l'absence de système d'information efficace, les problèmes de gestion et d'encadrement ainsi que les lacunes du système d'orientation-recours.

**Conclusion :** Le système de santé de l'Arabie saoudite nécessite une réforme complète mettant l'accent sur les soins de santé primaires.

## نظام الرعاية الصحية العامة وخدمات الرعاية الأولية في المملكة العربية السعودية: نظام يشهد تحولا

مشيب الأسمرى، محمد المالكي، جيري فيتزجيرالد، ميشيل كلارك  
الخلاصة

**الخلفية:** ضخت المملكة العربية السعودية استثمارات كبيرة في نظام رعايتها الصحي من خلال إنشاء بني تحتية للرعاية الصحية بقصد تحسين صحة الأفراد في الدولة. غير أن الأنظار تترقب لترى إذا ما كان هذا النظام فعالاً وكفؤاً من حيث تقديم خدمات الرعاية الصحية المطلوبة. وتتطلب الرعاية الصحية، التي تمثل الأساس للتغطية الصحية الشاملة، تقييم أدائها، وتحدياتها، وتحديد فرصها المستقبلية من أجل خدمة السكان في المملكة العربية السعودية.

**الأهداف:** هدف هذا الاستعراض إلى الوقوف على التحديات الماثلة في نظام الرعاية الصحية في المملكة العربية السعودية، مع إيلاء تركيز خاص إلى خدمات الرعاية الصحية الأولية، وتحليل العوامل المتداخلة لتقديم اقتراحات علاجية تهدف إلى زيادة تقوية نظام الرعاية الصحية وتعمل على تحسينه.

**طرق البحث:** أُجري استعراض سردي لدراسات سابقة وتقارير حكومية من أجل استخلاصها، وتحليلها، وتوليفها وإبلاغ نتائجها.

**النتائج:** وجد الاستعراض مجالات رئيسية للتحسين ضمن نظام الرعاية الصحية الأولية. وتتضمن تلك المجالات: النطاق، والتركيب، والبنية التحتية، والتمويل، والطلب المتزايد، والتكاليف المتزايدة، وقدرة القوى العاملة. وتتضمن التحديات الأخرى المهمة عدم التساوي في الحصول على الخدمات الصحية، وجودة الخدمات ومأمونيتها، والعبء المتزايد الناجم عن الأمراض المزمنة، وغياب نظام فعال للمعلومات، ومسائل تتصل بالإدارة والقيادة، والثغرات في نظام الإحالة.

**الاستنتاج:** يحتاج نظام الرعاية الصحية في المملكة العربية السعودية إلى الإصلاح الشامل، مع التركيز بصورة خاصة على الرعاية الصحية الأولية.

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# Factors associated with tuberculosis diagnosis and treatment delays in Middle East and North Africa: a systematic review

Dalya Eltayeb,<sup>1</sup> Elize Pietersen,<sup>2</sup> Mark Engel<sup>2</sup> and Leila Abdullahi<sup>3</sup>

<sup>1</sup>Department of Public Health and Family Medicine; <sup>2</sup>Department of Medicine, Faculty of Health Sciences; <sup>3</sup>Vaccines for Africa Initiative, University of Cape Town, Anzio Road Observatory, Cape Town, South Africa (Correspondence to: Dalya Eltayeb: dalyaeltayeb@gmail.com).

## Abstract

**Background:** Political instability, economic sanctions and substandard quality of health care negatively affect tuberculosis (TB) control in the Middle East and North Africa (MENA) region.

**Aims:** We aimed to elucidate factors contributing to delays in TB diagnosis and treatment in MENA countries.

**Methods:** Two reviewers independently appraised eligible articles identified through comprehensive searching and extracted data which were subjected to meta-analysis.

**Results:** Delays in TB diagnosis were associated with older age and low income [(OR = 1.49; 95% CI: 1.31–1.70) and (OR = 1.26; 95% CI: 1.09–1.45)] respectively (n = 17 studies). Being female was associated with patient delay and health system delay [(OR = 1.24; 95% CI: 1.02–1.50) and (OR = 1.68; 95% CI: 1.18–2.38)] respectively. Knowledge and perception of TB, having employment and low levels of crowding were each protective against patient delay. The GRADE system rated the evidence as of low quality.

**Conclusion:** This review provides evidence for facilitators and barriers to TB diagnosis and health system delays. For successful TB control in the MENA region, TB awareness and interventions targeting the elderly and those from lower-income settings, particularly directed at gender differences, are essential.

**Keywords:** Tuberculosis case finding, delayed diagnosis, tuberculosis control, Middle East and North Africa, health care-seeking behaviour, delivery of health care

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## Introduction

Tuberculosis (TB) remains a major global health problem (1). In 2015, an estimated 4.3 million cases were neither detected nor treated in national TB programmes globally (1).

A diagnostic delay of two months will result in transmission of TB to an average of 8 contacts (2) and within a year, this number will increase eight to 15 persons; the increase would be even higher in settings of overcrowding and higher social capital (3). Furthermore, delays between admission and initiation of treatment will result in the exposure to TB of an average of 23.9 health care workers (4). Therefore, to curb TB transmission and reduce poor disease outcomes and adverse social and economic consequences, timely diagnosis and prompt initiation of anti-TB treatment is vital (5).

Reasons for delayed TB diagnosis can be attributed to both patients and the health care system (6). Patients may delay in seeking help while the health care system may delay in suspecting TB and initiating relevant investigations. Delays, and ultimately TB control, are affected by patient factors such as sociodemographic characteristics, stigmatization effects of TB, fear of high individual expenses, symptoms on presentation and health care factors such as absence of a refined TB

suspicion index, infrastructure and organization of the health system (7).

