World Health Organization
Regional Office for the Eastern Mediterranean

المجلة الصحية لشرق المتوسط

EMHJ

Eastern Mediterranean Health Journal

La Revue de Santé de la Méditerranée orientale

Over 14% of the population in the Eastern Mediterranean Region has diabetes. The focus of World Diabetes Day 2014, held on 14 November, is on healthy eating and enabling healthy food choices, key to preventing diabetes. WHO and the International Diabetes Federation are calling on all stakeholders, from individuals to countries, to make, enable and promote healthy food choices.

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المجلة الصحية لشرق المتوسط

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

EASTERN MEDITERRANEAN HEALTH JOURNAL

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

LA REVUE DE SANTÉ DE LA MÉDITERRANÉE ORIENTALE

EST une revue de santé officielle publiée par le Bureau régional de l'Organisation mondiale de la Santé pour la Méditerranée orientale. Elle offre une tribune pour la présentation et la promotion de nouvelles politiques et initiatives dans le domaine des ser-vices de santé ainsi qu'à l'échange d'idées, de concepts, de données épidémiologiques, de résultats de recherches et d'autres informations, se rapportant plus particulièrement à la Région de la Méditerranée orientale. Elle s'adresse à tous les professionnels de la santé, aux membres des instituts médicaux et autres instituts de formation médico-sanitaire, aux ONG, Centres collaborateurs de l'OMS et personnes concernés au sein et hors de la Région.

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المجلة الصحية لشرق المتوسط

EMHJ

Editorial

Prevention of type 2 diabetes – where is the evidence?

Jaakko Tuomilehto[1]

Diabetes is an "old disease". The first description of diabetes written on papyrus about 3500 years ago is found in the Ebers papyrus, which was discovered in Egypt in 1873 by the German archeologist Georg Ebers. Humans, like most mammals, may develop diabetes, if sufficient environmental exposure to physical inactivity, unhealthy diet and obesity are present. Genetic effects are important for the individual risk of type 2 diabetes (T2D) but twin studies have shown that the genetic effects combined explain less than 50% of the risk of T2D (*1*). Today we know almost 100 susceptibility genes associated with T2D but the relative importance of each of these genes is low (*2*), and together they explain only a small part of the disease risk. Thus, genetic screening cannot be used for the prediction of T2D for individuals. On the other hand, healthy lifestyle can also prevent T2D in people who are genetically at high risk, e.g. those with positive family history (*3*). Thus, the importance of lifestyle factors for the development and prevention of T2D is overwhelming.

The strongest evidence in medicine is considered to come from randomized controlled trials (RCTs). They are also important in providing the link to causal inference that in most observational studies cannot be derived. At the same time, observational studies are necessary for the identification of factors associated with an increased or decreased risk of a disease, and for generation of hypotheses on potential means for prevention based on modifiable risk factors.

Observational studies have by now identified a large number of factors that are associated with the development of T2D or with the protection against it. Most of them are related to physical activity, diet and obesity. It has also been shown unequivocally that exposures (poor nutrition, infections, smoking, etc.) during fetal life and early infancy resulting in insufficient development (often shown as low birth weight) also predict T2D later in life (*4*). Traditionally, T2D has been considered to be a disease of the elderly. However, with increasing obesity and sedentary lifestyle in children, there are increasing numbers of cases of T2D already occurring at a young age in many populations (*5*).

In the past two decades several innovative RCTs have repeatedly shown that interventions on modifiable risk factors can reduce the incidence of diabetes in high-risk groups. The evidence has been summarized in several systematic reviews and meta-analyses (*6,7*). There is compelling scientific evidence from RCTs that T2D can be prevented or its onset delayed. The key for prevention is a multimodal package of lifestyle changes that is a sum outcome of dietary and physical activity behaviours. The power of lifestyle was dramatically illustrated by the Finnish Diabetes Prevention Study (DPS) that explicitly showed that when the study participants with impaired glucose tolerance reached all five modest lifestyle intervention targets, none of them progressed to T2D (*8*).

Importantly, lifestyle intervention lasting for 3–6 years has been shown to have a carry-over effect on T2D incidence that lasts for several years; up to 15 in the Finnish Diabetes Prevention Study (*9*) and 20 years in the China Da Qing Diabetes Prevention Study (*10*). The observed sustained risk reduction seems to be a result of sustained lifestyle changes, but the legacy effect of improved glycaemia during the early intervention may also have contributed to the long-term effect. The follow-up data from the Chinese study indicate moreover that vascular risks are also reduced by lifestyle management.

Several prognostic questionnaires exist for detecting people at risk of T2D (*11*). One of the screening tools with an adequately high sensitivity and specificity is the Finnish Diabetes Risk Score (FINDRISC) developed in Finland (*12*). The FINDRISC has been successfully implemented in the Finnish primary health care system and used also in many other countries. The FINDRISC was also tested in the Omani population and as a result a slightly modified Omani Diabetes Risk Score was developed (*13*) which may be a suitable screening tool for the Arab populations in the Middle East.

Lifestyle interventions aiming at translating evidence from efficacy RCTs on T2D prevention into "real world" intervention programmes have also been carried out in various populations. Such data were recently combined in a meta-analysis considering the relationship between intervention effectiveness and adherence to guidelines (*14*). The primary meta-analysis included 22 studies with outcome data for weight loss at 12 months. The pooled result of the direct pairwise meta-analysis shows that lifestyle

[1]*Professor Emeritus, University of Helsinki, Finland and Professor of Vascular Prevention, Danube University Krems, Krems, Austria.*

interventions resulted in a mean weight loss of 2.12 kg. Evidence from this meta-analysis suggests that pragmatic T2D prevention programmes are effective. Effectiveness varies substantially between programmes but can be improved by maximizing guideline adherence to lifestyle changes.

In conclusion, there is no doubt that we can easily identify people at high risk of T2D and that lifestyle interventions can half their risk of T2D. Such evidence for efficient prevention strategies is rare for any noncommunicable disease. Yet, we must find the ways to make T2D prevention work at the population level. People cannot simply "outsource their lifestyle problems" completely to to health care personnel, although health personnel can advise people at high risk. The main issue is about healthy diet and sufficient physical activity. This needs all sectors of the community to be involved in so as to reduce the high burden of T2D.

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Editorial

Continuing progress in the priority health areas: actions for Member States and WHO

Ala Alwan[1]

The WHO Regional Committee for the Eastern Mediterranean Region convenes every October and is attended by all countries of the Eastern Mediterranean Region (21 Member States in addition to Palestine), with delegations headed by the respective Minister of Health. During these sessions, Member States discuss challenges facing health development, review progress in implementing health programmes, and endorse regional policies, activities and financial plans. The Regional Committee is considered the governing body of WHO's work in the Region.

The Sixty-first session of the WHO Regional Committee for the Eastern Mediterranean in Tunis concluded on 22 October 2014 after 3 days of intense discussion. The Session was attended by ministerial delegations from Member States, representatives of United Nations agencies, World Bank, GAVI, Global Fund, and the African Development Bank as well as 32 non-governmental organizations.

The Regional Committee agenda focused largely on the five priority health areas targeted for the Region with presentations and discussions on: the Regional Director's annual report and progress to mid-2014 covering the priority areas, which are maternal and child health, health systems strengthening, emergency preparedness and response, communicable diseases (in realtion to global health security) and noncommunicable diseases.

It was encouraging to see the very active engagement of the participants in the discussions and deliberations of the tabled issues and the substance of the resolutions. In a departure from earlier Regional Committee Sessions, only three resolutions were proposed, considerably fewer than in previous years. This will allow focus on practical strategies in line with the priorities set by the Committee. Member States were, at the same time, reminded of outstanding resolutions still needing to be implemented. The Regional Committee also decided to retire 79 previous resolutions which were considered to have been implemented and/or to have expired.

Regional Director's annual report

The Regional Director's annual report reviewed the work undertaken and progress made in the previous year in regard to the strategic priorities in Region endorsed by the Regional Committee in 2012 (*1*). The resolution on the Report covers several strategic health areas as well as WHO reform.

One of the objectives of WHO reform is to meet the expectations of Member States in addressing agreed global health priorities and realize improved health incomes, but to achieve this requires their active involvement in this ongoing process. Member States were called on to fully engage in the WHO reform debate and advocate for a substantial increase in the proportion of the budget allocated for technical support to countries.

Strengthening health systems remains an overarching priority. It is central to achieving universal health coverage. However, gaps in countries' health systems continue to hinder progress. To address these gaps, a regional framework for action on advancing universal health coverage was developed and Member States were called on to implement a national road map based on the framework (*2*).

Strengthening health information is key to national health development and it is a principal requirement in addressing the five strategic health priorities of the Region. Health information systems are fragmented and weak in many countries and there are major gaps. The Regional Committee discussed the outcome of two years of intensive work to develop a comprehensive but practical framework for health information systems with three fundamental components: monitoring health risks and determinants, tracking health status, and assessing health systems response. A list of core indicators was developed for each of the three components (*3*). The Committee endorsed the regional framework for health information systems and core indicators and called on Member States to implement the framework and report regularly on the indicators as of 2015.

Our Region is currently beset with emergencies, mostly as a result of political conflict. Beyond the immediate death of innocent individuals caught in emergency situations are the consequences of societal disruption, displacement of people and the difficulty in maintaining health services and delivering health care at a time when demand can surge. This Region has become home to over 50% of refugees in the world. Against this backdrop, enormous numbers of

[1]*Regional Director, World Health Organization Regional Office for the Eastern Mediterranean, Cairo, Egypt.*

health care workers strive to operate and provide needed health services and care, often in very poor conditions. The importance of emergency preparedness and response cannot therefore be overestimated. Recognizing this, Member States were urged to strengthen the capacity of their health systems to deal with crises through a whole-health and multisectoral approach, and support intercountry agreements for mutual assistance if the capacity of a country to manage is overwhelmed by a major emergency. They were also asked to allocate a minimum of 1% of the WHO country budget to the Emergency Solidarity Fund, and develop a national cadre of emergency management experts which can be rapidly deployed in emergencies, as needed, as part of the regional surge roster.

Global health security

The recent outbreaks of Ebola virus disease and Middle East Respiratory Syndrome (MERS-CoV) have highlighted the vulnerability of countries to emerging and re-emerging disease threats (*4*). It is for this very reason that the International Health Regulations (IHR) (2005) were adopted by all Member States at the Fifty-eighth session of the World Health Assembly and why it is imperative that countries meet their obligations to implement IHR (2005) by the deadline of June 2016. Member States now have just over a year and a half to complete this process. In the resolution on global health security, the Committee expressed concern at the lack of preparedness among countries of the Region to meet emerging health threats as shown by the serious gaps in their core capacities for implementation of IHR (2005) and urged them to formally commit to meeting the 2016 target and accelerate implementation. It emphasized that this should be a national priority with allocation of necessary funds and resources. At the same time, with the threat of potential importation of Ebola, Member States were urged to urgently evaluate their capacity to deal with such an event and identify the main deficiencies. I am pleased to say that this is being followed up on already, with an initial 17 countries of the Region now receiving expert assessment missions to evaluate national preparedness and help enhance operational readiness for Ebola virus disease.

Noncommunicable diseases

WHO estimates for 2012 indicate that noncommunicable diseases were responsible for 57% of all deaths in the Region. A major proportion of these deaths occurred prematurely. This highlights the high burden these diseases place on public health and development in the Region. Since a regional framework for action was endorsed by the Regional Committee in 2012, WHO has worked to develop practical guidelines and actions to support Member States in implementing the strategic interventions included in the four key elements of the framework: governance, surveillance, reduction of risk factors and health care. This has resulted in an updated regional framework for action including a set of process indicators against which Member States and the Regional Committee can measure progress in the Region (*5*).

In the resolution on noncommunicable diseases the Regional Committee endorsed the updated framework. Member States were urged to move from commitment to action by accelerating the implementation of the updated agreed interventions. The Committee requested the WHO Executive Board to invite the Director-General also to develop process indicators, for consideration by the World Health Assembly in 2015, so as to allow all Member States to monitor progress at the country level in order to report to the high-level meeting of the General Assembly in 2018. Additionally, recognizing that marketing of foods and non-alcoholic beverages to children is widespread in the Region, Member States were urged to implement the WHO recommendations endorsed by the Sixty-third World Health Assembly in 2010.

Conclusion

These three resolutions give both Member States and WHO clear strategic actions to take in order to advance health in the Region. Fulfilling the requirements needs dedication and hard work but I am hopeful that with the active commitment of Member States and with support from WHO we can continue to make progress in all the priority health areas in the coming 12 months.

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Confidentiality, informed consent and children's participation in the Saudi biobank governance: a comparative study

G.H. Alahmad[1] and K. Dierickx[2]

الخصوصية والموافقة المسبقة ومشاركة الأطفال في إدارة البنك البيولوجي السعودي: دراسة مقارنة

غياث حسن الأحمد، كريس ديريكس

الخلاصة: إن نمو البنوك البيولوجية للبحوث قد أوْجَد العديد من التحديات الأخلاقية الجديدة في جميع أنحاء العالم. وهذا المقال يلخص ويناقش القضايا الرئيسية في إدارة البنك البيولوجي السعودي، وهو بنك بيولوجي وطني أنشئ حديثاً في المملكة العربية السعودية وانطلق في عام 2014. ويضم مشروع البنك البيولوجي السعودي عينات إنسانية بيولوجية من مشاركين بأعمار 10-70 عاماً، ويهدف إلى إجراء دراسة مستفيضة عن تأثير الجينات والبيئة ونمط الحياة في الأمراض الشائعة. وقد درسنا نقاط القوة والضعف في إدارة البنك البيولوجي السعودي، إضافة إلى أوجه التشابه والاختلاف مع أربعة بنوك بيولوجية أخرى (في المملكة المتحدة وأيسلندا وإستونيا وكندا). وتمت مناقشة ثلاث قضايا أخلاقية مختلفة بالتفصيل، وهي: الخصوصية والموافقة المسبقة، ومشاركة الأطفال في البحث. وقمنا بتقييم هذه القضايا فيما يتعلق بالدلائل الإرشادية الأخلاقية الدولية والشريعة الإسلامية. ويرى الباحثان أن الرؤى التي اكتُسبت قد تفيد في تطوير قوانين البنوك البيولوجية الوطنية في بلدان إسلامية أخرى، لاسيما في بلدان إقليم شرق المتوسط.

ABSTRACT The growth of research biobanks has created many new ethical challenges worldwide. This article outlines and discusses key issues in the governance of Saudi Biobank, a newly established national biobank in Saudi Arabia launched in 2014. The Saudi Biobank project includes human biological samples from participants aged 10–70 years and aims to conduct an extensive study on the influence of genes, environment and lifestyle in common diseases. We examined the strengths and weaknesses of Saudi Biobank's governance as well as the similarities and differences with 4 other biobanks (in the United Kingdom, Iceland, Estonia and Canada). Three different ethical issues are discussed in detail: confidentiality, informed consent and children's participation in research. We evaluated these issues in relation to international ethical guidelines and Islamic law. The insights gained may be useful in developing national biobanking regulations in other Islamic countries, particularly in countries of the Eastern Mediterranean Region.

Confidentialité, consentement éclairé et participation des enfants dans la gouvernance de la Biobanque saoudienne : étude comparative

RÉSUMÉ Le développement des biobanques de recherche a créé de nombreux nouveaux défis éthiques dans le monde. Le présent article décrit et aborde des questions clés concernant la gouvernance de la Biobanque saoudienne, une biobanque nationale créée récemment en Arabie saoudite, en 2014. Le projet de la Biobanque saoudienne porte sur des échantillons biologiques humains recueillis auprès de participants âgés de 10 à 70 ans et vise à mener une étude approfondie concernant l'influence des gènes, de l'environnement et du mode de vie sur les maladies les plus courantes. Nous avons examiné les forces et les faiblesses de la gouvernance de la Biobanque saoudienne ainsi que les similitudes et les différences avec quatre autres biobanques (au Royaume-Uni, en Islande, en Estonie et au Canada). Trois questions éthiques différentes sont abordées en détail : la confidentialité, le consentement éclairé et la participation des enfants à la recherche. Nous avons évalué ces questions par rapport aux directives internationales d'éthique et au droit islamique. Les connaissances recueillies peuvent être utiles pour l'élaboration d'une réglementation nationale des biobanques dans d'autres pays islamiques, notamment dans des pays de la Région de la Méditerranée orientale.

[1]King Abdullah International Medical Research Centre, Riyadh, Saudi Arabia. [2]Centre for Biomedical Ethics and Law, Faculty of Medicine, Katholieke Universiteit Leuven, Leuven, Belgium (Correspondence to G.H. Alahmad: ghiathalahmad@hotmail.com).

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Introduction

Research biobanks today play a significant role in advancing medical science by offering the necessary resources for conducting research involving large numbers of biological samples. However, these research biobanks have created many new ethical challenges. These include issues such as whether human sample donors should give broad consent for use of samples rather than specific consent for each research study; the risks to participants from breaches in confidentiality of data; the risk of misuse of genetic information; how children's participation should be handled; and whether there is any direct benefit to biobank participants (*1*). Scholars have studied these challenges to identify appropriate solutions, and as a result a number of different guidelines, regulations and laws concerning biobanks have arisen: for example, the UK Biobanks Governance (national guidelines) (*2*), the Guidelines for Human Biobanks and Genetic Research Databases from the Organization for Economic Co-operation and Development (OECD) (regional guidelines) (*3*), and the International Declaration on Human Genetic Data by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (international guidelines) (*4*).

Saudi Biobank is a newly established national biobank in Saudi Arabia. Other new national biobanks in Middle Eastern countries have been launched (Qatar Biobank) or are expected to launch in the near future, particularly in the Gulf region (*5*). The ethical standards and governance of any biobank are affected not only by general principles but also by the laws and ethos of the country. Saudi Biobank was designed in a manner to respect not only international guidelines and Saudi law but also Islamic values, as outlined by the Saudi Biobank governance document (*6*). It is stated that consideration will be given to Islamic sources to ensure that the biobank is compliant with Islamic law, especially the Holy Quran, *sunna* and other sources including the decisions of juristic councils, such as the Council of Senior Scholars in Saudi Arabia and International Islamic Fiqh Academy (IIFA). The International Ethical Guidelines for Biomedical Research involving Human Subjects—Islamic View, published by the Islamic Organization for Medical Sciences (IOMS), in 2004 (*7*) is one of the references for the Saudi Biobank governance. Furthermore, the governance of Saudi Biobank considers as well the Saudi Arabian Law of Ethics of Research on Living Creatures of the National Committee of Medical and Bioethics. However, there is no clearly stated mechanism about how to apply Islamic opinions derived from these sources to the Saudi Biobank governance.

No previous studies have discussed the governance of Saudi Biobank. Moreover, there are a lack of published guidelines on genetic or general research ethics in the Eastern Mediterranean Region (EMR) (*8*). This paper aimed to perform a comparative analysis of the Saudi Biobank governance with that of different types of national or regional biobanks in other countries, particularly regarding the key topics of confidentiality, informed consent and children's participation, and how these are translated into the Islamic context. This paper will help future biobanks in the EMR, and areas with similar cultural and societal values and circumstances, to build their governance and to benefit from Saudi Biobank's strengths and weaknesses.

Methods

Background: Saudi Biobank

Saudi Biobank was established and co-financed by 2 governmental organizations: the King Abdul Aziz City for Science and Technology and the King Abdullah International Medical Research which is a part of the National Guard Health Affairs (NGHA). The Saudi Biobank project aims to conduct an extensive study on the influence of genes, environment and lifestyle in common diseases (*9*).

Saudi Biobank plans to obtain human biological samples and collect data from approximately 200 000 NGHA workers and their families. The NGHA has 4 large hospitals and 60 health centres (primary or secondary) with a total capacity of 2000 beds; it serves a community population of 2.5 million and approximately 60 000 patients a year (*9*). Muslims are 97.1% of the Saudi population (*10*). The NGHA offers the following advantages: a high-quality health-care system, new programme development, information technology resources and strategic development. These factors were important in selecting the NGHA as the Saudi Biobank headquarters (*9*).

Saudi Arabia has a different demographic distribution of ages compared with Western nations, notably a high proportion of young people in the population. The population under 40 years old in Saudi Arabia is approximately 78% and under 15 years is 32% (*11*). Therefore, the biobank was set up to include samples from children aged from 10 years and adults up to 70 years (*6*).

Data collection

This article concentrates on Saudi Biobank's governance and how it addresses 3 basic ethical issues: informed consent, confidentiality and children's participation. The components of each of these ethical issues were analysed and compared with governance documents from other biobanks.

The study was carried out from June to December 2013. To make a proper evaluation of Saudi Biobank's governance, it was compared with the governance documents of 4 different biobanks selected from biobanks that fulfilled the following criteria: national or regional biobanks established for

research purposes; ethical guidelines were accessible online to third parties from different countries; biobanks varied in size; and participants ranged in age. The selected biobanks were UK Biobank in the United Kingdom (*2*), Estonian Genome Project in Estonia (*12*), deCODE Genetics in Iceland (*13*) and CARTaGENE in Quebec, Canada (*14*).

Some of the international guidelines that address research biobank ethical issues are more general than explicit (*15*). Therefore, while we noted these guidelines we did not include them in our comparative results section but only referred to them in the discussion. These international guidelines included the Human Genome Organization's Ethics Committee (HUGO) statement (*16*), the Declaration of UNESCO (*4*), the World Health Organization's (WHO) report on genetic databases (*17*) and the guidelines of the OECD (*3*).

Results

The reviewed biobanks represent a varied picture of biobanks. They differ in many aspects, including the year of establishment, the number of participants and the participants' ages. Each biobank has its own system of ethics, which is guided by the general law of the country in which it is based.

Confidentiality

Confidentiality is a major concern in the governance of all the reviewed biobanks (*2,6,12–14*). Different protection mechanisms are employed to guarantee the confidentiality of personal information (Table 1). The stored samples and data are coded and/or anonymized and kept under strict control and are protected by a good security system (*2,6,12–14*).

Preventing discrimination, i.e. actions against or negative attitudes towards a person based on variations in his or her genome (*18*), is mentioned in the governance documents of the Icelandic, Estonian and Saudi biobanks but not to the same degree (*6,12,13*). In their statement on informed consent, the Estonian biobank states, "No one may discriminate against me on the basis of being or not being a gene donor" (*12*). The Icelandic biobank affirms avoiding discrimination: "It is prohibited to discriminate against a donor of a biological sample on the grounds of data derived from a biological sample" (*13*). In a special paragraph, Saudi Biobank's governance statement discusses preventing discrimination and outlines the levels: "Protection against any discrimination will be applied in the 3 levels: individuals, families and tribes" (*6*). Saudi Biobank also mentions preventing any type of stigmatization: i.e. socially or economically categorizing people according to their attitudes, stereotypes, beliefs (*19*) or medical conditions (*20*).

Informed consent

All biobanks are obligated by their governances to obtain informed consent from all participants prior to participation (Table 1) (*2,6,12–14*). The Icelandic biobank distinguishes between 2 groups of participants: healthy volunteers who donate for research purposes; and patients whose samples are collected initially for clinical reasons connected with their diagnosis and treatment but will be used later for research. Written signed informed consent is needed in the former case, while consent is assumed without the need of a donor's signature in the latter case, provided that the samples are not personally identified (*13*). Saudi Biobank requires written informed consent in both cases (*6*). Informed consent must contain all the information that is required to enable the participant to make a voluntary decision. General consent covering all types of research in the biobank is used by all biobanks, except the Icelandic biobank, deCODE Genetics, which provides 2 choices: either a limited consent for a specific research proposal; or a one-time broad consent that covers future research (*2,6,12–14*).

Saudi Biobank, UK Biobank and the Canadian biobank, CARTaGENE, allow re-contacting of participants for the following reasons: to collect new information; to collect new consent for new uses; or to provide feedback on the results of the research (*2,6,14*).

Withdrawal of consent at any time, without penalty, is a guaranteed right for all participants in all biobanks (Table 1). All the biobanks define different withdrawal options. Both Saudi Biobank and UK Biobank, for example, define 3 withdrawal options. The 1st option is the same in both biobanks: to have no further contact with the biobank. However, in the 2nd option UK Biobank will stop accessing samples and data, but Saudi Biobank will continue accessing them without collecting new samples or contacting donors. In the 3rd option Saudi Biobank mandates making anonymization irreversible, and will continue using previously collected samples after making them irreversibly anonymized. However, Saudi Biobank does not include an option for destruction of samples. This contrasts with UK Biobank (and the Icelandic biobank), which has an option to destroy samples after withdrawal from expressed consent. In the Estonian biobank the participants have the right to withdraw completely before coding (i.e. all samples and data to be removed), while after coding the participants have the right to apply for destruction only of the data which enables decoding. But in cases of unlawful disclosure of data, the gene donors to the Estonian biobank have the right to apply for the destruction of the tissue samples, the description of the DNA and the description of their state of health. For deCODE Genetics in Iceland, the biological sample will be destroyed when the donor withdraws written signed consent. On withdrawal of assumed consent, the biological sample shall not be destroyed, but preserved for use in the interests of the donor.

Table 1 Confidentiality, informed consent and children's participation in the governances of 5 different biobanks, 2013

Category	Variable	Saudi Biobank (Saudi Arabia)	UK Biobank (United Kingdom)	Estonian Genome Project (Estonia)	DeCODE Genetics (Iceland)	CARTaGENE (Quebec, Canada)
General data	Year of establishment	2011	2004	2001	1998	1999
	No. of participants	200 000	500 000	1 000 000	112 500	60 000
	Ages of participants	10–70 years	40–69 years	18+ years	All	25–74 years
Confidentiality	Obligation of respect of confidentiality	Yes	Yes	Yes	Yes	Yes
	Confidentiality methods:					
	Coding	Yes	Yes	Yes	Yes	Yes
	Access policy	Yes	Yes	Yes	Yes	Yes
	Security system	Yes	Yes	Yes	Yes	Yes
	Prohibition of discrimination	Yes	(Information unavailable)	Yes	Yes	(Information unavailable)
	Prohibition of stigmatization	Yes	(Information unavailable)	(Information unavailable)	(Information unavailable)	(Information unavailable)
Informed consent	Obligation of informed consent	Yes	Yes	Yes	Consent is presumed	Yes
	Limited or general consent	General consent	General consent	General consent	Limited to a specific research or broad consent for all research	General consent
	Possibility of re-consent or re-contact	Yes	Yes	(Information unavailable)	(Information unavailable)	Yes
	Right to withdraw consent	Yes	Yes	Yes	Yes	Yes
	Application for withdrawal	Three options: (1) no further contact; (2) no further contact and no further access to samples; (3) only use of fully irreversible, anonymized samples and data	Three options: (1) no further contact; (2) no further access to samples; (3) no further use of samples	Two stages: (1) before coding: right to withdraw; (2) after coding: data to be destroyed. In cases of unlawful disclosure: sample destruction	Two conditions for samples: (1) to be destroyed; or (2) not to be destroyed Data will remain	No further use of data and samples and destruction of codes
Children	Children's participation	Yes	n/a	n/a	Yes	n/a
	Guardian's consent	Yes	n/a	n/a	Yes	n/a
	Guardian	Any parent, but father has superior rights in conflicts of interest	n/a	n/a	Any parent	n/a
	Child's assent	Yes	n/a	n/a	Yes	n/a
	Age when assent starts	10 years	n/a	n/a	(Information unavailable)	n/a
	Consent when donor child becomes an adult	Continuous consent is assumed and child has the right to withdraw	n/a	n/a	(Information unavailable)	n/a

n/a = not applicable.

Also, on withdrawal, any data existing in the database will remain, but no new data will be entered. At CARTaGENE in Canada, after withdrawal of consent there is no further use of data or samples and there is destruction of codes, except for previous statistical analyses and publications (*2,6,12–14*).

Children's participation

Saudi Biobank and the Icelandic biobank, are familial biobanks that recruit samples from children (Table 1). While there is no minimum age of participants in deCODE Genetics in Iceland, it is 10 years in Saudi Biobank. However, UK Biobank and the Estonian biobank recruit only adult participants (aged 40–69 years and 18+ years respectively), while in Canada CARTaGENE has a minimum age of 15 years.

The governances of the Icelandic biobank and Saudi Biobank mandate parental consent for participation of children aged ≤ 16 years and ≤ 18 years respectively. For Saudi Biobank, either of the parents can give consent; however, the father has superior rights in cases of conflicts of opinion. The child's assent is also sought when possible. None of the biobanks define the age at which children can start giving assent themselves. Furthermore, Saudi Biobank does not ask for re-consent or contact child donors when they reach 18 years, but children can withdraw consent from the biobank. The children will know about their participation either when they give assent personally or when their guardians notify them about participation. The Biobanks Act in Iceland does not refer to re-contacting children when they reach adulthood.

Discussion

Saudi Biobank aims to conform to international guidelines, as noted in its governance documents; however, differences can be seen with and between other national biobanks, giving each biobank its own unique character.

Before discussing the current situation of the biobank in Saudi Arabia, 2 important factors that might affect the ethics of Saudi Biobank need to be mentioned. First, Islam, which is the religion of the majority of the population of the country, besides being the source of the legal system, colours various aspects of life in Saudi Arabia, including medical issues. Secondly, social characteristics and the tribal structure of the Saudi Arabian community still have deep influences on people's social behaviour. Extended families and consanguineous marriages are common in Saudi Arabia. Although the effects of these 2 factors cannot be separated, they are inter-related and have an influence on certain customs in Saudi society. The precedence of male guardians in taking decisions related to children is an example where we can find both Islamic and social effects. Considering these 2 factors, we will discuss the issues concerning Saudi Biobank in relation to the international guidelines and governances of other national biobanks.

Confidentiality

We noted that all the governances of the studied biobanks, including Saudi Biobank, mandated respecting the confidentiality of donors, followed certain kinds of practical data protection procedures, such as coding, access policies and security systems, and maintained information confidentiality by making the data inaccessible to biobank staff, insurance companies and other parties. This reflects the importance of this issue; biobank samples and data contain a great deal of potentially sensitive information. Respect for the confidentiality of data is one of the primary concerns of bioethicists (*21–23*).

Saudi Biobank uses international and national guidelines as references, and grants confidentiality at a level of importance which matches what is stated in the Law of Ethics of Research on Living Creatures by the Saudi National Committee of Medical and Bioethics (*24*), and in international guidelines, such as those of HUGO, UNESCO, WHO and OECD, all of which state that maintaining confidentiality of genetic material is mandatory for all biobanks. The governance of Saudi Biobank is fully compatible with these guidelines and also with the respect for confidentiality mentioned in Islamic religious rulings (*fatwas*) (*25*).

We observed that Saudi Biobank stresses the issues that result from any potential breaches of confidentiality, such as the risk of discrimination and stigma. The Icelandic and Estonian biobanks also address avoiding discrimination, but Saudi Biobank is the only biobank that specifically addresses this issue in a paragraph in its governance document. Moreover, Saudi Biobank discusses avoidance of stigma. These provisions reflect the sensitivity towards the risk of any type of discrimination or stigmatization in Saudi society. Breaches of confidentially may lead not only to stigma for an individual but also at the familial and tribal level (*26*). In a society with strong, extended families and a high percentage of consanguineous marriages, any stigma could potentially adversely affect all family members and issues such as marriage. This concern regarding societal/family stigma is supported by other studies about the high rate of consanguinity and genetically inherited diseases in EMR countries such as in Saudi Arabia (*27*) and among some other Muslim populations (*28*). There is a growing awareness too in other countries of the need to protect certain groups from disclosure of genetic information, especially after the case of the Havasupai American Indian tribe, in which samples were used without proper consent for research about schizophrenia, inbreeding and human population migration theories (*29,30*).

Preventing discrimination, as specified in the governance of Saudi Biobank,

is supported by the Saudi Law of Ethics of Research on Living Creatures (Article 36). There are no specific laws in Iceland and Estonia to prevent genetic discrimination (*31*); however, both the Icelandic and Estonian biobanks mention preventing discrimination in their governance documents. Even though preventing discrimination has not been stated clearly in the governance of UK Biobank and the Canadian biobank, many legal documents in the UK and Canada offer protection against any kind of discrimination, including genetic discrimination. In the UK, there is no specific law or legislation related to genetic discrimination; rather, the legislators have merged the Disability Discrimination Act 1995 into the Equality Act of 2010, both of which include anti-discrimination measures (*32*). Likewise, Canada has enacted laws such as Article 15 of the Canadian Charter of Rights and Freedoms, the Canadian Human Rights Act, the Tri-Council Policy Statement and PIPEDA (About Genetic Discrimination). Similarly, in Iceland, the Parliament passed a bill in December of 1998 that permitted the creation of a consolidated record of all the Icelandic peoples concerning genealogy, genetics and personal medical information (*33*).

Informed consent

Informed consent is considered to be a cornerstone of ethical practices in conducting medical research, including research biobanks. Informed consent is a reflection of an individual's autonomy, which is a basic principle of bioethics. Obtaining valid consent, free and voluntary participation and clear and adequate disclosure and understanding of information are ethical prerequisites. Saudi Biobank and other biobanks require informed consent to be obtained from all donors. This policy matches the requirements of the Saudi law of research ethics, international guidelines such as the UNESCO Universal Declaration on Bioethics and Human Rights (2005) and other guidelines about research on stored materials.

One-time consent for all research conducted on donor samples and data has been selected as policy by Saudi Biobank. However, it has received criticism because the donors might not be well-informed about future research using their samples, and therefore the principle of autonomy might be undermined (*34*). Although these criticisms are recognized elsewhere in the literature, we note that one-time consent matches the requirements specified in international documents and with the findings of other authors of biobank studies (*16,25–38*). Moreover, one-time consent is the standard selected by many biobanks worldwide (*13*). Getting informed consent for every instance of research is cumbersome and can therefore be viewed as a hindrance to scientific progress (*39*). Adequate initial counselling of donors and keeping the door open for further questions and answers is necessary (*40*). Even if the donor signs consent just once, research ethics committees have to review and approve each research project separately, and the donors should enjoy the right of withdrawal any time. It can be argued that these 2 provisions—ethical approval from an institutional review board and withdrawal rights—offer sufficient protection to the donor (*41,42*).

The obligation to obtain informed consent before performing research in Saudi Biobank is supported by interpretations of Islamic texts. Although nothing is written in Islamic laws concerning biobanks, the research ethics guidelines issued by the IOMS mandates informed consent before any medical research (*36*). In addition, Islamic *fatwas* issued by juristic councils support the obligation of informed consent, such as *fatwa* no. 161 (17:10) (2006) by the IIFA about Islamic perspectives on medical research (*43*), the *fatwa* about stem cells (17:3) (2002) by the Islamic Fiqh Council (IFC) (*38*) and so on. Moreover, a survey of national research ethics regulations and guidelines in Middle Eastern Arab countries showed that regulations mandate informed consent (*8*). Although nothing is written about one-time consent in Islamic *fatwas*, one-time consent does not contradict any Islamic laws.

Most international guidelines consider withdrawal of consent without any adverse consequences to the rights of any participant in a research study. Saudi Biobank offers 3 options for withdrawal, but none of them requires complete destruction of the samples and data. In the 3rd option—complete withdrawal—Saudi Biobank will completely anonymize the samples and data, but it does not require their destruction (*6*). The Declaration of UNESCO, WHO databases and the HUGO statement provide 2 alternatives for complete withdrawal: to destroy any unused samples and data or to keep them but with full anonymization (*4,16,17*). The OECD mentions destroying the samples and any data with respect to the cultural heritage and/or religious beliefs of the participant (*3*). The Singapore Tissue Network and CARTaGENE biobank in Canada will destroy the samples, as will UK Biobank in its 3rd withdrawal option, and prevent information from contributing to further analyses, but not to previous analysis, while Saudi Biobank will keep samples after they are completely anonymized. The Estonian Genome Project will not destroy samples, but destruction may be applied if the identity of a gene donor is unlawfully disclosed. Clearly, sample destruction provides the best guarantee of a participant's protection, but it may result in a loss of research effort and money. Although full anonymization cannot ensure absolute protection, especially in cases of abuse by data key-holders (*44*), it can offer both protection and respect to a certain degree, in that donors will be informed before participation about the impossibility of complete destruction of their

samples when withdrawal is requested. Whichever method is chosen, biobanks must make all possible efforts to guarantee sufficient protection to donors. The multiple options for withdrawal of consent at Saudi Biobank are similar but not identical to those at UK Biobank.

Children's participation

The inclusion of children's samples in research biobanks is widely accepted as being useful, especially to study diseases of childhood (*45*). This is particularly important at Saudi Biobank due to the high percentage of children in the total population of Saudi Arabia; 77.5% of the population is under the age of 40 years compared with 49.6% in the UK. Children are not simply small adults, however, and we cannot just apply the results of research on adults to children. Children's participation in research raises different ethical challenges than for adults' participation. For example, it has been stated that research on children can be performed only if it addresses a medical problem related to a child's health and be beneficial to the participating child or to the community of children. Other conditions for children's participation in research include: minimizing risks to the child; considering the best interest of the child; obtaining the guardian's consent and—when appropriate, based upon the age of the child—the child's assent as well (*46–48*). Many researchers distinguish between research on children and research on samples taken from children, especially regarding the issue of minimalizing risks (*49,50*).

Saudi Biobank recruits participants aged from 10 years and over and this differs from many other biobanks, such as UK Biobank and CARTaGENE in Canada. The process is similar to some other biobanks that recruit children among their participants, such as the Icelandic biobank. According to the declaration of UNESCO, WHO databases and the OECD guidelines, research on children is allowed provided the child is offered enough safeguards from more than minimum risks and that the guardian's consent is obtained. Saudi Biobank guidelines also satisfy the OECD guidelines; although the child's opinion is not obligatory, it must be respected, and his or her assent must be collected if possible.

Concerning research on children, the governance of Saudi Biobank is consistent with the opinions stated in several Islamic sources regarding paediatric research, such as the *fatwas* of IIFA (67, 1992; 161, 2006) (*32*), ICF (3/17, 2002) (*51*) and the IOMS guidelines (2005) (*52*). According to Islamic sources, paediatric research has to be in the best interest of the child and must involve no more than minimal risk. According to IOMS the best interest of the child can be a direct individual benefit to the child him/herself or an indirect, general benefit to other children in the population (*52*).

The same conditions are stated in the Saudi Arabian law of ethics of research on living creations. Using Islam as a reference can explain why Saudi Biobank gives fathers superior rights over mothers in cases of conflict of interest. According to Islamic references fathers are the guardian to their children (*53*). This is different to the case of Iceland, where due to the different cultural and legal setting the biobank does not specify which parent has superior rights.

However, the question arises, why does Saudi Biobank define 10 years as a minimum age for allowing research on children, when the Saudi Arabian law of ethics of research on living creations does not mention a minimum age? The Icelandic biobank and Marshfield Clinic Personalized Medicine Research Project have no minimum age limit to accept participants. Children younger than 10 years old form a significant proportion of the Saudi population and there is no clear justification provided by Saudi Biobank why the age 10 years was chosen.

Collecting assent from children for their participation in research biobanking is important and consistent with the ethical principle of respecting children's autonomy and including them in decision-making that affects them. The importance of obtaining the child's assent is supported by other studies, and is mentioned in international guidelines about research ethics, such as the Declaration of Helsinki (*54*), the International Ethical Guidelines for Biomedical Research involving Human Subjects by the Council for International Organizations of Medical Sciences (*55*), and the Convention on the Rights of the Child by the United Nations (*56*).

Saudi Biobank encourages (but does not require) children's assent to allow their samples to be used in the biobank and it seems that the minimum age of 10 years was chosen to ensure that participating children are capable of understanding the biobank's principles and procedures and of participating in the decision-making process. The importance of the child's understanding is also mentioned in the guidelines of other biobanks (e.g. in Western Australia). The Council for International Organizations of Medical Sciences state that starting from the ages of 12 to 13 years the child's opinion should be taken into account (*55*). However, other research sources suggest that 16–18 years is a more appropriate age for understanding the implications of genetic research and yet others have proposed much lower ages, even as low as 4 years old, when children are capable of understanding their own medical issues (*57*). None of the Islamic sources define the minimum age at which medical research can be performed on children. In a previous study, we could not find any Islamic *fatwa* about the age at which children can ethically be considered to be able to give an assent to medical research and suggested collecting assent from children starting at age 7 years (G.H. Alahmad and K. Dierickx, forthcoming, 2014).

Conclusion

Saudi Biobank, which is based on international and national ethical guidelines and Islamic religious principles, shares the same fundamental ethical values as other biobanks, although differences could be found on some of the details of the governance. Confidentiality is a sensitive concern, particularly as it relates to discrimination and stigmatization. Informed consent is of course an important issue in all biobanks. However, in contrast to some other biobanks, Saudi Biobank does not have a provision for destruction of samples and data after withdrawal of consent. Participation of children in biobanking is considered important in the context of Saudi Arabia, and they are offered the requisite level of protection by Saudi Biobank. We propose meeting with other biobanks worldwide for future collaborations and greater discussion and harmonization of guidelines. The governance of Saudi Biobank is one of the newly established health policies in the Middle East that regulate biobanking research and can be adapted partially or completely by other biobanks in the Arab and Islamic world.

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Adjustment factors to per capita health-care indicators in countries with expatriate male-majority populations

A.H. Hussin[1]

عوامل لتصحيح مؤشرات الرعاية الصحية للفرد في البلدان التي أغلبية سكانها من الذكور المغتربين

التجاني حسين

الخلاصة: شهد عدد السكان في بلدان مجلس التعاون الخليجي من عام 2000 إلى عام 2010 زيادة قدرها 53٪، مقارنة بمتوسط الزيادة العالمية والتي بلغت 13٪. وقد تفاوتت المعدلات بين البلدان؛ حيث تراوحت بين 23٪ في عُمان إلى 198٪ في قطر. وكانت القوة الدافعة الرئيسة لهذه الزيادة الحادة في عدد السكان هو ارتفاعَ الطلب على العمالة الوافدة. ولذا، فإن الهدف من هذه الدراسة هو تصحيح تعداد السكان في بلدان مجلس التعاون الخليجي بغية التأكد من أن المقارنات مع مؤشرات الأداء الرئيسة للرعاية الصحية في بلدان أخرى تعبِّر عن التركيبة السكانية. وخلصت الدراسة إلى أن تصحيح تعداد السكان في دول مجلس التعاون الخليجي له دور أساسي في تحديد الإنفاق على الصحة والنواتج الصحية، وأن التنبؤات غير الدقيقة من شأنها أن تؤدي إلى مبالغة خطيرة في حاجة بلدان مجلس التعاون الخليجي إلى الاستثمار في قطاع الرعاية الصحية. ويمكن لواضعي السياسات أن يستفيدوا من النماذج السكانية الواردة في هذه الدراسة من أجل وضع خطط دقيقة لتقديم الرعاية الصحية.

ABSTRACT From 2000 to 2010, the population in the Gulf Cooperation Council (GCC) countries underwent an increase of 53%, compared with an average global increase of 13%. The rates varied by country, ranging from 23% in Oman to 198% in Qatar. The main driving force for this sharp increase in population was the high demand for immigrant labour. The aim of this study was to adjust the population in the GCC countries in order to ensure that the comparisons of health-care key performance indicators with other countries account for the composition of the populations. The conclusion of the study was that adjusting the population in the GCC is instrumental for determining health spending and health outcomes, and that inaccurate forecasting would result in serious overestimation of the need for GCC countries to invest in the health-care sector. Policy-makers can utilize the population models in this study to accurately plan for health-care delivery.

Facteurs d'ajustement aux indicateurs de soins de santé par habitant dans des pays où les populations d'expatriés sont majoritairement de sexe masculin

RÉSUMÉ De 2000 à 2010, la population des pays du Conseil de coopération du Golfe a augmenté de 53 %, par rapport à une augmentation moyenne mondiale de 13 %. Les pourcentages varient d'un pays à l'autre, allant de 23 % à Oman à 198 % au Qatar. L'importante demande en main-d'œuvre immigrante constituait l'élément moteur principal de cette forte augmentation de la population. La présente étude visait à ajuster les populations dans les pays du Conseil de coopération du Golfe afin de garantir que les comparaisons des indicateurs de performance clés pour les soins de santé avec d'autres pays tiennent compte de la composition des populations. L'étude concluait dans un premier temps que l'ajustement des populations des pays du Conseil de coopération du Golfe était essentiel pour déterminer les dépenses de santé et les résultats sanitaires, et dans un deuxième temps que des prévisions inexactes entraîneraient d'importantes surestimations de la nécessité pour les pays du Conseil de coopération du Golfe d'investir dans le secteur des soins de santé. Les responsables politiques peuvent utiliser les modèles de population de cette étude pour planifier avec exactitude la prestation de soins de santé.

[1]*Dubai Health Authority, Dubai, United Arab Emirates (Correspondence to: altijani@gmail.com; ahussin@dha.gov.ae).*

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Introduction

Benchmarking the populations of countries in order to compare health spending and outcomes between nations and regions is a logistical task of considerable complexity. In projections of health spending, estimates are usually based on the projected effects of demographic factors with regard to supply and demand for health-care services (*1*). In the period between 2000 and 2010, the population of the 6 Gulf Cooperation Council (GCC) countries—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE)—increased dramatically (*2*). A financial boom driven by high oil and gas revenues has been used to build and expand the infrastructures in these countries and enlarge the window for immigrant workers to join the national labour force. Non-nationals have come from developed and other Arab countries to work mainly in the government, oil and gas sectors, while single, male workers have come mostly from the Indian sub-continent to work in blue-collar jobs such as construction. Table 1 shows the pattern of population increase by sex for the GCC countries during the period 2000–10, and compares it with the global population. The global population increased by 13%, while the ratio of males to females remained the same at 102:100. However, the population in these in GCC countries grew by 53%, significantly higher than global growth rates, and the male to female sex ratios also increased dramatically over the same period. The higher ratio of males to females was evident in 2000, and continued to increase through to 2010. Figure 1 illustrates these distinct characteristics of the GCC population: the sex imbalance in the working-age groups, which causes the pyramid to be asymmetric, and a bulge in the working-age groups caused by the high number of immigrants who are residing in these countries temporarily in order to meet the demands of the job market. This bulge should not be interpreted as a classic youth bulge, which would indicate a contracting population.

This demographic bias, dominated by the working-age male, must be taken into account in any attempt to benchmark per capita health-care key performance indicators (KPIs) against countries which have a more balanced population distribution. If, for example, the number of mammograms conducted is measured per million of raw population, then for the GCC countries the measurement could indicate that the health system discriminates against women (since the numbers would be lower than the OECD norms purely due to the sex imbalance in society). To adjust for this, the raw population figures must be modelled to reflect the different sex distribution within the GCC.