The World Bank's description of the Middle East and North Africa (MENA) region covers the 21 members of the Arab League, plus the Islamic Republic of Iran, Israel and Turkey (8). The MENA region is challenged with delayed detection of TB, which negatively affects treatment and control in the region (9). Factors in the region that have destabilized health care delivery are political instability and economic sanctions. Health care resources are thus stretched beyond control, and the quality of health care service delivery deteriorated to a level that can be described as "below standard" (9).

There is a scarcity of systematic reviews addressing TB diagnostic and treatment delays (10). Furthermore, these reviews included older studies, are applicable to high HIV prevalence settings, and specifically did not include diagnostic and treatment delays in MENA countries.

We conducted a systematic review to address this paucity of data. We wished to evaluate the evidence regarding factors associated with TB diagnostic and treatment delays in the MENA region. Successful identification of such factors may actually lead to interventions which may ultimately increase effective TB control.

## Methods

### Protocol

The review protocol has been published in the PROSPERO International Prospective Register of systematic reviews, (<http://www.crd.york.ac.uk/PROSPERO>) registration number CRD42015023337.

### Search methods for identification of studies

This systematic review adheres to Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines 2009 (11). We searched MEDLINE using combinations of the following keywords: TB, tuberculosis, mycobacterium, patient delay, health seeking delay, care-seeking delay, health system delay, health facility delay, health provider delay, diagnosis delay, total delay and treatment delay. Key terms (factors or enablers and barriers) that did not provide new articles were excluded from the final search strategy. Search strategies incorporated both medical subject headings (MeSH) and free-text terms using controlled vocabularies applicable to databases. Published and unpublished articles, irrespective of language used, were interrogated up to June 2015.

Electronic searches were carried out on the following published databases: Cochrane Central Register of Controlled Trials (CENTRAL), Web of Science, PubMed, CINAHL, PsychInfo and Scopus. Grey literatures were searched using Index Medicus for the Eastern Mediterranean Region (IMEMR), (Africa-wide) allied health and Google scholar. In addition, we searched conference proceedings and reference lists of relevant articles.

Observational studies (case-control, cross-sectional and population-based) were considered for review. Studies which reported patient and health system delays in patients diagnosed with, or suspected of, pulmonary TB (PTB) were included. Andersen's behavioural model of health care utilization was used to classify factors regarded as primary outcomes for the study (12). These factors were defined as predisposing factors (factors influencing the initial performance of behaviour); enabling factors (factors making it possible for individuals to enact their behaviour) and need factors (factors following behaviour enactment and influence continued behaviour). Secondary outcomes were: magnitude of patient delay (defined as time interval from onset of TB symptoms to first visit of any health provider), health system delay (defined as time interval from the first health provider visit to initiation of treatment) and total delay, which includes both patient and health system delays (defined as time interval from onset of TB symptoms to initiation of treatment).

### Data collection and analysis

#### Selection of studies and data extraction

Two reviewers (DE and EP) independently screened titles and abstracts of all identified articles to select potential eligible studies; reviewed full texts of potentially eligible studies; nominated the final set of articles for inclusion

into the review; extracted data using a standardized data extraction form and reviewed risk of bias. A third reviewer (ME or LA) facilitated disagreements regarding study selection and data extraction.

#### Assessment of risk of bias

We noticed a 2-study design, a descriptive phase and an analysis phase, in 12/20 studies. In these studies the descriptive phase, a cross-sectional design, was used to determine the extent of delay while during the analysis phase, a nested case-control design, patient delay was compared to the median time of delay. The quality of these studies was assessed based on results from the analysis phase. Two authors used the Newcastle-Ottawa Quality Assessment Scale for case-control studies (13) to assess the risk of bias in these 12 studies.

Cross-sectional and descriptive surveys were assessed according to an assessment tool by Hoy et al. (14) as adapted by Werfalli et al. (15). This adapted assessment tool allows for allocation of a composite score to assist with relative comparison between studies.

#### Data analysis and synthesis

The results of each study were expressed as an odds ratio (OR) with the corresponding 95% confidence interval (CI) for dichotomous data. Studies that compared similar types of outcomes were grouped to get feasible results on an overall estimate of effect. Random effects meta-analysis was used due to heterogeneity in study results. Prevalence of TB delay from different studies was pooled in a meta-analysis using *Review Manager*, 5.3.

### Assessment of heterogeneity and subgroup analysis

Statistical heterogeneity between the study results were examined using the  $\chi^2$  test for homogeneity (with significance defined at the alpha-level of 10%) and quantified using the I-squared statistic. The  $\chi^2$  test for subgroup differences was used to test for subgroup interactions.

### Grading the quality of evidence

We used *GRADEpro* software to appraise limitations to validity in terms of the quality of evidence on the 12/20 observational studies pooled in the meta-analysis.

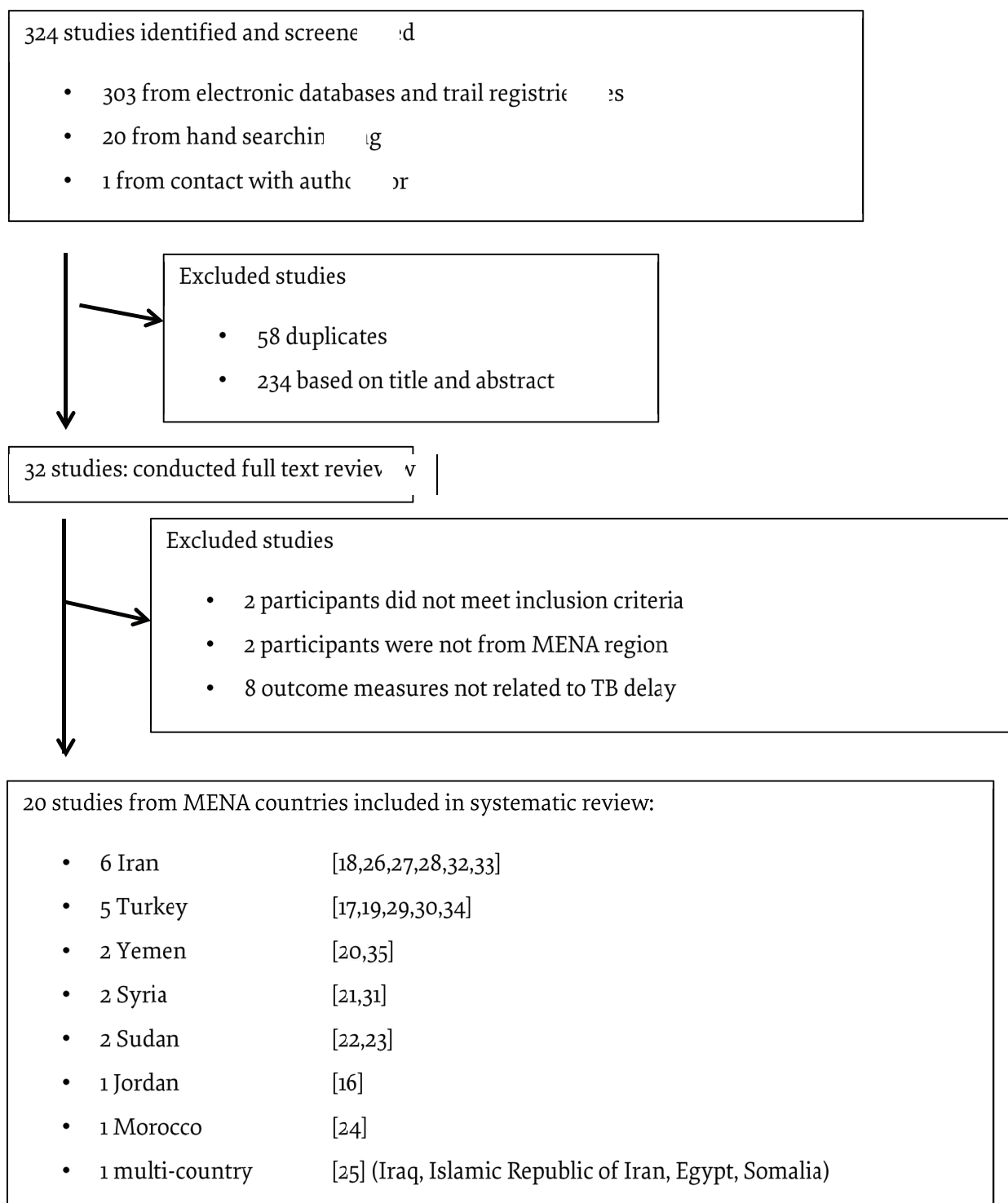
## Results

### Study flow and description of studies

Full-text evaluations were performed on 32 articles, of which 12 were deemed unsuitable for inclusion in the review (Figure 1) (references available from corresponding author upon request). Reasons for exclusion were: in 2 studies participants did not meet the inclusion criteria; in 2 other studies participants were not from the MENA countries; and in the last 8 studies the outcomes measures did not address TB delay.

The 20 studies included in this systematic review were published between 2001 and 2015; 18 had a cross-sectional study design while 2 were nested case-control studies. Participants included in the studies ranged from TB

Figure 1 Flow diagram of studies selected for inclusion in the systematic review



suspects (1 study) (16), smear negative and smear positive PTB patients (2 studies) (17,18)) and only new smear-positive patients (17 studies) (19–35). Almost all studies used a consecutive method of sampling and sample sizes ranged from 50 to 5702. Male sex was dominant in all of the studies and the majority were conducted in both urban and rural settings (detailed characteristic of studies included in the systematic review available upon request).

Sixteen studies assessed both sources of delay; 4 assessed only patient delay while 2 assessed total delay without any demarcation between patient and health system delay. Seventeen studies measured the duration of patient delay, of which only 10 analysed the factors attributed to this period (16,22,27,28,30–35). Out of 15 studies that measured the duration of health system delay, 6 analysed at least 1 factor associated with this period (22,23,26,32,34,35).

## Assessment of risk of bias

We found 11 studies had a low risk of bias (16,19–25a–25d), 7 had a moderate risk of bias (17,26–31) and 5 had a high risk of bias (18,32–35) (Tables 1,2). We considered the WHO report as a single study with coverage of 4 countries that met our inclusion criteria (25).

## Patient delay

Patient delay was measured in 17/20 studies. Measures of patient delay depended on patient recall of first symptoms for PTB. The majority of studies measured delay as a dichotomous variable based on a cut-off point, usually the median. The shortest (12.5 days) and longest (73 days) mean duration of patient delay was reported in the Islamic Republic of Iran (26,33). However, the quality of these studies should be considered before drawing any conclusion from this observation.