The supply of new hospitals in the GCC countries is on the rise, and this rise is primarily sponsored by the government (*3,4*). Similar efforts are also underway for the recruitment of health-care personnel. Roberfroid et al. offered a presentation of the typology of existing forecasting approaches for anticipating physician supply (*5*). These approaches are the supply projection, the demand-based approach and the needs-based approach. A fourth approach is benchmarking health systems with populations that have similar health profiles. All of these approaches rely on accurate measures of population size. In order to draw valuable conclusions from a reference country or region, Roberfroid et al. argued that adjustments are necessary for the population's demographics (*5*).

This paper discusses how to benchmark the population of the GCC countries in order to make international comparisons of health spending and health outcomes. The process of devising and then comparing KPIs has been a focus of research since the 1990s (*6,7*). As elsewhere, the health debate has centred on how to use selected KPIs to improve health-care delivery performance (*8*). The primary purpose of this paper was to adjust the population in the GCC countries in order to ensure that the comparisons of health KPIs take account of the composition of different populations.

Table 1 Pattern of total population growth in Gulf Cooperation Council countries, 2000–2010

Country	Year 2000		Year 2010		Population growth 2000–2010
	Population	Male to female ratio	Population	Male to female ratio	
Bahrain	638 193	133:100	1 261 835	163:100	98
Kuwait	1 940 786	144:100	2 736 732	150:100	41
Oman	2 264 163	127:100	2 782 435	144:100	23
Qatar	590 957	186:100	1 758 793	317:100	198
Saudi Arabia	20 045 276	117:100	7 448 086	122:100	37
United Arab Emirates	3 033 491	203:100	7 511 690	233:100	148
World (× 1000)	6 118 131	102:100	6 894 378	102:100	13

Source: World DataBank (2).

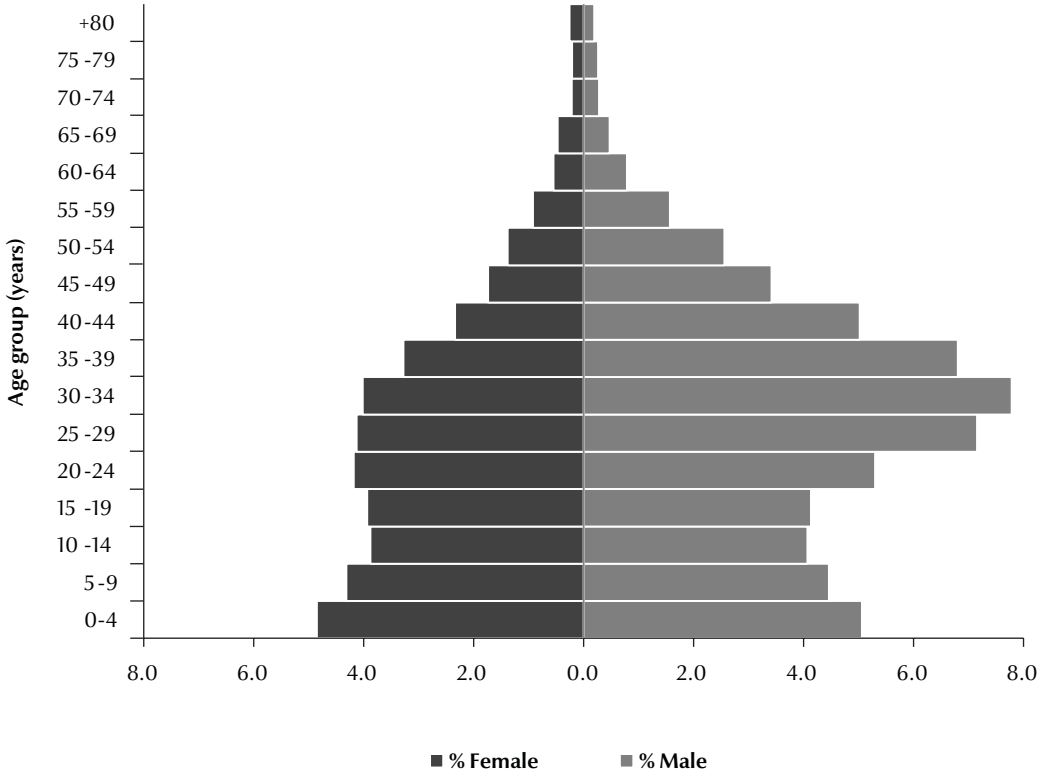

Figure 1 Population pyramid for Gulf Cooperation Council (GCC) countries, 2010: source: World DataBank (*2*)

Methods

The source for the data used in this study was the World Bank's *World DataBank* (beta) (*2*). The data were reported by age group, year, sex and country. We downloaded data for the period 1980 to 2011. While the GCC countries produce their own periodic population data through national statistics offices, we used the World *DataBank* for completeness and consistency.

The population data to input to the model was drawn from 5 regions: Middle East, Northern Africa, Eastern Europe, Asia (excluding Middle East), Latin America and the Caribbean. These regions were selected for 2 reasons. First, these countries are the primary native countries of the expatriate population in the GCC region, and thus can be expected to demonstrate a sex ratio that correlates to the modelled population. Secondly, these countries are less developed, with lower dependence ratios, and can be expected to have a population pyramid that is close to the modelled GCC population. In contrast, we excluded the data from high-income countries because these countries have different dependency ratio and population demographics than in the GCC.

A regression model based on a prediction procedure was used to produce a modelled male population aged 20–60 years. The main outcome measures were each GCC country's male population for the age groups 20–59 years, measured in 5-year age intervals (a total of 9 age groups). Each country's male population was replaced by a missing value for the years 2000 and beyond. The regression models were then used to predict the "missing" age groups of males for each country.

The decision to adjust only the male population in these countries represented a conservative approach. The female population was not modelled for 2 reasons. First, the proportion of female single workers is very low. Data from Qatar Statistics Authority for example showed that in 2010 males occupied 90% of the blue-collar jobs (*9*). Secondly, health-care utilization among single females, and females of all ages, is relatively higher than for single males and has been consistently documented in a number of studies (*10–15*).

The primary independent variables included the age groups, and the female population of each country. Thus, the population groups from a total of 106 countries, selected by sex, and for the period 1980–2011 was used to predict the modelled population for the 9 male age groups in the 6 GCC countries. To adjust for variations among countries, we included country fixed effects, i.e. a dummy for each country. In addition, the year (continuous variable) was used to control for the world population trend.

Both sides of the regression model were transformed to logarithm values, to account for the exponential relationship between the dependent variable and the predictors. The coefficients of the log-transformed variables measured

the elasticity of each of the predictors to the dependent variable. Thus, the model used in this study was a linear regression of log-transformed variables, and can be illustrated in equation 1: log (male population) = β0 + β1 log (female population) + β2 log (age group) + β3 log(year) + country fixed effect + error term.

The unit of observation was the age group, and at each year of the data. To account for the bias in the predictions of the transformed variables, the predicted values were multiplied by the exponential of the mean square of the error term (*16*).

Once the predicted value of the total population was estimated, an adjustment factor (Ω) was then computed. The adjustment factor for each country was the rate of the total modelled population to the total actual population, as in equation 2: Adjustment factor (Ω) = (modelled population)/(actual population).

For example, an adjustment factor of 0.80 indicates that the estimated total population is 80% of the actual population. The per capita health-care indicators were adjusted by dividing the nominal KPI by Ω. For example, a nominal per capita KPI of 100 and Ω of 0.80 produced an adjusted KPI of 125.

The statistical software *Stata* was used to conduct the analyses.

Sensitivity analyses

We used other models in our sensitivity analysis. First, we used age in its linear untransformed format. This model was used as our "lower estimates" model, because the results showed a greater degree of adjustment in the population. Secondly, we used other specifications for the age variable. These specifications included age and age squared, age fixed effect and the inverse of age. Thirdly, we used alternative specifications for the year trend variable. These specifications were the linear untransformed, and the year fixed effects. Fourthly, we interacted age and year, using the different specifications of these variables.

We used *Fitstat* and *Linktest* to test the accuracy of fit for each of these models, and compared the results with our log-transformed model. All of the above alternative models showed inferior accuracy of fit when compared with the log-transformed and "lower estimates" models. Regardless of the model's specifications, the predicted male population from these alternative models were within the boundaries of the 2 reported models in this paper.

Results

The modelled male population in the GCC countries was estimated as being much lower than the actual proportion. The results are shown in Table 2. The higher the actual male to female ratio, the lower the adjustment factor (Ω) was. For example, the actual population in Qatar was 1.759 million, and the sex ratio was 317:100 for 2010. The results show that the adjustment factors for the lower and higher estimates ranged between 0.61 and 0.66 respectively and the adjusted sex ratios ranged between 151:100 and 170:100 respectively.

In contrast, Table 2 shows that the actual population in Saudi Arabia was 27.45 million and the sex ratio was 122:100 in 2010. Although Saudi Arabia had a higher population than any other GCC country, the adjustment factors were the highest, i.e. 0.96 and 0.97 for the lower and higher estimates respectively, and the adjusted sex ratios were 114:100 and 118:100 for the lower and higher estimates respectively.

Population pyramids for the GCC countries in Figure 2 show the actual and modelled male population of the higher estimates. The bulge was still present for males in the working age groups, due to the high male population in these countries, even with the adjustment. However, the pyramids tended to be more symmetrical. Countries with higher actual male to female ratios, such as Qatar and the UAE, showed a higher reduction in the modelled male population. However, the imbalance still existed. Countries with lower actual male to female ratios, such as Oman and Saudi Arabia, had relatively lower

Table 2 Actual and modelled population in Gulf Cooperation Council countries, 2010

Country	Actual population		Modelled population			
			Adjustment factor (Ω)		Male to female ratio	
	(× 1000)	Male to female ratio	Lower estimate	Higher estimate	Lower estimate	Higher estimate
Bahrain	1 262	163:100	0.81	0.84	115:100	123:100
Kuwait	736	150:100	0.91	0.94	127:100	132:100
Oman	2 783	144:100	0.87	0.88	110:100	112:100
Qatar	1 759	317:100	0.61	0.66	151:100	170:100
Saudi Arabia	27 448	122:100	0.96	0.97	114:100	118:100
United Arab Emirates	7 512	233:100	0.73	0.79	139:100	159:100

The lower estimates used age instead of log (age) as in equation 1 in the Methods. Higher estimates used equation 1. The adjustment factor (Ω) was computed by dividing the total estimated population by the actual total population.

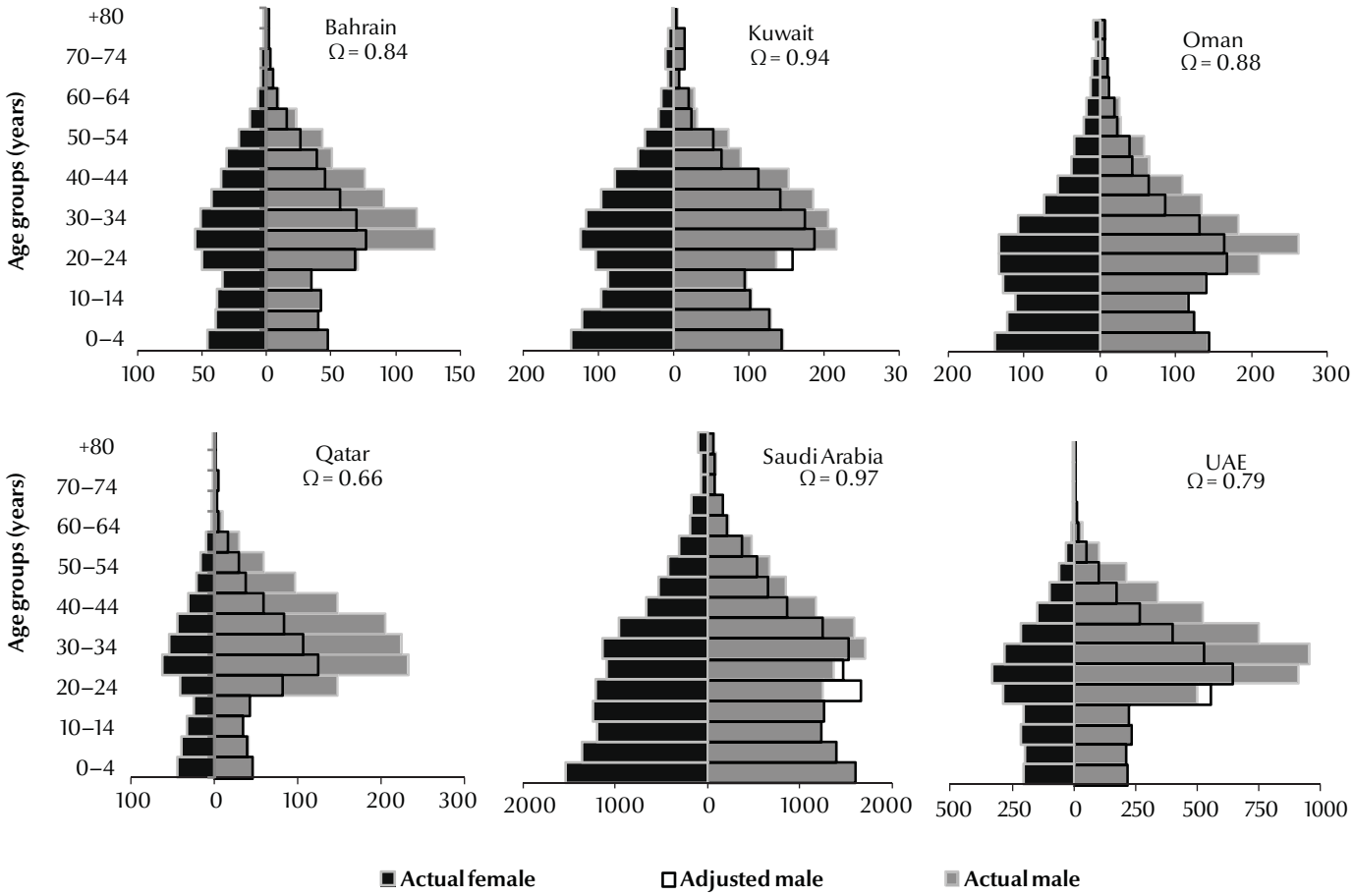

Figure 2 Population pyramids for the Gulf Cooperation Council countries, actual and modelled (higher estimates), 2010. The adjustment factor (Ω) was computed by dividing the total estimated population by the actual total population (UAE = United Arab Emirates)

reductions in the modelled male population.

Table 3 compares the most common per capita KPIs in the health-care sector in GCC countries, using the actual populations, and the adjustment factors. These indicators are per capita total health expenditure and number of hospital beds per 10 000 and number of physicians per 10 000. Table 3 also shows the same indicators for the countries in the Organization of Economic Cooperation and Development (OECD) as a reference group (*17,18*). Using the actual population, the hospital beds per 10 000 were lower in the GCC than those in OECD, ranging from 12.3 in Qatar to 22.0 in Saudi Arabia. Using the adjustment factors, these countries had higher indicators. With the higher adjustment, the indicators ranged from 18.7 in Qatar to 24.4 in UAE.

Discussion

Deriving good comparisons of international health care is a complex task, which combines a need to capture information on both inputs (expenditure) and outcomes and to adjust both these measures to reflect variations in the underlying population. In this case the study has focussed on how to adjust skewed population figures, especially for those health KPIs that use per capita measures.

The results of this study show that in the absence of the adjustment factors, the actual indicators can mislead policy-makers, possibly resulting in an undersupply of health-care resources input. For example, the hospital beds per 10 000 indicator underestimated 1086 hospital beds in Qatar (actual: 12.3; adjusted: 18.7) and 2552 hospital beds in Saudi Arabia (actual: 22.0; adjusted: 22.6), using the lower adjustments.

The difference in beds (underestimates) was computed by dividing the actual KPI by the adjustment factor, and then subtracting the product from the actual capacity. For instance, according to World Health Organization (WHO) data in 2012 *(18)* Saudi Arabia had a total of 59 810 hospital beds in 2010, and the adjustment factor was 0.97. Thus the product was 61 660 (59 810/0.97) and the difference was 2552 (61 660–59 810).

Table 3 Per capita health-care key performance indicators in Gulf Cooperation Council countries using actual and modelled populations, 2010

Country	Population (× 1000)			Hospital beds (per 10 000)			Physicians (per 10 000)			Total per capita health expenditure (US$)		
		Adjustment factor (Ω)[a]			Adjusted			Adjusted			Adjusted	
	Actual	Lower estimate	Higher estimate	Actual	Lower estimate	Higher estimate	Actual	Lower estimate	Higher estimate	Actual	Lower estimate	Higher estimate
Bahrain	1 262	0.81	0.84	17.7	21.1	21.9	21.1	25.1	26.1	1 108	1 320	1 373
Kuwait	2 736	0.91	0.94	20.0	21.4	21.9	21.0	22.4	23.0	1 416	1 513	1 549
Oman	2 783	0.87	0.88	17.7	20.2	20.4	17.5	19.9	20.1	497	566	572
Qatar	1 759	0.61	0.66	12.3	18.7	20.1	26.9	40.9	44.0	1 715	2 611	2 806
Saudi Arabia	27 448	0.96	0.97	22.0	22.6	23.0	21.8	22.4	22.8	714	733	747
UAE	7 512	0.73	0.79	19.3	24.4	26.5	27.9	35.3	38.4	1 520	1 926	2 090
OECD average[b]	1 232 402	–	–	33.7	–	–	31.4	–	–	3 265	–	–

[a] *The adjustment factor (Ω) was computed by dividing the total estimated population by the actual total population.*
[b] *Sources: (17,18).*
UAE = United Arab Emirates; OECD = Organization of Economic Cooperation and Development;.

Using this same computational method to measure the difference in actual versus adjusted beds, the number of physicians per 10 000 shows that Qatar and the UAE had higher values than the OECD average, even when using the higher population estimates. For example, using the higher adjustment factors, the results can be translated into an equivalent of an extra 2438 physicians per 10 000 in Qatar (actual: 26.9; adjusted 44.0) and an extra 5572 physicians per 10 000 in the UAE (actual 27.9; adjusted: 38.4). The other GCC countries also showed similar patterns, but to a lesser extent. For example, these computational methods show an equivalent of an extra 507 physicians per 10 000 in Bahrain and an extra 366 physicians in Kuwait.

The classic indicator—total per capita health expenditure—showed wide variations across GCC countries, using either actual or modelled populations. Oman was estimated to spend an actual US$ 497 per capita in 2010, while Qatar spent US$ 1715 per capita. Using the (lowest estimate) adjustment factors, this measure was still low in Oman (US$ 566 per capita) compared with Qatar (US$ 2611 per capita).

Several studies have used corrected population approaches to measure population-based indicators. The current study also argues that adjustments are necessary for population demographics in order to draw valuable conclusions from a reference country or region. In particular, the adjustments should be made for the GCC countries, where the sex imbalance is pronounced.

For instance, in a per capita data study that focused on the size of an ageing population, Scheffler et al. used 2 models to formulate workforce policy and determine where physician shortages were likely to occur by 2015 (*19*). The estimates were based on data from the WHO and the World Bank. The study utilized 2 modelling approaches for calculating the future global requirement for physicians in WHO regions. The first was a needs-based model, and the second was based on the projected rate of economic growth for each country.

In a different study, variables that were controllable by health planners were selected as parameters to simulate different scenarios in the calculation of supply and of deficit or surplus. Population data for the demographic growth and ageing of populations was included, due to the projected increasing need for specialized care (*20*). The demand/need submodel was based on the hypothetical growth rate in the number of health specialists to 1000 population, using data provided by the United States Department of Health and Human Services (*20*).

Birch et al. developed an extended analytical framework that incorporated population health needs, the level of service required to respond to health needs and provider productivity as variables in determining future requirements for health-care services (*1*). They identified separate determinants for provider requirements. Population size represented the strongest demographic determinant in their study (*1*).

Kane et al. confirmed the influence of an ageing American population in calculating health-care spending according to population size (*21*). Although the absolute number of physicians in the United States was expected to increase by 24% between 2000 and 2020, general population growth was expected to exceed the rate of growth in the number of physicians. Failure to accurately measure the population could result in misleading policy decisions. In a review of studies of the correlation

between physician density (physician to population ratio) and health care consumption, Leonard et al. confirmed that more physicians may induce more consumption, i.e. "a bed built was a bed filled" (p. 121) (*22*). This supplier-induced demand was described as physician-driven, representing competitive activity among health professionals to encourage health-care use in order to gain remuneration through services (*22*). This GCC study argues that in the absence of population adjustment measures, it could result in an oversupply of health-care resources, which might lead to changes in behaviours such as supplier-induced demand or an underproductive health workforce.

Huang et al. constructed a spending projection model for diabetes, in order to inform health-care budget decisions in the United States (*23*). Within the United States, health-care costs are rising, due to significant pressure from demographic forces such as a growing elderly population (*23*). The population size of people with diabetes was used as a base for projections, with the expectation that more individuals would become diabetic as they aged.

The studies reviewed consistently indicate that no best practice exists for benchmarking the populations of countries for the purpose of projecting health spending and outcomes. These studies do indicate that the value of measurement lies in identifying current and emerging population trends in order to respond with accuracy (*5*).

The technical focus in this paper remains how to adjust the population structure in the GCC countries (*24*). For example, it is generally acknowledged that older people have greater health-care needs than younger people, even if, more accurately, these costs are actually concentrated in the final year of an individual's life (*25*). However, just controlling for age may not be enough (*26,27*). The likely health demands of a given population in the age range of, for example, 60–70 years will vary due to reasons such as national differences in diet, consumption of alcohol, use of tobacco and level of physical activity. In effect, both the demand for, and financing of, health care depends partly on the demographic structure of a country.

Limitations

A few limitations of the study should be mentioned. First, the data utilized for this study were not obtained through the census information for the individual GCC countries. The GCC countries report sporadic census data, and for the years of their censuses only. We checked the data reported by the national statistics bureau of the GCC countries against the information provided by the World Bank. In all such cases, a match was found. In addition, the World Bank predicts the population for intercensus periods.

Secondly, the model could be unstable in predicting the adjusted population in non-GCC countries. We have used the same models to predict the adjusted population in regional countries outside of the GCC with stable population trends (Egypt, Jordan and Syrian Arab Republic). The results, not shown, indicated that the adjusted data matched the actual.

Thirdly, this study only adjusted the historical population and falls short of predicting future populations. Due to the fluctuations in the price of oil and gas and the fluctuations in the international financial markets, the rate of infrastructure construction is cyclical in the GCC. Thus, the importation of male labour to GCC countries is also cyclical. In addition, some GCC countries, including the UAE and Qatar and to a certain extent Bahrain, are developing medical tourism models to treat patients from abroad. This paper does not account for these exported services, because this goes beyond needs-based health-facility planning. Nevertheless, this study can be used to predict future modelled populations using the historical data as a baseline, and factoring economic and financial forecasts produced by each individual country.

Conclusions

The results in this paper can guide policy-makers in GCC countries to plan health-care facility expansions based on the actual needs of their economies, as based on robust population measurements. Failure to adjust for sex imbalances in the GCC countries would result in serious overestimation of the need for these countries to invest in health care, and would also invalidate benchmarking with other international comparisons. Policy-makers in the GCC can use these models to adjust for population in order to plan efficiently for expansions in the health-care sector and may use the adjusted heath-system indicators in planning for universal health coverage including migrant workers.