## Factors associated with patient delay

At least one factor attributing to patient delay was analysed in 10 studies (16,18–25,35). Studies mostly assessed predisposing factors such as patient sociodemographic characteristics, TB knowledge and perception about TB. Enabling factors were less often assessed, while none of the studies assessed at least one needs factor.

Predisposing factors that were significantly associated with patient delay were older age (OR = 1.24; 95% CI: 1.02 to 1.50), female sex (OR = 1.42; 95% CI: 1.19 to 1.69), unemployment (OR = 0.83; 95% CI: 0.72 to 0.95), low patient income (OR = 1.95; 95% CI: 1.07 to 3.55) and low crowding index (OR = 0.75; 95% CI: 0.57 to 0.99) (Figure 2).

Factors found to be significantly associated with patient delay were: inadequate TB knowledge (20,25a), although in 4 studies the summary OR was not significant for literacy (16,20,21,35); residing in rural areas (16); presence of chronic health problem (21,22); contact with a TB case (21) [yet protective against delay in another study (19)]; self-medication (25a) [although not significantly associated in another study (23)]; and high cost of medical services (20).

Factors found to be protective against patient delay were high TB perception (16,35); however, this predisposed to delay in 1 study (22); TB-related stigma was found to be protective from patient delay in 1 study (16) and predisposed to patient delay in another (25a). Marital status, smoking, a HIV positive status and travelling time were not associated with patient delay in any of the studies that interrogated these factors.

Health care provider (OR = 0.77; 95% CI: 0.70 to 0.85) (Figure 2) was the only enabling factor that had sufficient information to calculate summary OR. The type of provider at first consultation, i.e. consulting a non-health care provider, was associated with extended patient delay (19,20,21,23,25a). The high cost of medical services was significantly associated with patient delay in one study (20).

## Health system delay

Duration of health system delay was measured in 15/20 studies. All 15 studies used the health facility's record of first consultation as entry point to health care and 13/15 used start of treatment as the endpoint of time spent in the health system. Two studies used TB diagnosis as the endpoint. The majority of the studies measured delay versus non-delay as a dichotomous variable based on a cut-off point, usually the median. In patients who had health system delay, the shortest mean duration of health system delay (5 days) was reported in Iraq (25a) whereas the longest mean duration (129.25 days) was reported in the Islamic Republic of Iran (28).

## Factors associated with health system delay

At least one factor associated with health system delay was analysed in 6/15 studies (19,23–25,29,34). Enabling factors such as type of facility, type of providers at first visit, number of visits, number of providers consulted before reaching a TB diagnosis and expenses plus travel time were assessed. These factors were related to the aspect of health system delay in which patient return for diagnosis and treatment were required.

Predisposing factors that assessed health system delay were female sex, older age and patient income. Being female was significantly associated with health system delay (OR = 2.12; 95% CI: 1.24 to 3.60) (Figure 3) in 3 studies that contributed to the summary OR (19,23,24). Older age and patient income were not associated with health system delay in any of the studies that interrogated this factor. The enabling factors that were associated with health system delay were: high cost of medical services (25c); visiting a non-health care provider, i.e. a traditional healer and community or village healer at first visit (25c); more than 3 visits to a health care provider (24); and repeated visits to the same provider (23). Studies that reported lack of examination of sputum on the first visit (25b), obtaining a negative smear result for acid-fast bacilli (25b) and underutilization of chest X-ray and smear microscopy (Turkey and Sudan) (19,23), and a low suspicion index in 3 studies from Turkey (17,19,34) were not combinable to calculate the OR.

Visiting a public, compared with a private facility, at first consultation was the only enabling factor that we had sufficient information for to calculate summary OR. In 3 studies (21,24,25b), visiting a private facility was significantly associated with health system delay (OR = 1.41; 95% CI: 1.06 to 1.88) (Figure 3).

## Heterogeneity

### Patient delay factors

Heterogeneity was significant in terms of sex ( $P < 0.1$ ;  $I^2 = 45\%$ ), patient's income ( $P < 0.00001$ ;  $I^2 = 92\%$ ), and crowding ( $P = 0.15$ ;  $I^2 = 47\%$ ). Upon further investigation, we found one study as the source of heterogeneity in terms of sex (16). Participants in this study were TB suspects rather than the confirmed TB cases in the other studies.

**Table 1 Assessing risk of bias in case–control studies included in the systematic review (13)**

Study	A				B		C			Quality score
	A1	A2	A3	A4	B1	B2	C1	C2	C3	
Al-Absi 2006 Yemen (20)	1	1	0	0	1	1	0	1	1	6
Alavi et al. 2015 Iran (18)	1	1	0	0	0	0	0	1	1	4
Akrim et al. 2014 Morocco (24)	1	1	1	1	1	1	0	1	1	8
Date & Okita 2005 Yemen (35)	1	1	0	0	0	0	0	1	1	4
Maamari 2008 Syria (21)	1	1	1	1	1	1	0	1	1	8
Güneylioglu et al. 2004 Turkey (19)	1	1	1	1	0	0	0	1	1	6
Mohamed et al. 2013 Sudan (22)	1	1	1	1	0	0	0	1	1	6
Rahim et al. 2004 Sudan (23)	1	1	1	1	1	1	1	1	1	9
Rumman et al. 2008 Jordan (18)	1	1	1	1	1	1	0	1	1	8
WHO 2008 Iraq (25a)	1	1	0	0	1	1	0	1	1	6
WHO 2008 Iran (25b)	1	1	1	1	1	1	0	1	1	8
WHO 2008 Egypt (25c)	1	1	1	1	1	1	0	1	1	8
WHO 2008 Somalia (25d)	1	1	1	1	1	1	0	1	1	8

A = Selection of the study groups: A1 right case definition; A2 right controls definition; A3 the representativeness of the cases; A4 the representativeness of controls.

B = Comparability of the groups: B1 control of main confounders; B2 control of any additional factor.

C = Ascertainment of exposure: C1 appropriate method of exposure ascertainment; C2 same method of exposure ascertainment for cases and controls; C3 same non-response rate of case and control groups.

1: study met the criteria; 0: the study did not meet the criteria.

Quality score: ≤ 5 high risk of bias. > 5 low risk of bias

**Table 2 Assessing risk of bias in cross-sectional studies using the quality assessment tool (14) modified by (15)**

Study	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	Quality score
Bashour & Mamaree 2003 (31)	1	U	1	0	1	1	U	1	1	1	7
Ekinci et al. 2014 (17)	1	U	U	U	1	1	U	1	1	1	6
Masjidi et al. 2007 (26)	0	1	0	U	1	1	U	1	1	1	6
Mirsaeidi et al. 2007 (27)	1	0	0	U	1	1	0	1	1	1	6
Okur et al. 2006 (29)	0	0	1	1	0	1	0	1	1	1	6
Okutan et al. 2005 (30)	0	1	1	1	1	1	0	1	0	1	7
Shahriyar et al. 2012 (33)	0	1	0	0	1	1	0	1	0	1	5
Shamaei et al. 2009 (28)	1	1	1	0	0	1	0	1	1	1	7
Nasehi et al. 2012 (32)	1	1	1	0	0	0	0	0	0	1	4
Yilmaz et al. 2001(34)	U	U	U	U	1	1	U	1	1	1	5

External validity: A1 = representative of the target population; A2 = appropriate recruitment of the participants; A3 = appropriate sampling frame; A4 = minimal non-response bias.

Internal validity: B1 = data collected directly from the subjects (as opposed to a proxy); B2 = acceptable case definition; B3 = valid and reliable study instrument; B4 = same mode of data collection used for all subjects; B5 = appropriate shortest prevalence period for the parameter of interest; B6 = appropriate numerator(s) and denominator(s) for the parameter of interest.

1: study met the criteria; 0: study did not meet the criteria; U: response was unclear.

Quality score: 0–5 high risk of bias; 6–8 moderate risk of bias; > 8 low risk of bias.