Competing interests: None declared.

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Household food insecurity in the Islamic Republic of Iran: a systematic review and meta-analysis

F. Mohammadi-Nasrabadi,[1] N. Omidvar,[2] M.R. Khoshfetrat[1] and F. Kolahdooz[3]

انعدام الأمن الغذائي الأُسَري في جمهورية إيران الإسلامية: مراجعة منهجية وتحليل تِلْوي

فاطمة محمدي نصر آبادي، نسرين أميدوار، محمد رضا خوش فطرت، فريبا كلاهروز

الخلاصة: لقد قُدِّر انتشار انعدام الأمن الغذائي في جمهورية إيران الإسلامية عن طريق استعراض منهجي لجميع الدراسات المتاحة بين عامي 1991 و2011. فبعد تقييم الوثائق وتجميع البيانات، تمَّ تحليل الدراسات في فئات منفصلة استناداً إلى الطرق المستخدمة وهي: استذكار النظم الغذائية، أو الدخل أو الإنفاق الأسري، أو المسوحات القائمة على التجريب أو التصوُّر. وقد أظهر التحليل التلوي لدراسات استذكار النظم الغذائية وجود زيادات بسيطة ليست ذات أهمية بين عامي 1994 و2004 في انتشار انعدام الأمن الغذائي الخفيف (من 8.8٪ إلى 9.3٪) والمتوسط (من 5.4٪ إلى 5.6٪). وقد حدث انتشار انعدام الأمن الغذائي الشديد بنسب بلغت 3.8٪ و3.7٪ في عامي 1994 و2004 على التوالي. وأفادت التقارير – على نحو مستمر – بأن انتشار انعدام الأمن الغذائي (المعتدل إلى الشديد) استناداً إلى مسوحات الدخل أو الإنفاق الأسري بلغت نسبته 10٪. وكشف التحليل التِلْوي المنفصل للدراسات القائمة على التجريب أو التصور عن أن معدلات انعدام الأمن الغذائي الخفيف والمعتدل والشديد بلغت 28.6٪ و14.9٪ و6.0٪ على التوالي. ومن خلال الجمع بين نتائج الدراسة على هذا النحو قد يكون من الممكن التوصل إلى تقديرات أكثر واقعية لوضع السياسات المبنية على الأدلة لتطوير نظام مراقبة انعدام الأمن الغذائي الوطني.

ABSTRACT Using a systematic review of all available studies between 1991 and 2011, the prevalence of food insecurity in the Islamic Republic of Iran was estimated. After document evaluation and data aggregation, studies were analysed in separate categories based on the methods used: dietary recall, household income/expenditure or experiential/perception-based surveys. Meta-analysis of dietary-recall studies showed small non-significant increases between 1994 and 2004 in the prevalence of mild (from 8.8% to 9.3%) and moderate food insecurity (from 5.4% to 5.6%). Severe food insecurity was 3.8% and 3.7% in 1994 and 2004 respectively. Prevalence of food insecurity (moderate to severe) based on household income/expenditure surveys was consistently reported to be 10%. A separate meta-analysis of experiential/perception-based studies revealed rates of mild, moderate and severe food insecurity of 28.6%, 14.9% and 6.0% respectively. By combining study results in this manner makes it possible to come up with more realistic estimates for evidence-informed policy-making, until development of a national food insecurity surveillance system.

Insécurité alimentaire des ménages en République islamique d'Iran : revue systématique et méta-analyse

RÉSUMÉ Une revue systématique de toutes les études disponibles entre 1991 et 2011 a permis d'estimer la prévalence de l'insécurité alimentaire en République islamique d'Iran. Après évaluation documentaire et agrégation des données, les études ont été analysées dans des catégories distinctes en fonction des méthodes appliquées : rappel de l'alimentation, revenu/dépenses par ménage ou enquêtes fondées sur l'expérience/la perception. La méta-analyse des études de rappel de l'alimentation a mis en évidence de faibles augmentations non significatives entre 1994 et 2004 de la prévalence de l'insécurité alimentaire légère (de 8,8 % à 9,3 %) et modérée (de 5,4 % à 5,6 %). L'insécurité alimentaire sévère était de 3,8 % et 3,7 % en 1994 et 2004 respectivement. La prévalence de l'insécurité alimentaire (modérée à sévère) estimée à partir des enquêtes de revenu/dépenses des ménages a été rapportée de manière constante à 10 %. Une méta-analyse distincte des études fondées sur l'expérience/la perception a révélé des pourcentages d'insécurité alimentaire légère, modérée et sévère de 28,6 %, 14,9 % et 6,0 %, respectivement. En associant les résultats d'étude de cette façon, il est possible de parvenir à des estimations plus réalistes pour alimenter des politiques fondées sur des preuves, en attendant d'avoir mis en place un système de surveillance de l'insécurité alimentaire au niveau national.

[1]Department of Food and Nutrition Policy and Planning Research, National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran. [2]Department of Community Nutrition, National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran (Correspondence to N. Omidvar: omidvar.nasrin@gmail.com). [3]Aboriginal and Global Health Research Group, Department of Medicine, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Canada.

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Introduction

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (*1*). Because of its complex and multidimensional nature, measuring food insecurity has been an ongoing challenge for both researchers and practitioners (*2*). However, information on the population's food insecurity is needed to develop policies and programmes, monitor changes and evaluate the impact of food and nutrition programmes (*3*).

Different methods have been introduced for the measurement and screening of food security. Food consumption and expenditure surveys are the 2 most preferred methods that can provide more comprehensive and reliable information. However, such surveys are time-consuming, expensive and need highly qualified interviewers, and as a result they lack practicality in the field (*3,4*). Recently, substantial effort has been directed to the development of alternative methods for measuring food insecurity in developing countries (*2,3*). So-called "experiential" or "perception-based" methods of food insecurity measurement, developed by Radimer et al. (*5*), are based on the idea that people's experience of food insecurity (access) causes predictable reactions and responses that can be captured and quantified through a survey and summarized on a scale (*5*). Some of the tools developed from this approach have been used by the United States Department of Agriculture (USDA) since 1995 to monitor food assistance programmes and estimate the prevalence of food insecurity in the United States (US). The Household Food Security Survey Module (HFSSM) has consistently been validated as a statistically reliable and meaningful measure of food insecurity in the US (*6*). The Household Food Insecurity Access Scale (HFIAS), an adaptation of HFSSM, also was developed by the Food And Nutrition Technical Assistance project to explore the possibility of using this approach in a developing country context (*2,3*).

Following the Millennium Declaration and adoption of the Millennium Development Goals (MDGs) for combating poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women in 2000, special attention has been directed toward food insecurity and its measurement in the Islamic Republic of Iran. Studies performed in the country during the 1990s, in line with most other countries, measured mainly food access, either by measuring adequacy of energy and nutrients from consumption surveys or by estimating the poverty line obtained from income–expenditure surveys. Since 2000, direct measurement of food insecurity through perception-based questionnaires was gradually included. Despite validation and adaptation of some food insecurity scales for this country, the lack of homogeneity in measurement tools has resulted in outdated knowledge regarding the prevalence of differing levels of food insecurity in the country.

This study aimed to estimate the overall prevalence of food insecurity in the Islamic Republic of Iran, and to compare the estimates from different methods, through a systematic review of all available studies in the country between 1991 and 2011. The findings should provide insights into the present situation of food insecurity in the Islamic Republic of Iran and can be used to inform and sensitize policy-makers about the issue.

Methods

Study design

This systematic review was conducted according to the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guidelines for reviews of observational studies (*7*) and was approved by the ethics committee of the Iranian National Nutrition and Food Technology Research Institute. The review included observational studies using different study designs, published from January 1991 to September 2011.

Selection of studies

All studies regarding food insecurity in the Islamic Republic of Iran published in any language (Farsi or English) were searched using *PubMed*, *IranMedex*, *SID* (Scientific Information Database), *ISI* (Information Sciences Institute) database, *INP Abstracts* (Iran's Nutrition Publication Abstracts), *IranDoc* and *Magiran*. Searches used the following terms or keywords: "household food security", "household food insecurity" and "Iran". Additional studies (grey literature) were identified by searching the reference lists of identified articles, 2 series of the comprehensive *Abstracts* of the National Nutrition and Food Technology Research Institute, projects and theses from the Faculty of Nutrition and Food Technology in 1995–2001 (*8*) and 2002–2006 (*9*), and *Nutrition Abstracts* and *Reviews of Iran* (12 volumes) (*10*). Abstract books of all 11 Iranian Nutrition Congresses and other related congresses, including the Student Nutrition Congress (*11*), were reviewed, and dissertations of medical and non-medical universities were referred to.

Searching the papers, selecting them and checking the extracted data were undertaken independently by the first 2 authors (F.M. and N.O.). The abstracts of all identified studies were read to exclude those that were irrelevant. Studies were considered only if the samples were of Iranian urban or rural households. The full texts of the remaining articles were read to determine whether they met the inclusion criteria.

Publications that did not contain the required data for the systematic review (i.e. prevalence of food insecurity based

on energy intake, food expenditure or individuals' experiences/perceptions) were excluded. Studies conducted on specific age, ethnic or income groups, and those with identical data sets were also excluded. The following information was extracted from the remained relevant studies: author(s), year of publication, place, sampling method and subjects, measuring tool(s), food security criteria and figures on prevalence of food insecurity. After document evaluation and data aggregation, the studies were analysed in separate categories based on the methods used: dietary recall, household income/expenditure or experiential/perception-based surveys.

Studies selected and omitted

In the literature search, 52 potentially relevant publications were identified from information banks and the grey literature. Through the screening process based on the defined criteria, 40 studies were excluded: 14 studies were excluded after reading the title and abstract; 8 studies did not include the necessary data for a systematic review (*12–19*) [for instance, 2 of them had used the short form of the USDA questionnaire, which does not differentiate levels of food insecurity (*13,14*)]; 1 study was done on a particular age group (adolescents) (*20*); 2 studies were done on a special group (Afghan refugees) (*21,22*); 3 studies were undertaken only on low-income households (*23–25*); and 12 studies used identical data sets (*26–37*).

Among the 12 remaining studies which met the study criteria, 5 presented national data on the prevalence of household food security in the country [2 were based on dietary intake (*38,39*), while 3 used household income/expenditure data (*40–42*)] and 7 used data from representative samples from 6 cities, mainly in central Islamic Republic of Iran, and were based on individuals' experiences and perceptions of food insecurity (*43–49*).

Analysis

For the meta-analysis, the variation of food insecurity prevalence in each study was computed based on a binomial distribution formula. For meta-analysis of the experiential/perception-based studies, some studies reported food insecurity both with moderate and severe hunger and without hunger, according to US-HFSSM. Therefore, we considered moderate, severe and low food insecurity respectively. In the 2 comprehensive national Iranian studies on household food consumption and nutritional status used for meta-analysis, food insecurity was defined in 3 levels of daily energy intake as follow: mild (80%–90% of energy requirements), moderate (70% –80% of energy requirements) and severe (< 70% of energy requirements).

Using a heterogeneity test (Cochran Q), we found significant variations between the study findings. Hence, a random-effect model was used for the estimations. In order to minimize the random variation between point estimates of the studies, the findings from each study were adjusted using Bayesian analysis. In this adjustment, the overall point estimate based on the random-effect model was used as prior prevalence. After describing the findings in forest plots, the point estimates and their 95% confidence interval (CI) were computed accordingly. The chi-squared test was used to test the difference in food insecurity prevalence between the 2 dietary-intake studies that were conducted 10 years apart. All the analyses were conducted using *Stata*, version 9.

Results

The characteristics of the 12 studies (*38–49*) which met the study criteria are summarized in Table 1.

The 3 studies based on household income/expenditure were not included in the meta-analysis due to low variation in their data on the prevalence of food insecurity, which was repeatedly reported to be 10% in both rural and urban areas. We therefore based the meta-analysis of the prevalence of household food insecurity in the Islamic Republic of Iran on the other 2 categories of studies—dietary recall-based and experience/perception-based—and these were analysed separately.

The prevalence of severe, moderate and mild household food insecurity based on household dietary intake were extracted from 2 rounds of the National Comprehensive Study on Household Food Consumption and Nutritional Status in the Islamic Republic of Iran. The studies used similar methodologies and were conducted 10 years apart, in 1991–1995 and 2001–2003. As they deployed a large sample size, their findings were not combined in the meta-analysis with other, smaller studies conducted only in 1 province or district. The meta-analyses of the dietary-recall studies showed that the prevalences of mild, moderate and severe food insecurity in 2004 were 9.3% (95% CI: 8.0%–10.5%), 5.6% (95% CI: 4.2%–6.9%) and 3.7% (95% CI: 2.7%–4.8%) respectively (Figure 1). In 1994 the prevalences of mild and moderate food insecurity were 8.5% (95% CI: 7.3%–9.7%) and 5.4% (95% CI: 4.5%–6.3%) respectively, and severe food insecurity was estimated at 3.8% (95% CI: 3.1%–4.5%). None of the differences between the 2 time periods, however, were statistically significant ($P = 0.09$).

The perception-based studies used either the methods of US-HFSSM or HFIAS to measure household food insecurity. The underlying approach for both scales is the same. The meta-analysis of the 7 experiential/perception-based studies conducted over the years 1991–2011 indicated that the estimated prevalences of mild and moderate food insecurity were 28.5% (95% CI: 20.8%–36.1%) and 14.9% (95% CI: 8.8%–21.1%) respectively and of severe food insecurity was 6.0% (95% CI:

Table 1 Description of the studies included in the systematic review of the household prevalence of food insecurity in Islamic Republic of Iran (1991–2011)

Authors/year	Setting	Subjects/sampling	Measurement tool(s)	Definition of food insecurity	Prevalence (subgroup) %
Kimiagar et al. (1993) (*38*)	National survey (24 provinces)	5591 rural and urban households/systematic cluster sampling	3 × 24-hours dietary recall/food weighing	< 70% of energy requirement	4
				70%–80% of energy requirement	6
				80%–90% of energy requirement	8.9
Kalantari et al. (2004) (*39*)	National survey (24 provinces)	7158 rural and urban households/systematic cluster sampling	3 × 24-hours dietary recall/food weighing	< 70% of energy requirement	5
				70%–80% of energy requirement	7.5
				80%–90% of energy requirement	10.5
Pajouyan et al. (2004) (*40*)	National survey	20 000 (rural and urban household subjects)/ systematic cluster sampling	Food expenditure	< 90% of energy requirement (2300 kcal)	10 (rural)
					10 (urban)
Heydari et al. (2006) (*41*)	National survey	20 000 (rural and urban household subjects)/ systematic cluster sampling	Food expenditure	< 90% energy requirement (2300 kcal)	10 (rural)
					10 (urban)
Jafari-Sani & Bakhshoodeh (2006) (*42*)	National survey	20 000 (rural and urban) household subjects/2-stage cluster sampling	Food expenditure	2000 kcal	14.3 (urban)
					17.7 (rural)
Dorosty et al. (2008) (*43*)	Yazd city	3245 students (6–12 years)	US-HFSSM (18 items)	Mild food insecurity	16
				Moderate food insecurity	13.1
				Severe food insecurity	3.5
Refiei et al. (2009) (*44*)	Isfahan city	2004 households/random sampling	US-HFSSM (18 items)	Mild food insecurity without hunger	34.2 (adults)
					40.5 (children)
				Severe food insecurity with hunger	11.6 (adults)
					7.3 (children)
Ramesh et al. (2010) (*45*)	Shiraz city	778 households/multi-stage, cluster sampling	US-HFSSM (18 items)	Food insecurity without hunger	27.8
				Food insecurity with moderate hunger	14.4
				Food insecurity with severe hunger	1.8
Hakim et al. (2010) (*46*)	Dezful city	400 households/2-stage random sampling	US-HFSSM (18 items)	Food insecurity without hunger	29.3
				Food insecurity with moderate + severe hunger	8.2
Mohammadzadeh et al. (2010) (*47*)	Isfahan city	580 students (14–17 years) and their mothers/cluster sampling	US-HFSSM (18 items)	Food insecurity with hunger	28.3
				Food insecurity with moderate hunger	5.9
				Food insecurity with severe hunger	2.4
Mohammadi et al. (2011) (*48*)	6 districts of Tehran city	416 households/cluster sampling	HFIAS (9 items)	Mild food insecurity	17.5
				Moderate food insecurity	14.4
				Severe food insecurity	11.8
Salarkia et al. (2011) (*49*)	Varamin city	400 households/multi-stage cluster sampling	HFIAS (9 items)	Mild food insecurity	46.5
				Moderate food insecurity	25.0
				Severe food insecurity	7.5

HFIAS = Household Food Insecurity Access Scale; US-HFSSM = United States Household Food Security Survey Module.

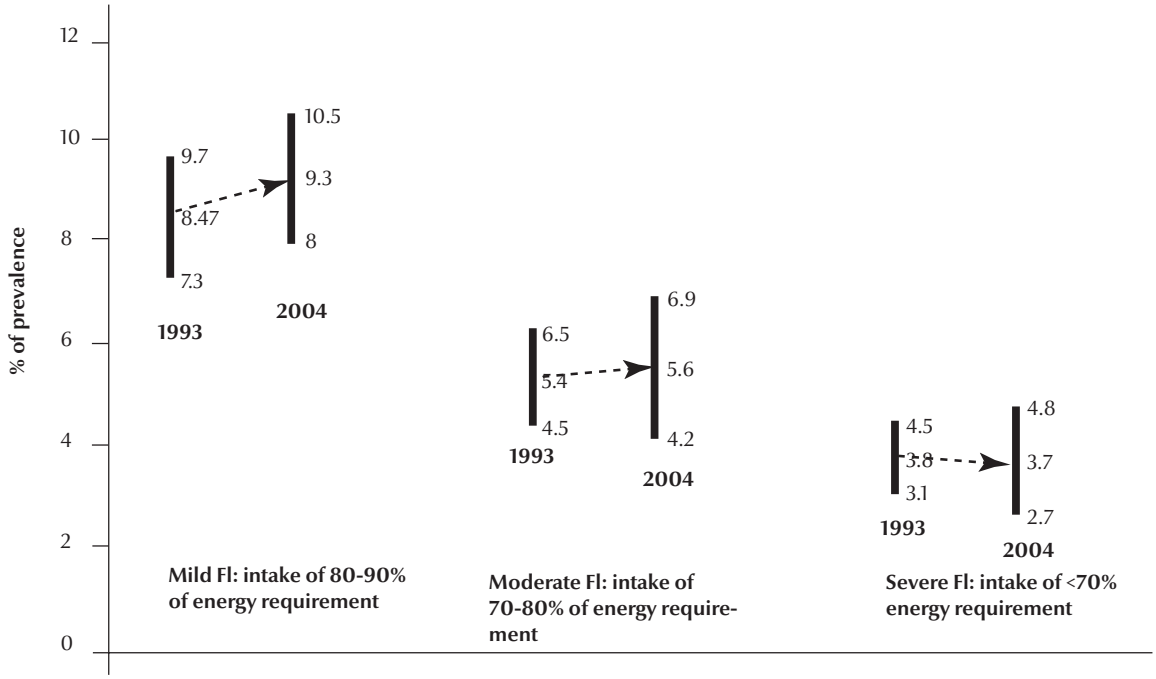

Figure 1 Prevalence (and 95% confidence intervals) of household food insecurity (FI) in the Islamic Republic of Iran: meta-analysis of 2 rounds of national comprehensive studies on household food consumption and nutritional status (1993 and 2004)

2.3%–9.8%) (Figure 2). A significant heterogeneity between the studies was detected ($P < 0.001$).

Discussion

The Islamic Republic of Iran is currently undergoing a nutrition transition leading to considerable variations in nutrition status within the population. As a result, low nutrient density characterizes diets at all income levels, over-consumption and obesity is evident among more than a third of the population, while food insecurity is also evident among a proportion of the Iranian population (*50*).

Our meta-analysis of the large-scale, comprehensive national food consumption surveys in 1993 and 2004 showed rates of mild, moderate and severe food insecurity of 8.5%, 5.4% and 3.8% respectively in 1994 and 9.3%, 5.6% and 3.7% respectively in 2004. These results also showed that the prevalences of mild and moderate food insecurity in the Islamic Republic of Iran increased slightly, but not significantly, between the 2 time periods, while a very slight decrease in severe food insecurity was discernible. These prevalences from the meta-analysis were lower than those presented by the original reports (8.9%, 6.0% and 4.0% respectively in 1994 and 10.5%, 7.5% and 5.5% respectively in 2004) (*38*,*39*). However, the figures obtained from the meta-analysis are more accurate because of the use of weighting techniques and a heterogeneity test for estimating the overall prevalence.

The causes of food insecurity in the Iranian population were not investigated in our analysis. Based on previous studies in the Islamic Republic of Iran, however, season is not an issue with regards to food access in urban communities. Food insecurity in Iranian households is mainly affected by economic factors affecting food access and food price instability (*34*). Very few studies have been conducted in the Eastern Mediterranean Region using perception-based or recall-based methods. Therefore, a thorough comparison between our results and other countries in the Region is not possible. However, comparing the prevalence of food insecurity in the Islamic Republic of Iran with other types of data—based on food production *per capita*, the ratio between total export earnings and food imports, calories *per capita* and protein *per capita*, and non-agricultural population share—shows that our country ranks in the middle, while the highest levels of poverty and food insecurity were in Sudan, Yemen and Iraq (*51*).

From the meta-analysis of the perception-based studies the prevalences of food insecurity were 28.5%, 14.9% and 6.0% for mild, moderate and severe food insecurity respectively. These values are much higher than those of the recall-based national studies discussed above. This difference could be

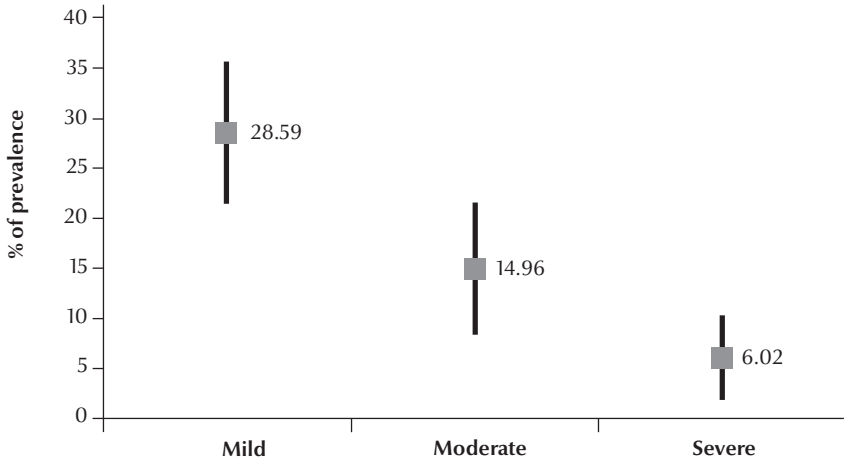

Figure 2 Prevalence (and 95% confidence intervals) of mild, moderate and severe household food insecurity in the Islamic Republic of Iran: meta-analysis of 7 experiential/perception-based studies (1991–2011)

attributed to the nature of perception-based questionnaires, which measure attitudes and worries about food, whereas recall-based studies measure energy intake insufficiency as an outcome of food insecurity. The possibility of overestimation by participants in perception-based methods should also be taken into account. These rates are comparable with perception-based studies in countries having a similar level of development, for example Brazil, where the prevalences of mild, moderate and severe food insecurity were 23.1%, 9.7% and 4.7% respectively (*52*), but are lower than in poorer developing countries, such as Malawi, where the rates of moderate and severe food insecurity were 37.2% and 10.9% respectively (*4*). However, in Jordan, while the rate of food insecurity is similar to Islamic Republic of Iran when based on national figures on food availability and energy intake (*51*), perception-based data (in northern Jordan) showed a higher prevalence of food insecurity: 32.4% as a sum of moderate and severe food insecurity (*53*). As expected, the prevalence of food insecurity in developed countries (from perception-based studies) are much lower; for example in Canada (*54*) and the US (*55*), where moderate food insecurity rates were 8.9% and 5.1% respectively and severe food insecurity rates were 5.7% and 2.7% respectively. The reported prevalence of food insecurity were not fully comparable as the estimation of food insecurity in these studies was based on data from national surveys while the estimation of food insecurity prevalence in the Islamic Republic of Iran was based on a meta-analysis of experience/perception studies carried out only in certain provinces.