Figure 2 Factors associated with patient delay

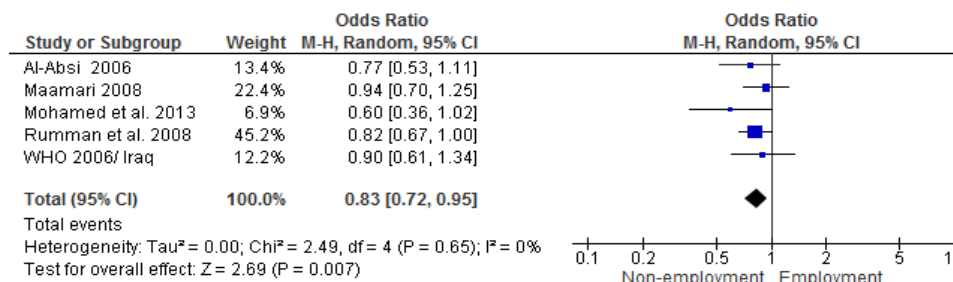
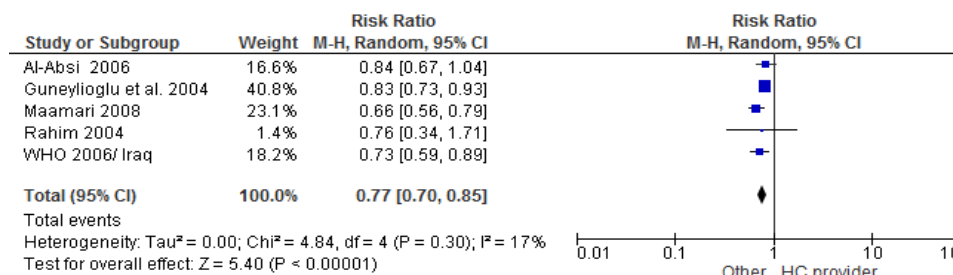
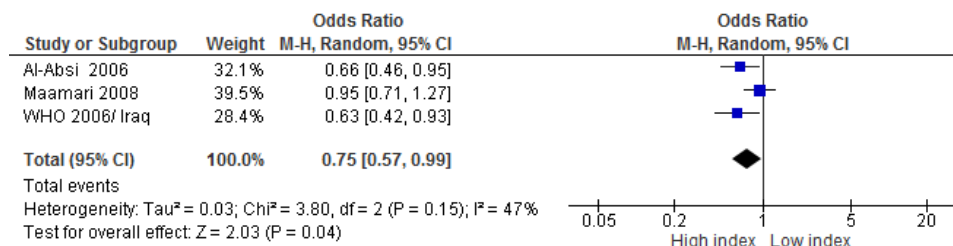
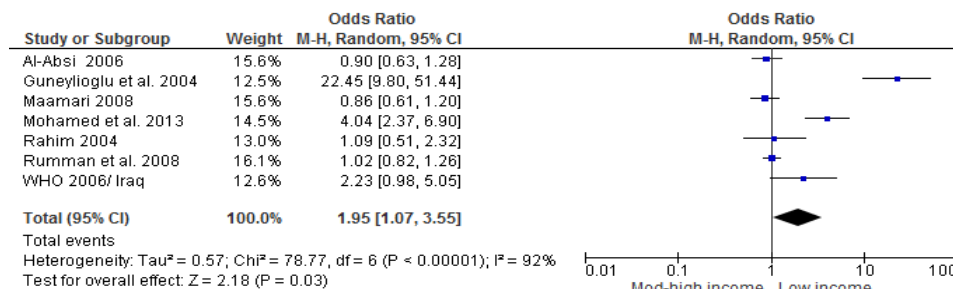
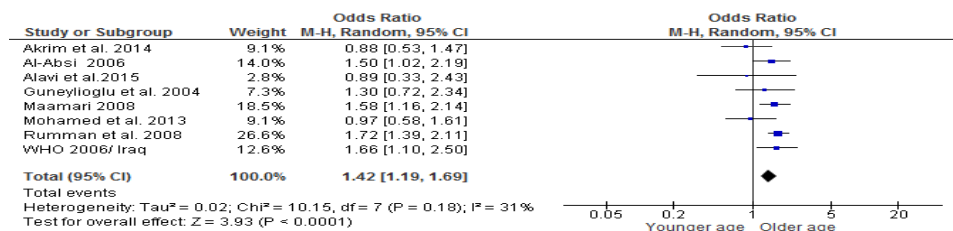
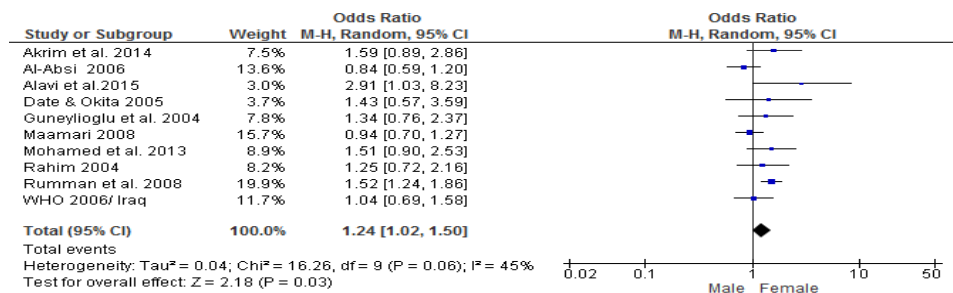
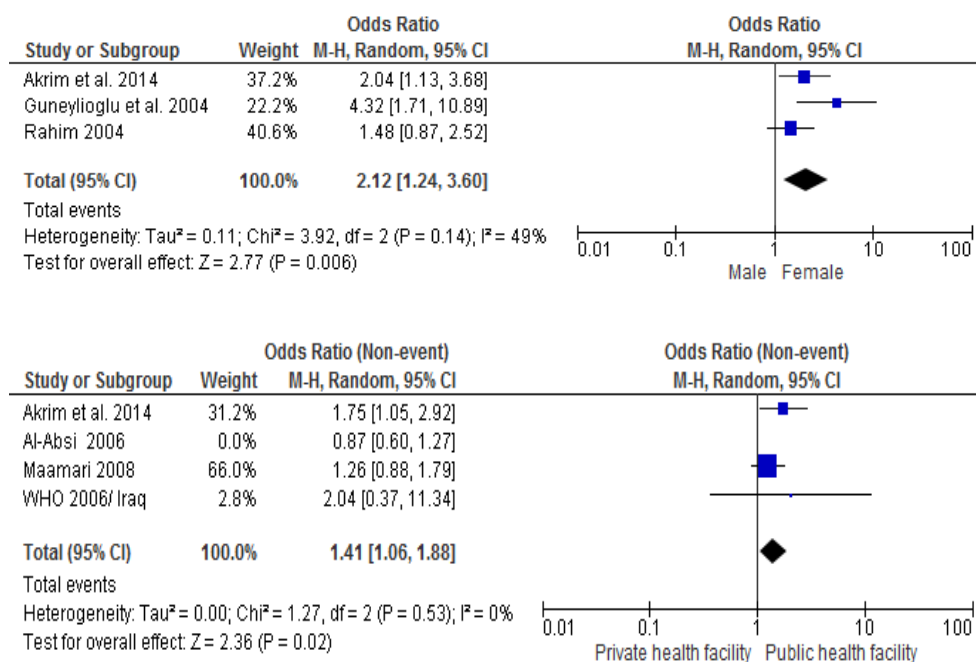


Figure 3 Gender and facility at 1st consultation vs. health system delay



Removal of this study from the meta-analysis for subgroup analysis rendered the heterogeneity nonsignificant ( $H, P = 0.47; I^2 = 0\%$ ). Two studies were different from the rest in terms of patient income (19,22); removal of these studies from the meta-analysis rendered the heterogeneity nonsignificant ( $H, P = 0.30; I^2 = 18\%$ ). Removal of the study having a higher cut-off point for the crowding index eliminated heterogeneity ( $H, P = 0.84; I^2 = 0\%$ ) when considering this outcome (21).

#### Health system factors

Heterogeneity was significant ( $P = 0.14; I^2 = 49\%$ ) in terms of sex and was based on a single study (19). Removal of this study from the meta-analysis rendered the heterogeneity nonsignificant ( $H, P = 1.00; I^2 = 0\%$ ).

#### Grade quality of evidence

The GRADE system produced a low quality grading for evidence in this review. This was a result of the shortcomings inherent in the observational study design of articles included in the review, plausibility of bias and small size estimates, which all have implications for the generalizability of estimates; for example, measurement of outcomes in these studies was dependent on patient self-reporting which created a possibility of recall bias. Nevertheless, the effects of exposure in these 12 studies were assessed as being similar and consistent thus, making them amenable to a meta-analysis.

## Discussion

### Overview

This review, which evaluated facilitators and barriers to TB diagnosis and health system delay, provides evidence for TB awareness and interventions targeting the elderly

and those from lower-income settings, as a strategy for successful TB control in the MENA region. The predisposing factors that were significantly associated with patient delay were older age, being female, unemployment, low patient income, and crowding. Notably, being female was the only factor associated with both patient and health system delay.

### Implications for practice

Tuberculosis control programme managers in the MENA region need to be cognizant of the range of factors which impact on patient and health systems delays. Such factors need to be considered when proposing policy interventions to reduce and contain transmission of TB disease, thus enhancing TB service delivery aimed at increased case detection rates in the MENA region.

This review provides evidence for the need to focus on health system enabling factors and to act on opportunities that will lead to a reduction in delays. Efforts to increase public awareness and to promote health education about TB, especially in outreach areas, should be prioritized. Maintaining a high suspicion index for TB among all health care providers is mandatory. This can be achieved through effective training, including monitoring and evaluation, of health care professionals.

### Implications for research

This systematic review underlined a couple of research-related caveats. The majority of studies had a cross-sectional study design which, while useful when measuring prevalence and identifying associations, nevertheless lack the ability to determine causality as do cohort studies (7). Recently, the MENA region has seen the fastest growing HIV epidemic. HIV-related data from

the region is lacking. Research related to diagnostic, patient and health system delays associated with TB among HIV patient is required to assist national TB programme managers in constructing policies and planning interventions.

The health system in general, and TB control in particular, in the region is expected to be severely impacted by the actual political instability and complex emergencies in the region, which will provide an environment where TB is very likely to occur. Hence, it is vital to establish structures to contain any potential flare-up of cases in these circumstances. These structures might be achieved through factors identified by this work, and research assessing the post-crises situation and illustrating the gaps and needs for TB control.

In summary, this review provides evidence for facilitators on barriers to TB diagnosis and health

system delays in the MENA region. For successful TB control in this region, TB awareness and interventions targeting the elderly and those in lower-income brackets, especially taking male–female differences into account, are essential.

### Limitations

Most studies recruited patients from public health facilities and TB management units near the capital of the country. No recruitment from private health facilities or from the peripheries was done. The generalizability of this systematic review is limited as patients recruited from private health facilities and marginalized or remote areas were not included in the analysis.

**Funding:** None.

**Competing interests:** None declared.

## Facteurs associés aux retards en matière de diagnostic et de traitement de la tuberculose dans la Région du Moyen-Orient et de l'Afrique du Nord : analyse systématique

### Résumé

**Contexte :** L'instabilité politique, les sanctions économiques et la qualité inférieure des soins de santé ont une incidence négative sur la lutte contre la tuberculose dans la Région du Moyen-Orient et de l'Afrique du Nord.

**Objectifs :** La présente étude avait pour objectif de mettre en évidence les facteurs qui contribuent aux retards dans le diagnostic et le traitement de la tuberculose dans les pays de cette Région.

**Méthodes :** Deux examinateurs ont passé en revue indépendamment les articles éligibles aux critères de l'étude qu'ils ont identifiés au moyen de recherches exhaustives. Ensuite, ils ont extrait des données qui ont été soumises à une méta-analyse.

**Résultats :** Les retards dans le diagnostic de la tuberculose étaient associés à un âge plus élevé et à un revenu faible (odds ratio [OR] = 1,49; intervalle de confiance [IC] à 95 % : 1,31-1,70) et (OR = 1,26; IC à 95 % : 1,09-1,45) respectivement (n = 17 études). L'appartenance au sexe féminin était associée à un retard dans la prise en charge tant au niveau des patients que des systèmes de santé [(OR = 1,24; IC à 95 % : 1,02-1,50) et (OR = 1,68; IC à 95 % : 1,18-2,38) respectivement. La connaissance et la perception de la tuberculose, le fait d'avoir un emploi et un faible niveau de promiscuité jouaient un rôle déterminant pour limiter les retards dans la prise en charge des patients. Le système GRADE (grade donné aux recommandations, examen, élaboration et évaluation) a évalué les données comme étant de faible qualité.

**Conclusion :** La présente analyse fournit aux facilitateurs des bases factuelles sur les obstacles en matière de diagnostic de la tuberculose ainsi que sur les retards liés aux systèmes de santé. Pour réussir à lutter contre la tuberculose dans la Région du Moyen-Orient et de l'Afrique du Nord, la sensibilisation à la maladie et les interventions ciblant les personnes âgées et celles issues des milieux à revenu faible sont essentielles, en accordant une attention particulière aux différences entre les sexes.

العوامل المرتبطة بالتأخر في تشخيص السل وعلاجه في الشرق الأوسط وشمال أفريقيا: استعراض منهجي

داليا الطيب، إليز بيترسون، مارك إنجيل، ليلي عبد الله  
الخلاصة

الخلفية: يؤثر انعدام الاستقرار السياسي، والعقوبات الاقتصادية، وتدني نوعية الرعاية الصحية سلباً على جهود مكافحة السل في منطقة الشرق الأوسط وشمال أفريقيا.