The perception-based studies included in this meta-analysis mainly used the methods of US-HFSSM or HFIAS to measure household food insecurity. The underlying approach for both scales is the same. However, the intended purpose and range of application for each tool is different. The HFSSM was developed exclusively for application in the US, while the HFIAS was developed to provide a cross-cultural equivalent measurement of food insecurity in resource-poor areas within a developing country setting. The relevance of each of these instruments for use in the Islamic Republic of Iran has not yet been investigated. However, other studies indicate that the choice of instrument for a particular population group may be important (*56*).

This study had some limitations. First, our meta-analysis included only information from 2 national recall-based and several local perception-based studies. There were 2 studies in the north-west of the country (*13,14*) that were excluded due to lack of data on the different levels of food insecurity, as explained earlier. The perception-based studies included were conducted mainly in the central part of the Islamic Republic of Iran. No disaggregation of food insecurity data with regard to different provinces, climates and ethnic groups was available. In addition, generalizing the present data from experiential/perception studies beyond the urban population is limited due to the lack of data on rural areas. The number of households selected for the 2 large comprehensive food consumption surveys was limited in some regions; therefore, food insecurity prevalence in urban and rural areas could not be presented separately.

The present study is the first systematic review on food insecurity prevalence in the Islamic Republic of Iran. Due to the lack of a continuous food insecurity surveillance system in the country, there is a need for such approaches to support evidence-informed policy and to plan interventions to reduce food insecurity in different parts of the country. National food consumption surveys have been conducted every 10 years in the Islamic Republic of Iran and have provided valuable data for policy-making. However, because of the expense and time-consuming nature of food consumption surveys, it is recommended that one reliable perception-based method be applied over time at the national level to provide comparable data in shorter intervals. An ongoing project—the Implementation of Food Insecurity and Vulnerability Mapping System—in the Islamic Republic of Iran has the potential to provide the necessary data with geographical maps of food insecurity and vulnerability (*57*).

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Déterminants des délais de consultation, de diagnostic et de traitement pour les nouveaux patients tuberculeux pulmonaires à microscopie positive au Maroc : étude transversale

M. Akrim,[1] K. Bennani,[2] A. Essolbi,[1] M. Sghiar,[2] A. Likos,[1] A. Benmamoun,[2] O. El Menzhi[2] et A. Maaroufi[1]

محدِّدات تأخُّر الاستشارة والتشخيص والمعالجة لدى مرضى السل الرئوي الجدد إيجابيِّي اللطاخة في المغرب: دراسة مستعرضة

محمد أكريم، كنزة بناني، أمينة الصلبي، محمد صغيار، أنّا ليكوس، عبد الرحمن بنمأمون، عمر منزهي، عبد الرحمان معروفي

الخلاصة: قد أجرى الباحثون دراسة مستعرضة في عام 2012 في 12 محافظة ومقاطعة مختارة في المغرب لتحديد تأخُّر الاستشارة (تأخُّر المريض)، وتأخُّر التشخيص وتأخُّر المعالجة (تأخيرات النظام الصحي)، والعوامل المتعلقة بهذه التأخيرات. وقد شملت العيِّنة 250 مريضاً – انتُخِبوا وتم الحصول على موافقتهم – ممن شُخِّص لديهم حديثاً سلٌّ رئويٌّ إيجابيٌّ اللطاخة. وتمت مقابلتهم عند تسجيلهم في المراكز المرجعية لتشخيص السل والأمراض التنفسية أو في مراكز الرعاية الصحية المتكاملة، باستخدام استبيان مختبَر مسبقاً ومنظَّم. فكان متوسط التأخُّر الكلي 46 يوماً [الفاصل الربعي (IQI) = 29-84 يوماً]. وكان تأخُّر المريض (الوسطي = 20، IQI = 8-47 يوماً) أعلى من تأخير النظام الصحي (الوسطي = 15، IQI = 7-35 يوماً). ولكون بعض المرضى من غير المتعلمين، فقد ظنوا أن الأعراض ستختفي من تلقاء ذاتها. وكان هناك تَرَابُط بين وجود معوقات مالية والشعور بالخوف من التشخيص أو من العزلة الاجتماعية وبين تأخُّر المريض، وتَرَابُط بين إجراء استشارة في القطاع الخاص أولاً أو وجود 3 استشارات أو أكثر قبل التشخيص وبين تأخير تشخيص النظام الصحي.

RÉSUMÉ Nous avons conduit en 2012 une étude transversale dans une sélection de 12 provinces/préfectures au Maroc pour déterminer les délais de consultation (délai patient), de diagnostic et de mise sous traitement (délai système de santé) chez les nouveaux cas de tuberculose pulmonaire à microscopie positive et les facteurs en relation avec ces délais. L'échantillon comprenait 250 patients, éligibles et consentants, qui ont été interviewés lors de leur enregistrement aux Centres de Diagnostic de la Tuberculose et des Maladies Respiratoires (CDTMR) ou aux Centres de Santé Intégrés (CSI), en utilisant un questionnaire structuré et prétesté. Le délai total médian est de 46 jours (intervalle interquartile [IIQ] : 29-84 jours). Le délai patient (médiane : 20 jours ; IIQ : 8-47) est supérieur au délai système de santé (médiane : 15 jours ; IIQ : 7-35). Être analphabète, croire à la disparition spontanée des symptômes, avoir des contraintes économiques ou peur du diagnostic et de l'isolement social sont associés au délai patient. Consulter en premier dans le secteur privé ou faire trois consultations au moins avant le diagnostic sont associés au délai système de santé.

Determinants of consultation, diagnosis and treatment delays among new smear-positive pulmonary tuberculosis patients in Morocco: a cross-sectional study

ABSTRACT We conducted a cross-sectional survey in 2012 in 12 selected provinces and prefectures in Morocco to determine consultation delay (patient delay), diagnosis delay and treatment delay (health system delays), and factors relating to these delays. The sample included 250 eligible and consenting newly diagnosed smear-positive pulmonary tuberculosis patients who were interviewed at the time of their registration within Diagnosis of Tuberculosis and Respiratory Diseases Reference Centers (CDTMR) or Integrated Health Centers (CSI) using a pretested and structured questionnaire. The median total delay was 46 days [inter-quartile interval (IQI) = 29–84 days]. Patient delay (median = 20; IQI = 8–47 days) was higher than health system delay (median=15; IIQ = 7–35 days). Being illiterate, thinking symptoms will disappear by themselves; having financial constraints and feeling fear of diagnosis or social isolation were associated with patient delay. Consulting first in the private sector or having 3 or more consultations before diagnosis was associated with health system delay.

[1]Institut National d'Administration Sanitaire, Programme FETP-Maroc, Rabat (Maroc) (Correspondance à adresser à M. Akrim : mohammedakrim@yahoo.fr). [2]Service des Maladies Respiratoires, Direction de l'Épidémiologie et de Lutte contre les Maladies, Rabat (Maroc).

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Introduction

La tuberculose est aussi ancienne que la civilisation humaine ; elle est l'une des plus vieilles affections touchant l'homme (*1*). C'est une maladie infectieuse, contagieuse, à transmission essentiellement interhumaine, due principalement à *Mycobacterium tuberculosis* (bacille de Koch). Aujourd'hui, même si la tuberculose est une maladie guérissable, que l'on peut prévenir, elle n'en reste pas moins l'une des plus grandes causes de morbidité et de mortalité à l'échelle mondiale.

Selon l'Organisation mondiale de la Santé (OMS), un tiers de la population mondiale est infectée par *M. tuberculosis*. Environ 9 millions de nouveaux cas de tuberculose sont déclarés chaque année et plus d'un million de patients meurent annuellement (*2*). Afin de diminuer l'impact de la tuberculose sur la population mondiale, les Nations Unies ont fait de la lutte contre cette maladie l'un des huit objectifs du Millénaire pour le développement (OMD), la cible à l'horizon 2015 étant de réduire l'incidence de la tuberculose de moitié par rapport au niveau de 1990 (*3*). Pour atteindre cette cible, l'Assemblée mondiale de la Santé a retenu deux indicateurs : un taux de dépistage des cas de tuberculose, à l'échelle mondiale et au niveau des pays, supérieur à 70 % et un taux de succès thérapeutique de 85 % (*4*).

Le Maroc avait atteint ces taux dès les années 1990, ce qui a valu au programme national de lutte antituberculeuse (PNLAT) la reconnaissance de l'OMS et du Partenariat « Halte à la tuberculose ». Malgré cela, notre pays continue d'enregistrer quelque 27 000 nouveaux cas de tuberculose chaque année, soit une incidence légèrement inférieure à 83 nouveaux cas de tuberculose (toutes formes) pour 100 000 habitants par an. Parmi ceux-ci, environ 12 000 patients présentent une tuberculose pulmonaire à microscopie positive (TPM+), soit une incidence annuelle de 37 nouveaux cas pour 100 000 habitants (*5*).

L'un des principaux objectifs de tout programme de lutte antituberculeuse est de réduire la transmission de la tuberculose dans la communauté, et ce à travers le dépistage précoce des cas et l'instauration rapide d'une thérapeutique adaptée (*6*). Ceci est encore plus important lorsqu'il s'agit de patients TPM+, lesquels constituent la principale source d'infection dans la communauté. En effet, on estime qu'un patient TPM+ non détecté a le potentiel d'infecter 10 à 15 personnes par an et plus d'une vingtaine au cours de l'évolution naturelle de sa maladie s'il n'est pas traité (*6-10*).

Malgré les énormes avancées dans plusieurs aspects de la lutte contre la tuberculose, le délai de diagnostic et de mise sous traitement reste un grand problème dans plusieurs pays (*10-13*). La détection précoce et le traitement des cas TPM+ sont les points clés du succès des programmes de lutte. L'identification et le traitement de ces cas infectieux de tuberculose sont considérés comme la mesure de lutte contre la tuberculose la plus rentable en termes de coût-efficacité (*14*). Le retard dans le diagnostic et dans l'initiation d'un traitement antituberculeux efficace chez ces patients conduit à des affections plus étendues et plus compliquées et à une augmentation du taux de mortalité (*10,15,16*). Il implique aussi une contagiosité plus prolongée dans la communauté et au sein du personnel de santé (*8,17-19*).

À ce jour, très peu de données sont disponibles dans notre pays concernant les différents délais de consultation, de diagnostic et de mise sous traitement des patients TPM+. Une étude réalisée dans le cadre des mémoires de Maîtrise de l'Institut national d'Administration sanitaire en 1999 a permis de documenter un délai moyen de plus de huit semaines et a permis de soulever un certain nombre de déterminants du retard de mise sous traitement chez les patients tuberculeux en milieu militaire (*20*). Or, ce dernier devis ayant une faible validité externe, il ne pouvait être extrapolé à l'ensemble de la population marocaine. La connaissance de ces délais et des déterminants qui agissent sur ceux-ci dans un échantillon représentatif de patients TPM+ pourrait nous aider à formuler des propositions pour une prise en charge précoce des patients et, par conséquent, contribuer à l'amélioration des performances du PNLAT dans notre pays.

L'objectif principal de cette étude était de déterminer les délais de consultation (délai attribuable au patient), de diagnostic et de mise sous traitement (délais attribuables au système de santé) et d'analyser les déterminants en relation avec ces délais chez les nouveaux cas de tuberculose pulmonaire à microscopie positive.

Méthodes

Nous avons mené une étude transversale descriptive selon une approche mixte, quantitative et qualitative, visant à analyser les déterminants des délais de consultation, de diagnostic et de mise sous traitement anti-bacillaire des patients nouveaux cas TPM+ consultant au niveau d'un échantillon représentatif de Centres de Diagnostic de la Tuberculose et des Maladies Respiratoires (CDTMR) et de Centres de Santé Intégrés (CSI), lieux de diagnostic et de prise en charge des patients tuberculeux au Maroc.

Douze CDTMR et cinq CSI, de 12 provinces/préfectures représentant 11 des 16 régions administratives du Maroc, ont été sélectionnés comme unités d'analyse pour la réalisation de cette étude. Un échantillonnage non probabiliste par choix raisonné a été privilégié pour la sélection de ces sites. Les 12 provinces/préfectures

sélectionnées représentent les différentes régions géographiques, les différents niveaux socio-économiques et milieux de résidence de la population marocaine. Ces centres couvrent au maximum le territoire national et incluent les provinces/préfectures qui ont notifié le plus grand nombre de cas incidents ces dernières années (plus de 41 % des nouveaux cas de tuberculose TPM+ y ont été notifiés) ; les 11 régions auxquelles ils appartiennent génèrent plus de 88 % des nouveaux cas TPM+ dans notre pays. Des provinces avec des incidences plus faibles ont aussi été incluses.

Population à l'étude

La population cible (unité d'observation) de l'étude sont les malades nouveaux cas de tuberculose pulmonaire TPM+ diagnostiqués au moment de l'enquête. L'analyse bibliographique ainsi que l'exploitation des données des registres de consultation et des dossiers médicaux, rapportant les informations sur la date de début des symptômes liés à la tuberculose pulmonaire et la date de début du traitement anti-bacillaire chez des patients tuberculeux TPM+ enregistrés en 2011, nous ont permis de relever un délai de mise sous traitement supérieur à 30 jours chez plus de 75 % des patients. Considérant cette prévalence, avec un risque de première espèce à 5 % et un degré de précision de 5 %, un échantillon de 288 patients devait être recruté dans le cadre de cette étude (voir formule de calcul de la taille de l'échantillon ci-après).

- Taille de l'échantillon = $[(1,96)^2 \times (0,75) \times (0,25)]/(0,05)^2 = 288$.
- Critères d'inclusion : patient nouveau cas de tuberculose pulmonaire à microscopie positive (TPM+), éclairé et consentant, et qui est diagnostiqué au moment de l'étude.
- Critères d'exclusion : malades présentant une tuberculose extrapulmonaire (TEP), tous les malades en retraitement, les patients de moins de 15 ans ainsi que ceux découverts lors d'un examen systématique.

Validité du devis

Le devis choisi présente une bonne validité interne car l'étude concerne seulement les nouveaux patients tuberculeux pulmonaires confirmés par une microscopie positive. Ces patients représentent la source principale de transmission de la tuberculose. Notre devis a aussi une bonne validité externe car nous pouvons extrapoler les résultats à l'ensemble des CDTMR et CSI dans notre pays.

Collecte des données

Un questionnaire structuré et prétesté a été utilisé pour la collecte des données de l'étude. Ce questionnaire est administré oralement par le médecin traitant ou le major du service. Les patients éligibles, éclairés et consentants sont successivement recrutés au moment de leur enregistrement, et ce, jusqu'à atteindre un effectif de 24 patients par province/préfecture. L'étude a été réalisée entre mars et mai 2012.

Les données socio-démographiques et cliniques, les facteurs de risque, le recours aux soins de santé, la connaissance de la tuberculose, la perception des symptômes et le stigma vis-à-vis de cette maladie sont collectés pour chaque patient. La date d'apparition des symptômes de la tuberculose, la date de la première consultation médicale pour cette affection, la date du premier diagnostic TPM+ et la date de mise sous traitement anti-bacillaire sont aussi relevées.

Il a été demandé aux patients d'être le plus précis possible dans la détermination de la date des événements antérieurs, et ce au jour près. Si le patient ne se rappelle que du mois sans aucune spécification, nous rapportons le 15 du mois comme date de l'événement. Nous rapportons le 5 du mois si le patient fait allusion au début du mois et le 25 si le patient fait allusion à la fin du mois. Nous nous reportons à tout événement qui puisse nous informer sur les dates exactes et nous consultons tous les documents qui peuvent nous éclairer sur les différentes dates depuis l'apparition des symptômes jusqu'à la mise sous traitement des patients.

Définition des variables à l'étude

La variable dépendante correspond aux différents intervalles de temps. Ces intervalles de temps et délais sont définis pour chaque participant à l'étude comme suit :

- délai de consultation : correspond au temps entre la date approximative d'apparition des symptômes de la tuberculose et la date de la première consultation médicale. Ce délai est reconnu dans la communauté scientifique comme « délai patient » ou « délai attribuable au patient ».
- Délai de diagnostic : correspond au temps entre la date de la première consultation médicale et la date de confirmation du diagnostic TPM+.
- Délai de traitement : correspond au temps entre la date du diagnostic de la tuberculose pulmonaire et la date d'initiation du traitement antituberculeux.

Ces deux derniers délais sont définis comme étant des délais attribuables au système de santé. Le délai total correspond à l'intervalle de temps entre la date d'apparition des symptômes et la date de mise sous traitement antituberculeux.

Les variables indépendantes (socio-démographiques, cliniques, facteurs de risque, recours aux soins, connaissance de la tuberculose ou stigma), qu'elles soient liées au patient ou bien au système de santé, sont évaluées pour leur association aux différents délais cités plus haut.

Analyse des données

Les données sont codées, saisies, vérifiées et nettoyées puis analysées à l'aide du logiciel Epi Info, version 3.5.3 pour Windows. Le test du χ^2 est utilisé pour la comparaison de deux groupes. Le test paramétrique ANOVA est utilisé pour la comparaison des moyennes des délais selon les attributs des différentes variables explicatives. Quand les conditions d'application du test ANOVA ne sont pas réunies, le test non paramétrique de Kruskal-Wallis est utilisé. Comme les délais n'ont pas une distribution normale et sachant qu'il n'y a pas de consensus international pour définir un seuil pour les différents délais définis dans cette étude, la médiane de chaque délai est utilisée comme valeur seuil pour dichotomiser les variables dépendantes. L'analyse bivariée et multivariée par régression logistique permettra de définir les associations entre les différents délais et les différents facteurs indépendants qui sont liées au patient, aux professionnels de santé ou à l'organisation des services de soins. L'analyse qualitative consistera à faire le recoupement des données quantitatives avec les informations sur les connaissances sur la tuberculose des patients interviewés. Les mesures d'association sont calculées avec des intervalles de confiance à 95 % (en fixant un seuil de signification statistique à $p \leq 0,05$).

Considérations éthiques

Des demandes d'autorisation pour la réalisation de l'étude et pour la collaboration à la recherche ont été adressées aux autorités sanitaires des régions, provinces et préfectures sélectionnées. Un consentement éclairé oral a été obtenu de la part de chaque participant à l'étude. L'anonymat et la confidentialité ont été respectés pour toutes les données personnelles recueillies auprès des patients interviewés.

Résultats

Sur les 253 patients nouveaux cas TPM+ interviewés, 3 n'étaient pas éligibles, car ils avaient un âge inférieur à 15 ans. Nous avons donc atteint plus de 86,8 % de l'effectif total attendu, lequel était de 24 patients par province ou préfecture pour l'ensemble des 12 provinces/préfectures choisies pour la réalisation de l'étude. Ainsi, 18 patients (7,2 %) ont été recrutés au CDTMR de la préfecture d'Al Fida-Derb Soltane, 21 (8,4 %) au CDTMR de la préfecture de Casablanca-Anfa, 8 (3,2 %) au CDTMR de la province de Béni Mellal, 25 (10,0 %) au CDTMR de la province d'El Jadida, 24 (9,6 %) au CDTMR et à deux CSI de la province de Fès, 25 (10,0 %) au CDTMR et au CSI de la province d'Inezgane-Ait Melloul, 23 (9,2 %) au CDTMR de la province de Kénitra, 25 (10,0 %) au CDTMR de la préfecture de Marrakech, 27 (10,8 %) du CDTMR de la province de Nador, 15 (6,0 %) au CDTMR et à deux CSI de la province de Salé, 13 (5,2 %) au CDTMR de la province de Settat et 26 (10,4 %) au CDTMR de la province de Tanger.

Caractéristiques socio-démographiques de la population à l'étude

Les données concernant les caractéristiques socio-démographiques et les facteurs de risque pour l'ensemble de la population à l'étude et par sexe sont représentées dans le tableau 1.

Parmi les 250 patients interviewés, 182 (73,1 %) étaient des hommes, 69,0 % appartiennent à la tranche d'âge 15-44 ans et l'âge moyen est de 36,7 ans. L'âge médian est de 29 ans pour les femmes et de 33 ans pour les hommes, avec des âges extrêmes de 15-84 ans et 15-79 ans respectivement. Plus de la moitié des femmes et le tiers des hommes n'ont jamais été scolarisés, démontrant une association statistiquement significative entre le sexe féminin et la non-scolarisation (*odds ratio* [OR] = 1,97 ; $p = 0,01$). Le quasi-tiers des patients à l'étude est sans profession, 77,5 % habitent en milieu urbain ou suburbain et le nombre moyen de personnes vivant dans le même foyer que le patient est de 5,9.

Concernant l'accessibilité aux soins de santé, 84,3 % des patients ont déclaré habiter à moins de 3 km d'une structure de santé médicalisée, avec une distance moyenne à parcourir de 2,7 km. Par contre, 84,7 % des patients déclarent n'avoir aucune couverture médicale.

Concernant les facteurs de risque associés à la tuberculose, 47,8 % des hommes et 6,0 % des femmes déclarent être fumeurs, la moyenne de cigarettes fumées étant de 18,5 paquets-années ; 10 % parmi ces fumeurs déclarent utiliser en même temps des drogues douces comme le kif ou le haschich. Trente-neuf patients (15,7 %) souffrent d'une pathologie chronique associée ; parmi eux, 17 sont diabétiques.

Caractéristiques cliniques et recours aux soins de la population à l'étude

La toux est le symptôme le plus commun qui a été rapporté par 240 patients (96,4 %), suivi de la fièvre (83,1 %) et de la perte de poids (80,3 %). L'hémoptysie n'est présente que chez 33,7 % des patients. Un peu plus de la moitié des patients ont rapporté une notion d'automédication.