الأهداف: استهدفنا توضيح العوامل المسهمة في تأخير تشخيص السل وعلاجه في بلدان منطقة الشرق الأوسط وشمال أفريقيا.

طرق البحث: قام مراجعان مستقلان بتقييم المقالات المؤهلة التي حُدِّدَت من خلال البحث الشامل واستخلاص البيانات وخضعت للتحليل التلوي.



**النتائج:** اقترن تأخير تشخيص السل بتقدم العمر وانخفاض الدخل (OR = 1.49; 95% CI: 1.31–1.70) و (OR = 1.26; 95% CI: 1.09–1.45) وعلى التوالي (17 دراسة). وارتبط النوع الاجتماعي للإناث بتأخر تشخيص المرضى وتأخر النظام الصحي [OR = 1.24; 95% CI: 1.02–1.50] و (OR = 1.68; 95% CI: 1.18–2.38) على التوالي. ووجد الباحثون أن المعرفة بالسل وفهمه، ووجود وظيفة، وانخفاض مستويات الأزدحام، كان كل منها كفيلاً بالحماية من تأخر تشخيص المرضى وعلاجهم. وصنف نظام تصنيف التوصيات وتقديرها ووضعها وتقييمها البيئات المتاحة بأنها منخفضة الجودة.

**الاستنتاج:** يقدم هذا الاستعراض بيّنات للميسرين بشأن العقبات التي تؤدي إلى تأخر تشخيص السل وعلاجه. ولكي تتكامل جهود مكافحة السل في منطقة الشرق الأوسط وشمال أفريقيا بالنجاح، فإن الحاجة تمس إلى إذكاء الوعي بالسل وتوجيه التدخلات إلى كبار السن والأفراد في السياقات ذات الدخل المنخفض، مع توجيهها بشكل خاص نحو مراعاة الفروق بين الجنسين.

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# Findings of the midterm review of the implementation of the global health sector strategy and regional action plan for viral hepatitis

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## Introduction

During May 2016, the World Health Assembly endorsed the World Health Organization (WHO) global health sector strategy on viral hepatitis 2016–2021 (1), which aims to inspire countries to eliminate viral hepatitis as a public health threat by 2030, reducing new infections by 90% and mortality by 65% (1). Accordingly, the WHO Eastern Mediterranean Region developed the regional action plan for the implementation of the global health sector strategy on viral hepatitis 2017–2021 (2), with a vision, goal and targets aligned with those of the global strategy. The purpose of the regional action plan is to provide a roadmap and priority actions to achieve an Eastern Mediterranean Region free of new hepatitis infections and where people living with chronic hepatitis have access to affordable and effective prevention, treatment and care (2).

Between September and December 2019, a midterm review of the implementation of the global health sector strategy and regional action plan took place, to assess the response to viral hepatitis at the regional and national levels. Following this, the WHO Regional Office for the Eastern Mediterranean (WHO/EMRO) organized a regional consultation on the findings of the midterm review in Lahore, Pakistan, 3–5 December 2019 (3). The consultation was attended by participants from countries of the Region as well as representatives from global partner and civil society organizations, and staff from WHO.

### *The objectives of the consultation were to:*

- review and validate the findings of the midterm review of the implementation of the global health sector strategy and the regional action plan for viral hepatitis;
- identify impediments to progress towards national, regional and global targets, as well as identifying challenges and sharing best practices and lessons learned; and
- develop a roadmap for accelerated action towards achieving the 2021 targets and sustaining action towards hepatitis elimination by 2030.

### *Summary of discussions*

Participants reviewed the burden of viral hepatitis in the Region by country, as well as progress towards the

global elimination targets and the milestones of the regional action plan. Gaps were identified including the need to strengthen key interventions, such as hepatitis B birth dose, harm reduction and scaling up testing and treatment for both hepatitis B and C infection. Egypt's experience with hepatitis elimination was discussed, highlighting the country's efforts from the establishment of a national committee for viral hepatitis in 2006 up to the recent mass campaign to screen 60 million Egyptians and treat more than 3.5 million for hepatitis C infection (4).

### *Recommendations*

#### *To WHO*

- Providing technical support to Member States for policy dialogue and hepatitis response, including development of norms and standards, price negotiation, advocacy and resource mobilization.
- Exchanging best practices in health information and hepatitis response, including governance and community actions, as well as access to testing and treatment.

#### *To Member States*

- Designating focal points for national and subnational coordination of hepatitis response, as well as technical advisory groups with clear terms of reference to assist in identifying data sources and the review of strategies.
- Developing centralized national databases for hepatitis testing and treatment that include both the private and public sectors.
- Standardizing tools for hepatitis screening and treatment that are linked to the surveillance systems.
- Scaling up hepatitis B virus testing for pregnant women and 3-dose vaccination for infants.
- Developing national hepatitis guidelines, testing algorithms, and enhancing laboratory quality.
- Ensuring that hepatitis services are covered within health insurance schemes.

<sup>1</sup> This report is based on the Summary Report on the Consultation of findings of the midterm review of the implementation of the global health sector strategy and regional action plan for viral hepatitis, 3–5 December 2019, Lahore, Pakistan (<http://applications.emro.who.int/docs/EMSTD205E.pdf?ua=1>).

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*Editor-in-chief*

Eastern Mediterranean Health Journal  
WHO Regional Office for the Eastern Mediterranean  
P.O. Box 7608  
Nasr City, Cairo 11371  
Egypt  
Tel: (+202) 2276 5000  
Fax: (+202) 2670 2492/(+202) 2670 2494  
Email: emrgoemhj@who.int

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