Cent trente-huit patients (56 %) ont consulté en premier lieu au niveau du secteur privé ; parmi eux 78,1 % ont consulté dans un cabinet généraliste et le BKD (diagnostic du bacille de Koch [BK] par examen direct) n'est demandé par les médecins privés que chez 24,8 % des patients. La moyenne des consultations médicales, avant que le diagnostic TPM+ ne soit posé, est de deux consultations par patient et 33,1 % des patients seulement ont le diagnostic de la tuberculose posé après la première consultation médicale. Par ailleurs, 83,9 % des diagnostics de

Tableau 1 Caractéristiques socio-démographiques de la population à l'étude

Caractéristique	Hommes (*n* = 182)		Femmes (*n* = 67)		Total (*n* = 249)	
	Nbre	%	Nbre	%	Nbre	%
Tranche d'âge (ans)						
15-24	37	20,6	26	40,0	63	25,7
25-34	58	32,2	14	21,5	72	29,4
35-44	28	15,6	6	9,2	34	13,9
45-54	31	17,2	10	15,4	41	16,7
55-64	20	11,1	3	4,6	23	9,4
65 et +	6	3,3	6	9,2	12	4,9
Statut matrimonial						
Célibataire	90	49,5	31	46,3	121	48,6
Marié(e)	84	46,2	27	40,3	111	44,6
Divorcé(e)	8	4,4	5	7,5	13	5,2
Veuf (ve)	0	0,0	4	6,0	4	1,6
Milieu de résidence						
Urbain/suburbain	142	78,0	51	76,1	193	77,5
Rural	40	22,0	16	23,9	56	22,5
Éducation						
Sans	65	37,4	35	52,2	100	41,5
Primaire	59	33,9	9	13,4	68	28,2
Secondaire	42	24,1	15	22,4	57	23,7
Universitaire	8	4,6	8	11,9	16	6,6
Profession (emploi)						
Sans	37	20,7	43	65,2	80	32,7
Fonctionnaires et salarié(e)s	63	35,2	11	16,7	74	30,2
Fonction libérale commerce, artisanat, agriculture	63	35,2	1	1,4	64	26,1
Étudiant(e)	11	6,1	11	16,7	22	9,0
Retraité(e)	5	2,8	0	0,0	5	2,0
Couverture sanitaire						
Non	153	84,1	58	86,6	211	84,7
Oui	29	15,9	9	13,4	38	15,3
Nombre de personnes vivant sous le même toit						
Inférieur ou égal à 6	112	64,0	45	68,2	157	65,1
Supérieur à 6	63	36,0	21	31,8	84	34,9
Distance par rapport à la structure sanitaire médicalisée la plus proche						
3 km ou moins	147	84,0	56	83,8	203	84,3
Plus de 3 km	28	16,0	10	15,2	38	15,8
Notion de contage tuberculeux						
Non	135	78,5	47	77,0	182	78,1
Oui	37	21,5	14	23,0	51	21,9
Maladie chronique associée						
Non	153	84,1	57	85,1	210	84,3
Oui	29	15,9	10	14,9	39	15,7
Habitude tabagique						
Non	59	32,4	62	92,5	121	48,6
Oui	87	47,8	4	6,0	91	36,5
Sevré	36	19,8	1	1,5	37	14,9

la tuberculose chez nos patients ont été réalisés dans les laboratoires des structures publiques de santé.

Enfin, presque 40 % des patients rapportent leur délai de consultation à l'espoir de guérir spontanément et l'idée que les symptômes vont disparaître d'eux-mêmes. Par contre 5,1 % ont peur du diagnostic ou de l'isolement

social, 3,6 % n'ont pas confiance dans le système de santé et 14,2 % ont tardé à aller consulter en raison de contraintes économiques. Et même si 58,7 % des patients interviewés déclarent connaître la tuberculose, la moitié la connaît à travers la famille et l'entourage (Tableau 2).

Distribution des différents délais dans la population à l'étude

Le délai total médian est de 46 jours avec un minimum de trois jours et un maximum de 377 jours. Le délai attribuable au patient (médiane : 20 jours ; fourchette : 0-315) est supérieur au délai attribuable au système de santé (médiane : 15 jours ; fourchette : 0-331), avec des moyennes respectives de 36 et de 31 jours. Un peu plus de la moitié des patients (51,6 % des hommes et 50,6 % des femmes) ont consulté pour leurs symptômes en moins de trois semaines et 72,0 % de l'ensemble des patients ont un délai total supérieur à 30 jours. La distribution des différents délais est représentée dans le tableau 3.

Déterminants associés aux différents délais dans la population à l'étude

La comparaison des moyennes et des médianes des délais entre les différents attributs des variables à l'étude nous a permis de noter une différence statistiquement significative pour tous les délais entre les différents sites de l'étude. La petite ville de Nador au nord-est du Maroc présente le délai total le plus court avec une moyenne de 26,3 jours et une médiane de 24,5 jours. Les grandes métropoles à forte incidence de tuberculose, Tanger, Casablanca-Anfa, Inezgane Ait Melloul, Kénitra et Salé, présentent les délais totaux les plus longs (moyennes supérieures à 70 jours). Paradoxalement, au niveau de la grande métropole de Casablanca, le site d'Anfa présente les délais parmi les plus longs du pays et celui d'Al Fida, parmi les plus courts.

Tableau 2 Principaux symptômes et recours aux soins de la population à l'étude

Principaux symptômes et recours aux soins de la population à l'étude	Hommes (*n* = 182)		Femmes (*n* = 67)		Total (*n* = 249)	
	Nbre	%	Nbre	%	Nbre	%
Principaux symptômes						
Toux	175	97,0	65	96,2	240	96,4
Fièvre	154	85,1	52	77,6	206	83,1
Perte de poids	148	81,3	52	77,6	200	80,3
Hémoptysie	56	30,8	28	41,8	84	33,7
Douleur thoracique	96	53,0	33	49,3	129	52,0
Nature de la 1ère structure médicale consultée						
Cabinet généraliste privé	82	45,1	25	37,9	107	43,1
Cabinet spécialiste privé	24	13,2	7	10,6	31	12,5
Centre de santé	54	29,7	25	37,9	79	31,9
Hôpital public	22	12,1	9	13,6	31	12,5
Causes du délai de consultation selon les patients						
Pas de délai	65	35,5	29	41,4	94	37,2
Peur du diagnostic ou de l'isolement social	6	3,3	7	10,0	13	5,1
Contraintes économiques	25	13,7	11	15,7	36	14,2
Manque de confiance dans le système de santé	9	4,9	0	0,0	9	3,6
Espoir de guérison spontanée	78	42,6	23	32,9	101	39,9
Connaissance de la tuberculose						
Oui	106	58,6	39	59,1	145	58,7
Non	75	41,4	27	40,9	102	41,3
Source d'information sur la tuberculose						
Famille, amis, relations, etc.	52	50,5	23	59,0	75	52,8
Proche atteint de tuberculose	10	9,7	3	7,7	13	9,2
Professionnel de santé	9	8,7	2	5,1	11	7,7
Médias	16	15,5	4	10,3	20	14,1
École	3	2,9	1	2,6	4	2,8
Multiples sources d'information	13	12,6	6	15,4	19	13,4

Tableau 3 Distribution des différents délais dans la population à l'étude

Délai	Moyenne (ET)	Médiane (IIQ)
Délai de consultation ou délai patient (n = 243)	36,0 (48,3)	20 (8-47)
Délai de diagnostic (n = 249)	27,1 (44,6)	11 (4-31)
Délai de traitement (n = 249)	3,2 (3,2)	2 (1-5)
Délai attribuable au système de santé (n = 249)	30,3 (44,6)	15 (7-35)
Délai total (n = 243)	66,8 (63,8)	46 (29-84)

ET : écart type ; IIQ : intervalle interquartile.

La ville de Béni-Mellal, au centre du pays, présente les plus courts délais attribuables aux patients avec une moyenne de 14,5 jours ; elle présente, par contre, les plus longs délais de diagnostic avec une moyenne à 50,6 jours. Inversement, la ville de Settat a la moyenne des délais attribuables aux patients parmi les plus élevées (54,9 jours) et celle des délais de diagnostic parmi les plus basses (8,8 jours).

La comparaison des moyennes des différents délais à travers les différentes variables explicatives a par ailleurs montré qu'un long délai de consultation est significativement associé à la tranche d'âge 55-64 ans. Le délai de diagnostic est, quant à lui, très significativement associé au fait que la première consultation médicale soit dans le secteur privé ou que le patient ait fait plus de deux consultations médicales avant que le diagnostic TPM+ ne soit posé. Pour le délai total, une association avec le statut matrimonial, le niveau d'éducation et le stigma vis-à-vis de la tuberculose a été retrouvée. Ce dernier est aussi associé au délai de consultation. La perte de poids chez les patients est significativement associée aux délais de consultation et de diagnostic, prolongeant par conséquent le délai total.

Des analyses bivariées et multivariées par régression logistique entre les différents délais dichotomisés selon leurs médianes et les différents facteurs de risque ont permis de confirmer ces associations. Les résultats de ces différentes mesures d'association sont représentés dans le tableau 4. Le fait d'être analphabète, d'avoir perdu du poids, de connaître la tuberculose, de penser guérir spontanément et de faire plus de deux consultations médicales avant le diagnostic est significativement associé à un délai total de plus de 45 jours (p = 0,0077, 0,0424, 0,0139, 0,0025 et 0,0072 respectivement).

Les patients qui pensent que leurs symptômes vont disparaitre d'eux-mêmes, ceux qui ont une perte de poids, ceux qui ont des contraintes économiques et ceux qui ont peur du diagnostic ou de l'isolement social ont quatre fois plus de risque de long délai de consultation (plus de 20 jours après le début des symptômes) (p=0,0000,0,0017,0,0034 et 0,0226 respectivement). Les patients analphabètes ont sept fois plus de risque pour le même délai ; une interaction a été mise en évidence entre la variable niveau d'éducation et la variable sexe. Les patients qui ont eu plus de deux consultations médicales avant le diagnostic de la tuberculose et ceux âgés de 35 ans et plus ont, respectivement, 3,94 et 0,39 fois plus de risque d'avoir un retard de diagnostic et de mise sous traitement. Enfin, le fait d'être marié semble être un facteur protecteur pour le délai patient et un facteur à risque pour le délai système de santé.

Discussion

La surveillance de la tuberculose au Maroc se fait essentiellement à travers un système passif de détection des cas selon lequel les patients se présentent d'eux- mêmes aux structures sanitaires pour solliciter des soins de santé. Or ce système dépend énormément de la motivation, des connaissances et des capacités financières du malade. Il dépend aussi du degré de suspicion des professionnels de santé et de la qualité et de l'efficacité des services de diagnostic et de prise en charge (*21*). Cette étude nous a permis de documenter les différents délais, depuis l'apparition des premiers symptômes jusqu'à la mise sous traitement anti-bacillaire des malades nouveaux cas de tuberculose pulmonaire à microscopie positive, et d'analyser les facteurs associés à ces délais.

Le délai total moyen de 66,8 jours (9,5 semaines) enregistré dans notre étude est légèrement supérieur à celui enregistré chez les patients militaires marocains pris en charge au niveau du centre de phtisiologie des Forces Armées Royales de Marrakech en 1999 (*20*). L'auteur de ce travail avait relié ce délai principalement à la distance parcourue par les malades adressés à ce centre, et qui était en moyenne de 624 km.

Par rapport à d'autres pays de la région, le délai total enregistré dans notre étude est inférieur à celui rapporté dans d'autres pays de la région Moyen-Orient et Afrique du Nord comme l'Iran, le Pakistan, la Somalie et la Syrie ainsi que dans d'autres pays d'Afrique subsaharienne et d'Asie (*8,11,13,22-24*), mais reste supérieur à celui enregistré en Égypte, en Iraq et au Yémen qui avaient documenté des délais moyens/médians de 57/44, 59,2/35 et 45,96/37,5 jours respectivement (*11*).

Tableau 4 Mesures d'association du délai patient, du délai système de santé et du délai total aux différentes variables explicatives liées aux patients ou aux recours aux soins de santé

Variable	Délai total		OR[b] (IC)	OR[a] (IC)	Délai patient		OR[b] (IC)	OR[a] (IC)	Délai système de santé		OR[b] (IC)	OR[a] (IC)
Délai (jours)	< 46	≥ 46			< 20	≥ 20			< 15	≥ 15		
Sexe												
Féminin	31	33	1,06 (0,58-1,96)		32	32	0,96 (0,52-1,76)		30	36	1,23 (0,67-2,24)	
Masculin	89	89			87	91			92	90		
Âge (ans)												
35 et plus	49	56	1,23 (0,74-2,06)		53	52	0,88 (0,53-1,47)		59	50	0,70 (0,42-1,16)	0,39 (0,18-0,82)
15-34	69	64			63	70			61	74		
Statut matrimonial												
Marié(e)	46	62	1,71 (1,01-2,90)		56	52	0,81 (0,48-1,37)	0,43 (0,19-0,99)	52	59	1,32 (0,79-2,21)	2,30 (1,047-4,94)
Célibataire	66	52			55	63			65	56		
Niveau d'éducation												
Non	38	58	1,93 (1,10-3,36)	2,17 (1,17-4,05)	42	54	1,41 (0,84-2, 37)	7,15 (1,96-26,06)	49	51	1,00 (0,60-1,66)	
Oui	82	65			77	70			73	76		
Principaux symptômes de la tuberculose: toux												
Oui	112	122	8,71 (1,08-188,67)	7,73 (0,9066,26)	112	122	3,81 (0,71-27,16)	2,26 (1,09-4,70)	116	124	2,14 (0,46-11,07)	
Non	8	1			7	2			6	3		
Perte de poids												
Oui	86	108	2,85 (1,39-5,88)	2,15 (1,03-4,50)	88	106	2,07 (1,04-4,16)		94	105	1,42 (0,37-2,78)	
Non	34	15			31	18			28	22		
1ère structure médicale consultée												
Privé	63	74	1,37 (0,80-2,35)		72	65	0,72 (0,42-1,24)		57	78	1,75 (1,01-3,01)	
Public	57	49			47	59			60	47		
Consultations avant diagnostic												
3 et plus	15	31	2,38 (1,21-4,69)	2,94 (1,34-6,45)					10	37	4,66 (2,09-10,62)	3,94 (1,81-8,56)
1-2	105	91							112	89		
Connaissances sur la tuberculose												
Oui	63	81	1,79 (1,03-3,11)	2,17 (1,17-4,03)	67	77	1,25 (0,72-2,16)		65	81	1,58 (0,92-2,71)	
Non	57	41			51	47			57	45		
Raison du délai rapportée par le patient												
Considère qu'il n'y a pas de délai	60	34			65	29			41	53		
Pensait guérir spontanément	36	63	3,09 (1,65-5,81)		31	68	4,92 (2,56-9,50)	4,01 (1,59-10,16)	54	47	0,67 (0,37-1,23)	
Contraintes économiques	15	22	2,59 (1,11-6,08)		11	26	5,30 (2,15-13,27)		30	17	0,66 (0,29-1,51)	
Non-confiance dans système de santé	3	5	2,94 (0,56-16,76)		6	2	0,75 (0,10-4,49)		4	5	0,97 (0,21-4,64)	
Stigma (peur isolement social, diagnostic)	7	5	1,26 (0,32-4,90)		4	8	4,48 (1,10-19,51)		6	7	0,90 (0,25-3,33)	

OR[b] : odds ratio brut ; OR[a] : odds ratio ajusté des variables retenues dans le modèle de régression logistique pour chacune des variables dépendantes ; IC : intervalle de confiance.
Les odd ratio en gras sont ceux retenus dans le modèle final après calcul du coefficient de variation.

Le délai attribuable au patient dans notre étude est supérieur au délai attribuable au système de santé. Chez 48,6 % de nos patients, ce délai est supérieur au seuil « acceptable » de trois semaines recommandé par l'Organisation mondiale de la Santé (25). Ce résultat est en accord avec celui observé en Iraq, en Somalie, en Syrie, en Turquie et au Yémen (*11,26*). Par contre, il diffère de ce qui a été observé dans d'autres pays d'Afrique subsaharienne comme la Gambie, le Ghana ou l'Ouganda (*8,27,28*). Moins de 40 % de nos patients initient leur traitement moins de 24 heures après leur diagnostic et plus de 10 % tardent plus d'une semaine avant leur mise sous traitement. Ce délai de mise sous traitement est injustifiable puisque les patients sont censés prendre leur traitement aussitôt le diagnostic posé et le poursuivre au niveau du centre de santé le plus proche de leur domicile. Ce délai prolonge inutilement la période de transmission de la tuberculose dans la communauté et expose au risque d'infections nosocomiales dans le milieu hospitalier (*29*).

Cette étude a permis de soulever un certain nombre de facteurs de risque associés à chacun des délais. Elle a aussi révélé quelques domaines d'investigations supplémentaires. La perte de poids, par exemple, ne fait pas partie des symptômes ayant motivé la consultation chez nos patients ; ceci peut expliquer son association statistique avec le délai patient et le délai total. Une étude plus poussée, ciblant les dates exactes d'apparition de chacun des symptômes et leur association avec les délais, devrait nous permettre de savoir si la perte du poids ou tout autre symptôme est plutôt une cause ou bien une conséquence de ces délais.

Il est reconnu que ce type d'étude présente des limitations potentielles dues notamment au biais de mémorisation et au fait qu'elle ne représente que les patients qui se sont présentés au système de santé. Cependant, les résultats obtenus dans cette étude peuvent être généralisés à tous les patients nouveaux cas TPM+ marocains, à l'exception des patients militaires pris en charge au niveau des services de santé des Forces Armées Royales. En effet, les médecins privés, en principe, adressent tous leurs patients aux structures publiques de santé, et l'impact des patients qui, pour une raison ou une autre, ne se sont pas présentés au système de santé et donc ne sont pas détectés par le système de surveillance existant sur les résultats de notre étude devrait être négligeable puisque l'Organisation mondiale de la Santé estime le taux de détection des cas TPM+ dans notre pays à plus de 96 %.

Nous avons démontré, à travers cette étude, qu'aussi bien le délai attribuable au patient que celui attribuable au système de santé jouent un rôle dans le retard de la mise sous traitement des patient tuberculeux TPM+ dans notre pays. Ces délais appellent à l'identification et à la mise en œuvre de stratégies réalistes et réalisables pour la promotion de la prise en charge précoce des patients tuberculeux TPM+ au sein du PNLAT.

En effet, un mécanisme est nécessaire pour augmenter l'indice de suspicion de la tuberculose chez les professionnels de santé, surtout chez les médecins généralistes du secteur privé, afin que des investigations appropriées soient faites au moment de la première consultation d'un patient ayant les symptômes de la tuberculose. De plus, l'augmentation du taux de dépistage actif des cas dans l'entourage des patients tuberculeux pulmonaires TPM+ devrait aider à la diminution de ces délais, lesquels peuvent être utilisés comme indicateurs du système de suivi-évaluation du programme national de lutte antituberculeuse. Par ailleurs, des supervisions doivent être faites pour assurer une plus grande adhésion aux standards nationaux de la lutte antituberculeuse, et comme le programme de lutte antituberculeuse est intégré au système de soins de santé de base, des mesures doivent être prises pour rendre ce système plus attractif. Le programme se doit aussi de sensibiliser le plus grand nombre possible de prestataires de soins et de les engager dans la lutte antituberculeuse. Ceci pourrait se faire à travers la mise en œuvre des initiatives de partenariats public-privé et public-public préconisées par l'OMS dans le cadre la stratégie « Halte à la tuberculose ».

Enfin, des campagnes d'éducation doivent être menées auprès de la population générale, et au-delà d'un apport général d'information sur la tuberculose, l'accent doit être mis sur la prévention de la transmission de la tuberculose à travers une prise en charge rapide et efficace des patients.

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Adverse health effects of spousal violence among women attending Saudi Arabian primary health-care clinics

H.M. Eldoseri,[1] K.A. Tufts,[2] Q. Zhang[2] and J.N. Fish[3]

الآثار الصحية الضارة بالصحة لممارسة الزوج العنف الجسدي ضد النساء المترددات على عيادات الرعاية الصحية الأولية في المملكة العربية السعودية

هالة الدوسري، كمبرلي آدامز تفتس، هاري زانج، جينفر فيش

الخلاصة: فقد كان الهدف من هذه الدراسة استقصاء وتيرة ممارسة الزوج للعنف الجسدي ضد المرأة لدى النساء السعوديات، وتوثيق ما يتعلق بهذه الممارسة من الآثار الصحية والإصابات، إضافة إلى مَواقفهنَّ من الجنس الآخر ومن العنف. وقد أُجْريت مقابلاتٌ منظمةٌ مع 200 سيدة سبق لهنَّ أن تزوجنَ، أُخِذن كعينات من مراكز للرعاية الأولية في جدة. وقد أفاد ما يقرب من نصف النساء اللائي شملهن المسح (44.5٪) عن أنهنَّ عانَينَ في وقت ما من ممارسة الزوج للعنف الجسدي ضد المرأة. وعلى الرغم من أن 37 سيدة (18.5٪) حصلت لهنَّ إصابات متعلقة بممارسة الزوج للعنف الجسدي ضد المرأة فإن 6.5٪ منهن فقط ذكرنَ هذه الإصابات لأحد مقدِّمي الرعاية الصحية. وكان لدى ضحايا ممارسة الزوج للعنف الجسدي ضد المرأة ضعفٌ في إدراك حالتهن الصحية، فقد أبلغنَ عن أَلم أو انزعاج، وعن استخدام مضادات اكتئاب، وعن أفكار انتحارية. ولم توافق النساء في الغالب على المبرِّرات التي قُدِّمت لهن لضرب الزوجة، وعلى الرغم من ذلك، لم يكن هناك علاقة واضحة بين الموقف من النوع الاجتماعي وبين ممارسة الزوج للعنف الجسدي ضد المرأة. إن نتائج هذه الدراسة تؤيد الدعوات التي تنادي بإدماج التثقيف عن عنف الزوج في مناهج الرعاية الصحية لتعزيز نوعية الخدمات وفرص الحصول عليها.

ABSTRACT This study aimed to investigate the frequency of spousal violence among Saudi women and document the related health effects and injuries, as well as their attitudes to gender and violence. Structured interviews were conducted with 200 ever-married women recruited from primary-care centres in Jeddah. Nearly half of the surveyed women (44.5%) reported ever experiencing physical violence from their spouse. Although 37 women (18.5%) had received violence-related injuries, only 6.5% had reported these injuries to a health-care provider. Victims of spousal violence had poor perceptions of their overall health, and reported pain or discomfort, antidepressant use and suicidal thoughts. Women mostly disagreed with the presented justifications for wife-beating. However, the association between gender attitudes and spousal violence was not significant. The results of this study support calls for integration of education about partner violence into health-care curricula to enhance the access and quality of services.

Effets indésirables de la violence conjugale sur la santé des femmes consultant dans des centres de soins de santé primaires en Arabie saoudite

RÉSUMÉ La présente étude visait à examiner la fréquence de la violence physique infligée par les conjoints à des femmes saoudiennes et de documenter les effets sur la santé et les traumatismes qui y sont liés, ainsi que leurs attitudes vis-à-vis du sexisme et de la violence. Des entretiens structurés ont été menés auprès de 200 femmes ayant déjà été mariées, recrutées dans des centres de soins de santé primaires à Djedda. Près de la moitié des femmes ayant participé à l'enquête (44,5 %) ont déclaré avoir déjà été victimes de violence conjugale. Pourtant, si 37 femmes (18,5 %) ont présenté des traumatismes liés à la violence physique infligée par leur conjoint, seules 6,5 % avaient consulté un prestataire de soins de santé pour ce motif. Les victimes de violence conjugale avaient une perception médiocre de leur état de santé en général et affirmaient souffrir de douleur et de gêne, consommer des antidépresseurs et avoir des idées suicidaires. Les femmes interrogées étaient le plus souvent en désaccord avec les justifications proposées pour la violence conjugale. Toutefois, l'association entre les attitudes sexistes et la violence conjugale n'était pas significative. Les résultats de cette étude confirment la nécessité d'inclure une formation sur la violence conjugale dans les programmes d'études sur les soins de santé afin d'accroître l'accès aux services et leur qualité.

[1]School of Nursing, Johns Hopkins University, Baltimore, Maryland, United States of America (Correspondence to H. Eldoseri: heldo001@gmail.com). [2]College of Health Sciences; [3]College of Arts and Letters, Old Dominion University, Virginia, United States of America.

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Introduction

Spousal violence refers to a range of physically coercive or violent acts used against adult and adolescent women by current or former spouse (*1*). It is considered not only a human rights violation but also a serious public health concern (*2*). The World Health Organization (WHO) asserts that spousal violence, "occurs in all countries, irrespective of social, economic, religious or cultural group" (*3*). Variations in prevalence of spousal violence between different countries have been documented, pointing to the importance of establishing correlates of spousal violence across different populations (*4,5*). Most importantly, the variation suggests that spousal violence is a modifiable and preventable phenomenon that may be amenable to culturally relevant interventions including those aimed at persons living in the Eastern Mediterranean Region (EMR).

In the EMR and particularly in Arab societies, both universal and culture-specific factors may put women to greater risk for spousal violence. Laws and public policy that reflect gender inequities, mandate divorce restrictions and support patriarchal societies lead to increased risks for violence. Women may also be discouraged from reporting abuse to health-care professionals or legal authorities due to the social importance given to maintaining marital status. Reports of abuse are often denied, minimized, interpreted as delusional or ignored (*6*). As a result, health-care professionals often under-report and/or fail to detect and document abuse. Nevertheless, some studies conducted in EMR countries have documented different aspects of spousal violence (*7–11*). The observed variation in the prevalence of spousal violence across MR countries can be attributed not only to variations in methods of data collection but to the cultural and societal differences influencing the perspectives of the populations studied. Regional assessments, therefore, must take into account the national and cultural diversity of any research focused on spousal violence.

Little formal research, a paucity of statistical data and a virtual absence of official records on spousal violence in Saudi Arabia create a pressing need for focused investigation The small number of studies that have been conducted used broader definitions that measured different manifestations of gender-based violence, including domestic violence defined as emotional, physical and sexual violence perpetrated by anyone against women (*12*), the impact of physical violence during pregnancy (*13*), and physical and emotional violence in ever-married women (*14*). Such limited reporting fails to offer an accurate picture of the Saudi Arabian case, where the impact of spousal violence presents serious and disproportionate health concerns for women.

The documented relationship between spousal violence and adverse health effects underscores that this issue merits attention (*15*). Studies in the EMR have documented the deleterious health effects of spousal violence including negative maternal and child health outcomes (*16,17*). The association between spousal violence and impaired mental health, physical injuries, disability and death has also been documented in several studies conducted in the EMR (*18–21*). Violence against women is embedded in beliefs and attitudes about gender roles. In one Saudi Arabian study, half of the men supported the use of violence against women in cases of misconduct and a third of men actually resorted to violence to deal with a wife's misbehaviour. Interestingly, a third of the women in the same study agreed with the use of violence in cases of women's misconduct (*22*).

The purpose of this study was therefore to utilize the primary health care (PHC) setting to assess: the frequency and types of spousal violence; the association between reported spousal violence and adverse health effects; the types of injuries sustained; and if women discussed spousal violence with health-care professionals at the PHC. Additionally, we extended the study by exploring Saudi women's gender attitudes and acceptance of spousal violence under certain hypothetical scenarios in the context of marriage.

Methods

This exploratory study was cross-sectional in nature. The data were collected via structured interviews in PHCs in Jeddah, Saudi Arabia, between March and June 2012. The primary investigator conducted the interviews in Arabic and utilized her knowledge of cultural norms to navigate the PHC systems.

Sampling

A power analysis revealed that a minimum sample size of 132 was needed to achieve a power of 0.90 with an effect size of 0.4 and alpha set at 0.05. An increase in the sample size to 200 women was conducted to account for under-reporting. In each region, we targeted a sample size of 40 women for individual interviews. PHCs were selected from each of the 5 regions of the city; namely, north, south, east, west and central to enhance geographic representation of the study participants. However, due to logistics and research time constraints, we opted for convenience rather than random sampling of PHCs. The principal investigator sought to recruit women from PHCs in reachable locations, with cooperative managers, private areas for one-to-one interviews and the potential to receive at least 40 women visitors per week. In cases where the number of women interviewed in any PHC was less than 40 in 2 weeks, another PHC was selected from the same region to complete the 40 interviews per region. A total of 6 PHCs were selected, including 2 PHCs from northern region, out of a total 80 PHCs in Jeddah to recruit 40 participants from each region.

A flyer was used at the reception of the selected PHCs to invite eligible women to participate. The flyer stated the purpose of the study, emphasized the voluntary nature of participation, detailed the inclusion criteria, stressed confidentiality and included contact information for the study investigator. Interested women were directed to the study investigator to screen them for eligibility. Women were included in the study if they were: of Saudi nationality; married, divorced or widowed; between the ages of 18–65 years; and in receipt of health care at the selected PHC. Women who were never married or who had family members who had already participated in the study were excluded from participation. The latter condition was made to protect women from potential retaliation. In addition, the study was always referred to as the "Survey on Women's Health and Life Experiences". One-to-one interviews were conducted with consenting women at the end of their PHC visits. Thirteen women did not complete the interview process because they had to be picked up immediately by their husbands or did not show up after the end of their visits.

Data collection

Measures

A 73-item adapted version of the WHO Violence against Women questionnaire (version 10.0) was used. The original questionnaire is made up of 12 sections covering: the respondent and her family; general health; reproductive health; children; current or most recent partner; attitudes towards gender roles; respondent and her partner; injuries; impact and coping; past experience; financial autonomy; and completion of the interview. For the purpose of this study, sections 3, 4 and 9 (on reproductive health, children and impact and coping) were omitted. The questionnaire was translated into Arabic and then back-translated to English. The accuracy of language including idiom was assessed by an expert of Arabic. The internal consistency of the physical violence construct was good ($\alpha = 0.82$) and comparable with other studies utilizing the same questionnaire.

Spousal violence was measured by asking participating women the following question: "Has your husband ever: slapped you or thrown something at you that could hurt you?; pushed you or shoved you or pulled your hair?; hit you with his fist or with something else that could hurt you?; kicked you, dragged you or beaten you up?; choked or burnt you on purpose?; threatened to use or actually used a gun, knife, or other weapon against you?". In each act of spousal violence women were asked if the act happened in the past 12 months or ever, and the frequency (once, few times, several times). A woman who answered yes to any of the acts of spousal violence was considered exposed to spousal violence.

Women's attitudes about physical chastisement were explored by asking participating women if a husband has the right to beat his wife in 6 hypothetical scenarios: wife fails to do chores; wife disobeys husband; wife refuses to have sex; wife asks the husband if he is unfaithful; husband has doubts of his wife's fidelity; and wife actually commits adultery. Gender roles, whether progressive or traditional, were assessed by asking women if they agree or disagree with a series of statements. For example "a good wife obeys her husband even if she disagrees" and "it is important for a man to show his wife who is the boss". A woman accepting at least one of the scenarios was considered traditional in regard to gender attitudes.

Protection of human subjects and ethical considerations

The study proposal, protocol, flyer and notification statement were approved both by Old Dominion University research institutional review board and by Jeddah primary health-care administration in Saudi Arabia. A facilitation letter was issued by the PHC administration department to the study investigator to contact the selected PHCs and conduct the interviews with the eligible and consenting women. Investigators adhered to the ethical and safety guidelines for research on domestic violence against women (*23*). Due to the sensitive nature of this inquiry and the potential risk of retaliation, an institutional review board approved notification statement form was used instead of a signed consent form.

An Arabic notification statement was read by the study investigator for each consenting participant. The notification statement apprised all potential participants of the study's purpose, risks of participation, measures taken to ensure confidentiality, measures taken to minimize release of protected health information and the right to withdraw without penalty. A copy of the notification statement was given to the women if requested. After the interview was completed, each participant received a debriefing wherein they were asked not to divulge the nature of the study to anyone in order to protect them from potential retaliation. Referral cards with contact information and hotlines of women's shelters and social services were provided to each participant to address any potential needs arising from the interviews.

Data analysis

SPSS software, version 17.0, was used for data analysis. Univariate and multivariate analyses were conducted to describe the data. The chi-squared test for significance was used, with $P < 0.05$ considered significant. Logistic regression tests, including binary logistic regression and ordinal logistic regression, were conducted to analyse the significance of the relationship of spousal violence, women's health perceptions and gender attitudes. Odds ratio (OR) were calculated to assess the odds of perceived health status and gender attitudes associated with the reported spousal violence.

Results

A total of 200 women participated in the study. Table 1 shows the socioeconomic characteristics of the participating women and their husbands. Most women and their husbands were educated. However, the majority of women were not wage-earners (73.0%).

Prevalence of spousal violence

A higher proportion of women reported lifetime experience of spousal violence than in the last year; approximately half of women 89/200 (44.5%) reported ever experiencing spousal violence whereas 32/200 (16.0%) reported experiencing spousal violence in the previous year (Figure 1). While acts of spousal violence varied in nature and severity, repeated acts of spousal violence were more common than single incidents (Figure 2).

Women whose husbands were employed were less likely to report spousal violence than those whose husbands were unemployed (OR = 0.23; 95% CI: 0.08–0.67). However, no significant differences were observed in reports of spousal violence based on age and education of the women or their husbands (Table 1).

Injuries related to spousal violence

Nearly one-fifth of the women (37, 18.5%) stated that they had experienced injuries as a result of spousal violence including: cuts, abrasions, bites, scratches, bruises, dislocation, sprains, burns, deep cuts, wounds, broken eardrum, eye injuries, fractures, broken teeth and internal injuries. In addition, 8 of the women (4.0%) reported other injuries such as hair being pulled out of the scalp and abortions related to spousal violence. Of the women, 31 had required medical attention for spousal-violence-related injuries and 19 had actually received it. In total, only 13 women (6.5%) had told a health-care professional about the real cause of their injuries.

Adverse health effects, health services utilization & spousal violence

In general, women who reported ever experience of spousal violence perceived that their health status was worse than did women who had never experienced spousal violence (Table 2). Spousal violence was less likely in women who reported very good or excellent overall health status (OR 0.5; 95% CI: 0.3–0.9). In addition, spousal violence was twice as likely in women reporting recent feelings of pain or discomfort (OR 2.2; 95% CI: 1.2–3.9).

Table 1 Socioeconomic factors associated with spousal violence reported by the study sample of Saudi Arabian women

Socioeconomic factors	Total		No spousal violence		spousal violence		OR (95% CI)	*P*-value
	No.	%	No.	%	No.	%		
Age of woman (years)								
18–30 (ref.)	57	28.5	35	31.5	22	24.7		
31–50	92	46.0	45	40.5	47	52.8	1.8 (0.7–4.5)	0.2
≥ 51	51	25.5	31	27.9	20	22.5	1.5 (0.4–5.2)	0.5
Age of husband (years)								
18–30 (ref.)	23	11.5	14	12.8	9	10.3		
31–50	109	54.5	55	50.5	54	62.1	0.9 (0.3–2.9)	0.9
≥ 51	64	32.0	40	36.7	24	27.6	0.6 (0.2–2.7)	0.6
Woman's education (years)								
No education (ref.)	30	15.0	20	18.0	10	11.2		
≤ 12	114	57.0	56	50.5	58	65.2	2.4 (0.8–7.4)	0.12
> 12	56	28.0	35	31.5	21	23.6	1.7 (0.5–6.1)	0.41
Husband's education (years)								
No education (ref.)	16	8.0	9	8.5	7	7.9		
≤ 12	120	60.0	57	53.8	63	70.8	1.3 (0.4–4.8)	0.68
> 12	59	29.5	40	37.7	19	21.3	0.7 (0.2–2.7)	0.55
Woman earns money								
No (ref.)	146	73.0	82	74.5	64	71.9		
Yes	53	26.5	28	25.5	25	28.1	1.0 (0.5–2.1)	0.97
Husband employed								
No (ref.)	26	13.0	8	7.3	18	20.9		
Yes	169	84.5	101	92.7	68	79.1	0.2 (0.1–0.7)	0.007

Data were missing in some categories.
Ref. = reference group; OR = odds ratio; CI = confidence interval.

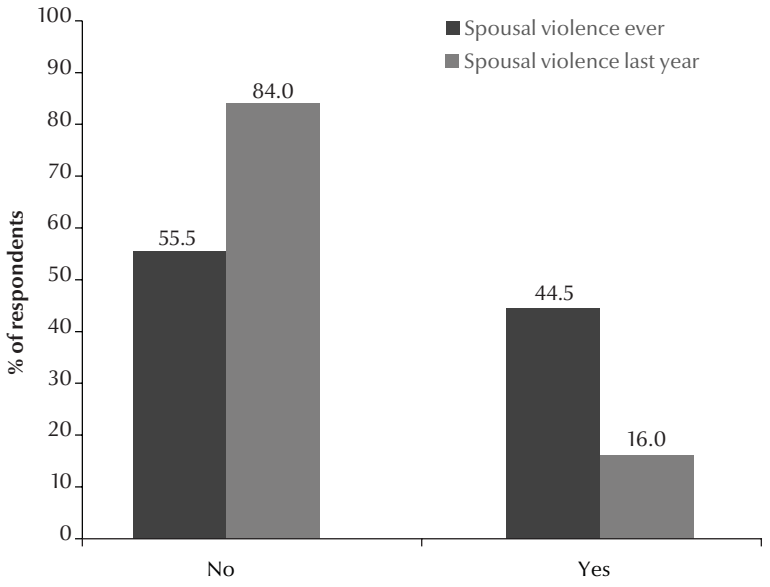

Figure 1 **Spousal violence experienced in the previous year and ever, by the study sample of Saudi Arabian women (*n* = 200)**

Reports of spousal violence were 17 times more likely in women who reported recent intake of antidepressant drugs (OR 17.4; 95% CI: 2–152) and 6.6 times more likely in women who had ever had suicidal thoughts (OR 6.6; 95% CI: 2.4–17.9). No significant association was found between spousal violence and recent hospitalization or visits to health-care professionals.

Women's attitudes to spousal violence

Women who held traditional gender attitudes represented 44.0–80.5% of the sample (Table 3). Responses to 4 of the 5 questions showed that traditional and progressive gender attitudes were held fairly equally among the participants. The only exception was the women's views of interference of others outside the family; 161/200 of the women (80.5%) disagreed that others should interfere if a husband mistreats his wife. Most of the women did not accept wife-beating under most scenarios presented (83.5–98.5%). The only exception was in the case of a wife's infidelity; in this situation 102/200 women (51.0%) accepted the husband's right to beat his wife.

Our analysis revealed that ever experience of spousal violence was more likely in women with defiant/progressive attitudes than in women with traditional attitudes, although the relationship was not generally

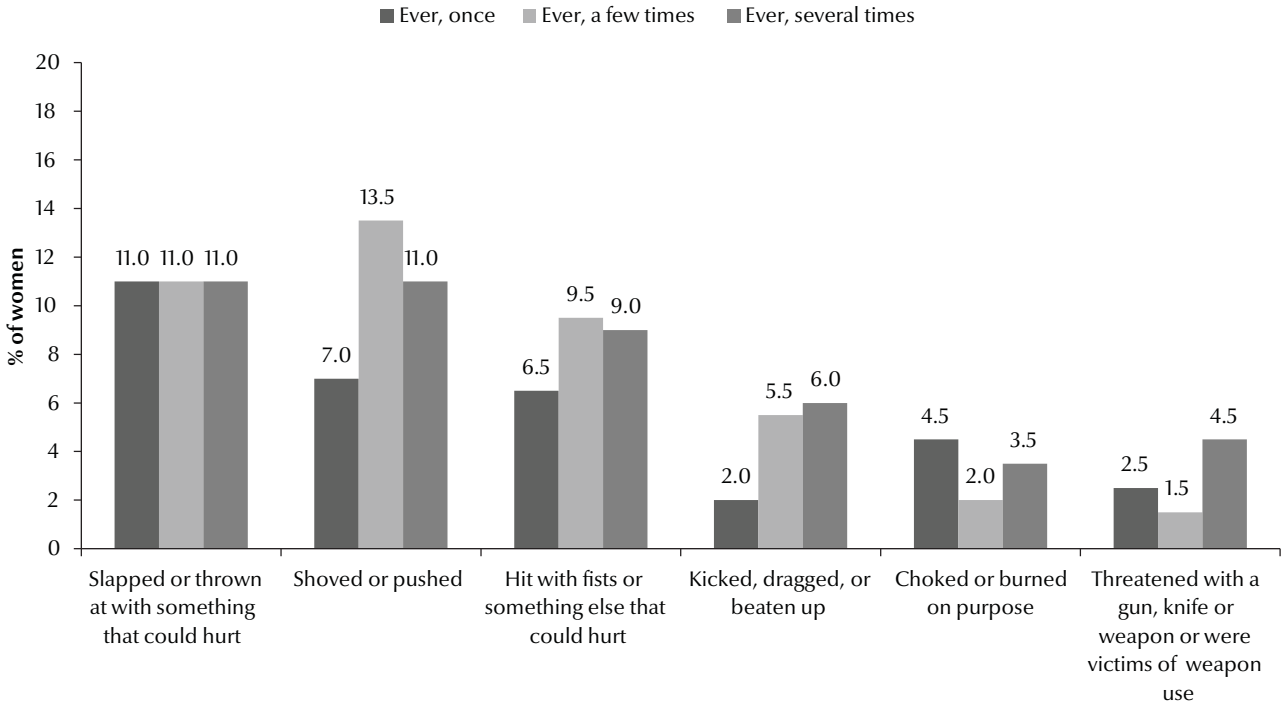

Figure 2 **Types of spousal violence ever experienced by the study sample of Saudi Arabian women (*n* = 200)**

Table 2 Adverse health effects associated with spousal violence reported by the study sample of Saudi Arabian women

Women's perceived health indicator	Total		No spousal violence		Spousal violence		OR (95% CI)	*P*-value
	No.	%	No.	%	No.	%		
Health perception								
Very poor or poor	14	7.0	6	5.4	8	9.0	0.5 (0.3–0.9)	0.02
Good	70	35.0	33	29.7	37	41.6		
Very good or excellent	116	58.0	72	64.9	44	49.4		
Movement in the past 4 weeks								
No or few problems	146	73	84	75.7	62	69.7	1.4 (0.7–2.6)	0.3
Some problem	41	20.5	22	19.8	19	21.3		
Many problems or cannot walk at all	13	6.5	5	4.5	8	9.0		
Daily functions in the past 4 weeks								
No or few problems	164	82.0	91	82.0	73	82.0	1.0 (0.5–2.0)	0.9
Some problems	28	14.0	16	14.4	12	13.5		
Many problems or cannot function at all	8	4.0	4	3.6	4	4.5		
Pain or discomfort in the past 4 weeks								
No or mild pain or discomfort	120	60.0	76	68.5	44	49.4	2.2 (1.2–3.9)	0.007
Moderate pain/discomfort	47	23.5	22	19.8	25	28.1		
Severe or very severe pain/discomfort	33	16.5	13	11.7	20	22.5		
Memory or concentration problems in the past 4 weeks								
No or few problems	139	69.5	82	73.9	57	64.0	1.8 (0.9–3.2)	0.07
Some problems	31	15.5	19	17.1	12	13.5		
Many or excessive problems	30	15	10	9.0	20	22.5		
Sleep or relaxing medication in the past 4 weeks								
None	186	93.0	105	94.6	81	91.0	2.1 (0.7–6.6)	0.2
One or more times	14	7.0	6	5.4	8	9.0		
Pain medication in the past 4 weeks								
None	55	27.5	32	28.8	23	25.8	1.09 (0.6–2.1)	0.8
One or more times	145	72.5	79	71.2	66	74.2		
Antidepressants in the past 4 weeks								
None	190	95.0	110	99.1	80	89.9	17.4 (2.0–152)	0.010
One or more times	10	5.0	1	0.9	9	10.1		
Ever thought of suicide								
No	172	86.0	105	94.6	67	75.3	6.6 (2.4–17.9)	< 0.001
Yes	28	14.0	6	5.4	22	24.7		
Ever attempted suicide								
No	189	94.5	108	97.3	81	91.0	4.0 (1.0–16.1)	0.06
Yes	11	5.5	3	2.7	8	9.0		

[a]*OR adjusted for women's age, earning capacity, and 12 years of education.*
OR = odds ratio; CI = confidence interval.

significant (Table 3). The only exception was in the case of women's views towards interference by others outside the family if a husband mistreated his wife, where spousal violence was 2.5 times more likely in women who disagreed with non-interference (OR 2.0; 95% CI: 1.1–3.8). The majority of women did not accept wife-beating under most of the scenarios presented. However, no significant relationship was found between women's acceptance of wife-beating and spousal violence.

Discussion

This study presents initial yet important findings related to spousal violence as obtained from PHC clinics in Saudi Arabia. The frequency of ever experience of spousal violence in our

Table 3 Gender attitudes and acceptance of wife-beatings association with spousal violence reported by the study sample of Saudi Arabian women

Women's gender attitudes	Total		No spousal violence		Spousal violence		OR (95% CI)	*P*-value
	No.	%	No.	%	No.	%		
A good wife should obey her husband								
Agree	98	49.0	59	53.2	39	43.8	1.2 (0.6–2.4)	0.6
Disagree	102	51.0	52	46.8	50	56.2		
Family problems should only be discussed within family								
Agree	161	80.5	93	83.8	68	76.4	1.4 (0.6–3.0)	0.4
Disagree	39	19.5	18	16.2	21	23.6		
It's important for a husband to show he is the boss of the house								
Agree	118	59.0	68	61.3	50	56.2	1.5 (0.8–2.9)	0.2
Disagree	82	41.0	43	38.7	39	43.8		
A woman should not choose her own friends if her husband disapproves								
Agree	99	49.5	57	52.3	42	47.2	1.2 (0.6–2.2)	0.6
Disagree	99	49.5	52	47.7	47	52.8		
If a man mistreats his wife, others outside the family should not interfere								
Agree	88	44.0	57	51.4	31	35.2	2.0 (1.1–3.8)	0.03
Disagree	111	55.5	54	48.6	57	64.8		
A man has the right to beat his wife:								
If she doesn't finish the house chores as he wants								
No	197	98.5	111	100.0	86	96.6	n/a	n/a
Yes	3	1.5	0	0.0	3	3.4		
If she disobeys him								
No	172	86.0	92	82.9	80	89.9	0.8 (0.3–2.2)	0.6
Yes	28	14.0	19	17.1	9	10.1		
If she refuses to have sex with him								
No	184	92.0	103	92.8	81	92.0	0.9 (0.3–3.5)	0.9
Yes	15	7.5	8	7.2	7	8.0		
If she asks him about his relationship with other women								
No	191	95.5	107	98.2	84	94.4	1.1 (0.2–7.7)	0.9
Yes	7	3.5	2	1.8	5	5.6		
If he has doubts about his wife:								
No	167	83.5	96	87.3	71	80.7	1.6 (0.7–3.9)	0.3
Yes	31	15.5	14	12.7	17	19.3		
If he discovers his wife cheating								
No	96	48.0	59	53.2	37	42.5	1.3 (0.7–2.5)	0.4
Yes	102	51.0	52	46.8	50	57.5		

[a]*OR adjusted for women's age, earning capacity and 12 years of education.*
n/a = not applicable; OR = odds ratio; CI = confidence interval.

research sample (44.5%) was higher than that observed in most other national studies, where spousal violence ranged from 13% to 34% (*12,14,15*). In the WHO multi-country study, the rate of spousal violence ranged from a low of 13% to a high of 61%. The variation was attributed to differences in cultural norms related to violence (*5*). The higher frequency of spousal violence in our study is similar to some other studies in the EMR (*24*).

Women in this study reported being subjected to both moderate (slapped, pushed, shoved or pulled by hair) and severe violent acts (kicked, dragged, beaten up, choked or burned). This may explain the higher frequency of injuries related to spousal violence. The fact that only 6.5% of injured women had disclosed the real reasons for their injuries to a health-care professional may explain why only 9.5% of injured women received any treatment; a finding that was similar was similar to findings in other EMR studies (*12,14*).

Our results of significant associations between spousal violence and poor overall health perceptions, recent perceptions of pain and discomfort, use of antidepressants and thoughts of suicide were consistent with that of the WHO multicounty study of worse health perceptions in victims of violence (*25*). In Palestine, Lebanon and the Syrian Arab Republic, spousal violence victims were more likely to report depression, suicidal thoughts, somatization and more frequent health complaints (*16,18,24*). However, the absence of a significant association between utilization of health care and spousal violence may reflect the women's reluctance to seek help for spousal violence.

The findings suggest that the containment of spousal violence to the household signal adherence to larger societal and cultural views. The majority of women in the study (80.5%) viewed family as a private sphere, agreeing that family problems should only be discussed within the family. Interestingly, although approximately half of the participants had traditional gender attitudes, the great majority of women did not accept the husband's right to beat his wife in most scenarios presented. The exception was in case of a wife's infidelity, whereby 51.0% viewed beating as appropriate, in accordance with the findings in other studies in the EMR (*8,17,24*). These findings demonstrate that these women generally did not accept spousal violence as an appropriate enactment of male power.

This study illuminates a distinct relationship between the prevalence of spousal violence and women's communication with PHCs. As only 13 women who suffered injuries as a result of spousal violence (6.5%) declared the reason for their injuries to a health-care provider it is clear that a gap exists between prevalence of spousal violence and access to services. Women's hesitation to disclose the real reasons for spousal violence-related injuries has been observed in other studies (*14,24*) and, considering the prevalence of reporting practices in Saudi Arabia, it points to prevailing traditional gender power structures that construct family patterns and practices as private and outside the purview of public services. In turn, this perception affects women's health and well-being due to their inability to communicate threats in the private sphere to the public one (*24*).

One of the notable findings of this study was that participating women readily disclosed sensitive information about spousal violence to the study investigator, even though systems and sociocultural norms are in place to discourage women from reporting private family issues publicly in PHCs. This finding was documented in another EMR study (*16*), providing fertile ground for investigations of the connections between private and public practices regarding spousal violence.

The study design had some limitations in the sampling methods and the potential for bias in participants' responses. The use of convenience sampling may have introduced a selection bias. By sampling from PHCs across Jeddah, we enhanced the probability of gaining access to women of various socioeconomic strata. Nevertheless, the selection of women from free-of-charge PHCs may have restricted our findings to women from middle to lower socioeconomic strata. In Saudi Arabia, affluent women are more likely to use private health-care services. Because participating women were asked about past experiences, recall bias may have affected their answers. Many women saw the Saudi interviewer as an influential figure with power to assist them in redressing their complaints. Therefore, most women seemed quite willing to divulge sensitive information about their experiences with violence. However, a social desirability effect may have impacted the quality of data obtained.

Conclusion

Nearly 50% of women reported ever experience of IPPVAW, an alarming rate that calls for urgent and efficient violence management policies and services. Official restrictions on Saudi women's autonomy may prevent them from accessing needed services. The health-care setting may be one of the few places where women can freely access help. Therefore, health-care professionals trained in documentation and reporting of IPPVAW can improve the surveillance and intervention efforts. The integration of IPPVAW education into health-care provider education curricula, with the goals of promoting an increased awareness of the prevalence, identification of at-risk women and encouraging non-judgemental attitudes, may contribute to a better service provision and creation of a more cohesive link between the private and public sphere (*26*).

Competing interests: None declared.

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Prevalence of thalassaemia, iron-deficiency anaemia and glucose-6-phosphate dehydrogenase deficiency among Arab migrating nomad children, southern Islamic Republic of Iran

M. Pasalar,[1] D. Mehrabani,[2] A. Afrasiabi,[1] Z. Mehravar,[1] I. Reyhani,[2] R. Hamidi[1] and M. Karimi[1]

انتشار الثلاسيميَّة، وفقر الدم بعوز الحديد، وعوز نازعة هيدْرُجين الغلوكوز -6- فُسْفات بين أطفال البدو المهاجرين العرب، جنوب جمهورية إيران الإسلامية

مهدي باسالار، داوود مهرباني، عبد الرضا أفراسيابي، زهرة مهرآور، إيرما ريحاني، رقية حميدي، مهران كريمي

الخلاصة: لقد تم في هذه الدراسة الاستقصاءُ عن انتشار فقر الدم بعوز الحديد، وعوز نازعة هيدْرُجين الغلوكوز -6- فُسْفات (G6PD)، وخَلَّة الثلاسيمية بيتا بين أطفال البدو المهاجرين العرب في جنوب جمهورية إيران الإسلامية. حيث تم تحليل عينات دم من 134 طفلاً من أطفال المدارس الذين تقل أعمارهم عن 18 عاماً (51 ذكور، 83 إناث). فوُجد انخفاض في فيرِّيتين المصل (<12 نانوغرام/ دل) لدى 17.9٪ من الأطفال (21.7٪ لدى الإناث و 11.8٪ لدى الذكور). وكان انخفاض خضاب الدم (الهيموغلوبين) مرتبطاً – بشكل كبير – مع انخفاض فيرِّيتين المصل. وكان لدى طفل واحد فقط عوز في عوز نازعة هيدروجين الغلوكوز -6- فوسفات. وكان الخضاب HbA2 ≥ 3.5 غ/ دل لدى 9.7٪ من مجموع الأطفال، مما يدل على وجود خلة الثلاسيمية بيتا (10.8٪ لدى الإناث و7.8٪ لدى الذكور). وكان هناك تشابه بين الخضاب في متوسط حديد المصل وفيرِّيتين المصل والسعة الإجمالية الرابطة للحديد لدى الذكور والإناث. وكان لمؤشر فيرِّيتين المصل نفس دقة مؤشر الهيموغلوبين في تشخيص فقر الدم بعوز الحديد. وكان ارتفاع معدل انتشار خلة الثلاسيمية بيتا يمثّل عاملَ الخطر المحتمل الرئيسي لدى هذه الفئة من السكان.

ABSTRACT This study investigated the prevalence of iron-deficiency anaemia, glucose-6-phosphate dehydrogenase (G6PD) deficiency and β-thalassaemia trait among Arab migrating nomad children in southern Islamic Republic of Iran. Blood samples were analysed from 134 schoolchildren aged < 18 years (51 males, 83 females). Low serum ferritin (< 12 ng/dL) was present in 17.9% of children (21.7% in females and 11.8% in males). Low haemoglobin (Hb) correlated significantly with a low serum ferritin. Only 1 child had G6PD deficiency. A total of 9.7% of children had HbA2 ≥ 3.5 g/dL, indicating β-thalassaemia trait (10.8% in females and 7.8% in males). Mean serum iron, serum ferritin and total iron binding capacity were similar in males and females. Serum ferritin index was as accurate as Hb index in the diagnosis of iron-deficiency anaemia. A high prevalence of β-thalassaemia trait was the major potential risk factor in this population.

Prévalence de la thalassémie, de l'anémie ferriprive et du déficit en glucose-6-phosphate déshydrogénase chez des enfants nomades et migrants arabes (sud de la République islamique d'Iran)

RÉSUMÉ La présente étude a évalué la prévalence de l'anémie ferriprive, du déficit en glucose-6-phosphate déshydrogénase et de la bêta-thalassémie mineure chez des enfants nomades et migrants arabes dans le sud de la République islamique d'Iran. Des échantillons de sang de 134 écoliers de moins de 18 ans ont été analysés (51 garçons, 83 filles). Des taux de ferritine sérique faibles (< 12 ng/dL) ont été observés chez 17,9 % des enfants (21,7 % chez les filles et 11,8 % chez les garçons). Un faible taux d'hémoglobine (Hb) était significativement corrélé à un faible taux de ferritine sérique. Seul un enfant était atteint de déficit en glucose-6-phosphate déshydrogénase. Au total, 9,7 % des enfants présentaient un taux d'HbA2 supérieur ou égal à 3,5 g/dL, signe d'une bêta-thalassémie mineure (10,8 % des filles et 7,8 % des garçons). Le taux moyen de fer sérique, de la ferritine sérique et la capacité de liaison du fer total étaient similaires chez les deux sexes. Le taux de ferritine sérique était aussi précis que le taux d'Hb pour le diagnostic de l'anémie ferriprive. La forte prévalence de la bêta-thalassémie mineure représentait le principal facteur de risque dans cette population.

[1]Haematology Research Centre, Nemazee Hospital; [2]Stem Cell and Transgenic Technology Research Centre, Department of Pathology, Shiraz University of Medical Sciences, Shiraz, Islamic Republic of Iran (Correspondence to M. Karimi: karimim@sums.ac.ir).

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Introduction

There are a number of different nomad tribes of different ethnicities in the Islamic Republic of Iran and the haematological problems of their children may not be the same as in the wider community. Beta-thalassaemia is a common health problem in the Islamic Republic of Iran (*1*) which drastically affects the family and personal life of sufferers and is a drain on health resources (*2*). Beta-thalassaemia is caused by a deficient synthesis of β-chains of haemoglobin leading to hypochromic microcytic red cells, ineffective erythropoiesis and haemolytic anaemia and is the result of a decrease in haemoglobin (Hb)F synthesis during the first year of life (*3*). There have been several studies on β-thalassaemia mutation spectrum in the Iranian population since 1997 when the national thalassaemia screening programme was implemented (*2,4*). Up to the end of 2001, 2.7 million prospective couples had been screened and 10 298 at-risk couples had been identified, showing acceptable coverage of screening plus an annual 7.4% increase in the number of people reaching marriageable age. The average prevalence of carrier couples detected increased from 3.0/1000 to 4.5/1000 (*5*).

Iron-deficiency anaemia too is a common haematological problem worldwide, and is a public health problem in many developing countries. It is estimated that more than 500 million people worldwide are affected by iron-deficiency anaemia (*6*).

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is another important haematological disorder in the Islamic Republic of Iran, where it is a major public health problem in many areas (*7*). G6PD is an X-chromosome linked disorder, leading to acute haemolytic anaemia following ingestion of fava beans, certain drugs and bacterial or viral infections (*8*).

Nutritional deficiency, familial marriage, illiteracy and certain cultural beliefs in different nomadic groups may produce variations in the prevalence of thalassaemia, G6PD deficiency and iron-deficiency anaemia (*9,10*). National data collection from different nomadic groups may help in planning health services more efficiently. The aim of this study was to investigate the prevalence of iron-deficiency anaemia, β-thalassaemia, and G6PD deficiency in Arab migrating nomads in Fars Province, southern Islamic Republic of Iran.

Methods

Sample

This cross-sectional study was conducted on Arab migrating nomad children in rural areas of Fars province in the southern part of the Islamic Republic of Iran. These nomads migrate between summer and winter quarters each year by up to 500 km. A total of 134 schoolchildren in the age range 6–18 years were recruited from all 17 Arab nomad schools in the region. Their ethnicity determined by their registration in selected schools for Arab nomads. The total Arab students registered in any of schools were selected by their identification number using a computer program through simple random sampling, without replacements. According to our previous local data and the following statistical formula, the consultant statistician calculated 133 persons as the sample size:

$$n = [Z^2 (1 - \alpha/2) \times P (1 - P)]/d^2$$

with confidence interval = 95%, d = 5.1% and P = 10%.

The entire study group were of the same middle socioeconomic class and known to have a moderate-calorie diet intake. We excluded students who had any recognized haematological disease.

The study was approved by the ethics committee of Shiraz University of Medical Sciences. Written consent was taken from each student within the legal age range and the remaining participants signed the consent with their parents signing as witnesses. None of the selected students refused participation in the study.

Data collection

The study was performed over a 6-month period from March to July 2012. Data collection and blood sampling were performed by 3 of the current authors at the students' schools.

The students were interviewed concerning family history of thalassaemia and G6PD deficiency, signs and symptoms of iron-deficiency anaemia and anaemia, such as pica, agitation, anorexia and pale conjunctiva, and also availability of safe (piped, potable) drinking water. For young children, their parents answered the questions.

A 5 mL blood sample was collected from the participants by antecubital venepuncture and put in an icebox and immediately transported to Dastgheyb Hospital laboratory (affiliated to Shiraz University of Medical Sciences) for analysis.

Routine haematological parameters were measured immediately after blood sampling using an automated cell counter (Sysmex K1000 haematology analyser). These included: red blood cell (RBC) count, haemoglobin (Hb), haematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and red-cell distribution width (RDW). Serum iron and total iron binding capacity (TIBC) were determined by a calorimetric procedure, and serum ferritin was determined by enzyme-linked immunosorbent assay method (Dynex). The degree of G6PD deficiency was measured by fluorescent spot testing. Determination of different kinds of haemoglobin was performed using high performance liquid chromatography (Hb-Gold).

Haemoglobin alpha-2 (HbA2) ≥ 3.5 g/dL was considered diagnostic of β-thalassaemia trait. MCV < 80 fL, MCH < 27 pg and Hb A2 ≥ 3.5% were considered as criteria for diagnosis of beta-thalassaemia. Anaemia was defined as Hb concentration below the World Health Organization cut-off for age and sex, i.e. < 12 g/dL for females and 6–14-year-old males, and < 13 g/dL for 15-year-old males. The degrees of iron deficiency was determined by the following criteria: iron depletion was defined as serum ferritin concentration < 12 ng/mL; and iron deficiency anaemia as anaemia accompanied by serum ferritin < 12 ng/mL.

Data analysis

Pearson correlation test was performed to examine the association of Hb concentration with serum ferritin. Statistical analysis was performed using *SPSS* software, version 18. Student *t*-test used to compare the mean values of male and female participants. Statistical significance was set at $P < 0.05$.

Results

Out of 134 schoolchildren 51 (38.1%) were male and 83 (61.9%) were female. The mean age of participants was 11.7 (SD 3.5) years, and the age range was 6–18 years, including 48 primary (6–11 years), 35 intermediate (12–15 years) and 51 secondary schoolchildren (16–17 years).

Regarding risk factors related to anaemia, 33 (24.6%) children did not have access to safe drinking water; 6 (4.5%) had a family history of thalassaemia and 4 (3.0%) had a family history of favism. The prevalence of symptoms which by themselves are non-specific, but are related to iron deficiency, was relatively high (Table 1).

Table 1 Prevalence of different risk factors related to anaemia in Arab migrating nomad schoolchildren (*n* =134)

Parameter	Yes		No	
	No.	%	No.	%
Availability of safe drinkable water	101	75.4	33	24.6
Family history of thalassaemia	6	4.5	128	95.5
Family history of favism	4	3.0	130	97.0
Pica	24	17.9	110	82.1
Anorexia	12	9.0	122	91.0
Agitation	43	32.1	91	67.9
Pallor	25	18.7	109	81.3

The mean HbA2 level of the children was 2.7% (SD 0.8%), Hb was 13.1 (SD 1.3) g/dL and Hct was 42.8% (SD 3.1%) (Table 2). The mean serum ferritin was 27.3 (SD 23) ng/dL.

The mean Hb levels of males [13.6 (SD 1.2) g/dL] were significantly higher than for female children [12.7 (SD 1.3) g/dL] ($P < 0.001$) and so were the Hct [44.5% (SD 2.6%) versus 41.8% (SD 2.9%) respectively] ($P < 0.001$) and MCHC values [30.6 (SD 1.6) g/dL versus 29.2 (SD 3.2) g/dL respectively] ($P = 0.004$). None of the other parameters (MCV, MCH, RDW, HbA2, HbF, serum iron, serum ferritin and TIBC) showed significant differences between males and females

Among the participants, only 1 child had G6PD deficiency (Table 3). A total of 24 children (17.9%) had serum ferritin < 12 μg/dL (Table 3), and the prevalence of low serum ferritin was higher in females than males (21.7% versus 11.8%), although the difference was not statistically significant ($P = 0.223$). The prevalence of low Hb showed a statistical correlation with low serum ferritin ($P < 0.05$). A total of 13 children (9.7%) had HbA2 levels ≥ 3.5% and the prevalence of β-thalassaemia trait was higher, but not significantly so, in female than male children (10.8% versus 7.8%) ($P = 0.787$) (Table 3).

Discussion

As the results indicate, 1 student had G6PD disorder (0.7%) and 24 (17.9%) showed low serum ferritin (< 12 μg/dL), indicative of iron-deficiency anaemia. The mean serum ferritin in our study was 27.3 (SD 23) ng/dL. Thirteen participants had HbA2 ≥ 3.5 g/dL and therefore 9.7% of our sample were classified as having β-thalassaemia trait. The mean HbA2 level was 2.7% (SD 0.8%) in the current research. The mean levels of Hb, Hct and MCHC showed statistically significant differences between male and female students, while other haematological parameters and iron indices showed no significant differences. The low Hb and Hct values correlated significantly with low serum ferritin ($P < 0.05$). Hence, it seems that serum ferritin index is as accurate as the Hb index in the diagnosis of iron-deficiency anaemia.

The prevalence of iron-deficiency anaemia in our research was 17.9%. This figure is consistent with previous reports in southern Islamic Republic of Iran (*9–12*), but is lower or higher than the prevalence found in other developing countries (*13,14*). The prevalence of iron-deficiency anaemia in developed courtiers has declined in recent decades, but there has been little change in developing countries. The most common reason for iron-deficiency anaemia in children is poor intake of iron in the diet. This finding is particularly prominent in developing countries where the low level of iron intake is accompanied by malaria and intestinal parasitic infestations (*15*). There is a big difference in the prevalence of iron-deficiency

Table 2 Haematological parameters and iron indices in Arab migrating nomad schoolchildren

Parameter	Males (*n* =51)	Females (*n* =83)	Total (*n* =134)	*P*-value
	Mean (SD)	Mean (SD)	Mean (SD)	
Hct (%)	44.5 (2.6)	41.8 (2.9)	42.8 (3.1)	< 0.001
Hb (g/dL)	13.6 (1.2)	12.7 (1.3)	13.1 (1.3)	< 0.001
MCV (fL)	83.6 (6.1)	81.5 (7.6)	82.3 (7.1)	0.097
MCH (pg/cell)	25.7 (2.8)	25.1 (3.1)	25.3 (3.0)	0.261
RDW (%)	13.8 (1.8)	13.7 (1.8)	13.7 (1.8)	0.755
MCHC (g/dL)	30.6 (1.6)	29.2 (3.2)	29.8 (2.8)	0.004
HbA2 (g/dL)	2.6 (0.7)	2.7 (0.9)	2.7 (0.8)	0.499
HbF (g/dL)	0.5	0.5	0.5	–
Serum iron (µg/dL)	89.2 (39.5)	91.4 (35.1)	90.5 (36.7)	0.737
TIBC (µg/dL)	319.8 (28.6)	325.4 (44.6)	323.2 (46.2)	0.424
Serum ferritin (µg/dL)	30.5 (28.6)	25.4 (18.6)	27.3 (23.0)	0.213

Hct = haematocrit; Hb = haemoglobin; MCV = mean corpuscular volume; MCH = mean corpuscular haemoglobin; RDW red-cell distribution width; MCHC = mean corpuscular haemoglobin concentration; HbA2 = haemoglobin alpha-2; HbF = haemoglobin F; TIBC = total iron binding capacity.
SD = standard deviation.

anaemia between developing and industrialized countries. In a study by Jain et al. the prevalence of iron-deficiency anaemia was 59.9% in India (*13*), while in a nutritional investigation in Madrid, Spain, the prevalence of iron-deficiency anaemia and iron deficiency state were 0.94% and 4.94% respectively (*16*). Although the prevalence of iron-deficiency anaemia in this study of Arab migrating nomads of the southern Islamic Republic of Iran is lower than the prevalence found in some other developing countries (*17*), it is still alarmingly high. Therefore, improved nutrition and educational programmes by the public health authorities may help to decrease the risk of iron deficiency and iron-deficiency anaemia.

A family history of favism was reported for 3.0% of children. Favism has been reported as a common disease in some northern (*13*) and southern regions of the Islamic Republic of Iran (*14,15*). Newborn screening in a tertiary-care centre in north Lebanon showed a prevalence of favism of 2.1% (62/3009), significantly higher in males than females (*18*).

In Sana'a, Yemen, of the total 508 male blood donors recruited into a study, 36 were G6PD deficient, giving a likely G6PD deficiency prevalence of 7.1% (*19*). In Thailand, 4 and 7 G6PD variants were observed in samples collected from Burmese and Thai populations, with a prevalence of G6PD of 6.6% (21/317) and 14.2% (26/183) in the different populations respectively (*20*). In Saudi Arabia, the prevalence of G6PD deficiency was reported to be 6.9% (*21*). The current study showed a much lower prevalence than the above-mentioned reports. We only found only

Table 3 Prevalence of glucose-6-phosphate dehydrogenase deficiency, iron deficiency and beta thalassaemia minor in Arab migrating nomad schoolchildren

Parameter	Males (*n* = 51)		Females (*n* = 83)		Total (*n* = 134)	
	No.	%	No.	%	No.	%
G6PD deficiency						
Present	1	2.0	0	0.0	1	0.7
Absent	50	98.0	83	100.0	133	99.3
Serum ferritin level (µg/dL)						
< 12	6	11.8	18	21.7	24	17.9
≥ 12	45	88.2	65	78.3	110	82.1
HbA2 level (g/dL)						
< 3.5	47	92.2	74	89.2	121	90.3
≥ 3.5	4	7.8	9	10.8	13	9.7

G6PD = glucose-6-phosphate dehydrogenase; HbA2 = haemoglobin alpha-2.

1 case of G6PD deficiency in our study, in a male child. The prevalence of G6PD deficiency was 0.74%, which is lower than some data reported from high-prevalence areas in northern and southern regions of the Islamic Republic of Iran (*9,10*). The difference from other studies may be due to variations in age groups studied, or to sociocultural or climate differences between the regions.

The prevalence of β-thalassaemia trait was 9.7% in our study, which is higher than in previous findings in nomads in southern Islamic Republic of Iran (*9,10*). The rate of β-thalassaemia carriage has a wide range worldwide. In Bangladesh, it was reported to be as high as 28% (*17*). In Malaysia, it was estimated that 4.5% of the population were carriers for thalassaemia, and this is similar to our finding (*22*). In Turkey the frequency of β-thalassaemia carriers in the city of Adıyaman was low (1.91%) (*23*).

Although most patients who have β-thalassaemia trait are asymptomatic and are found accidentally by a minor decrease in Hb level and MCV, the detection of such cases is important in the prevention of β-thalassaemia major. In the Islamic Republic of Iran, marriage registrars routinely refer prospective couples to a designated local laboratory for premarital screening. The man's red cell indices are checked first. If he has a microcytic cells (mean corpuscular haemoglobin < 27 pg or mean corpuscular red volume < 80 fL) the woman is tested. When both the man and woman are microcytic, HbA2 concentration would then be measured. If both have a concentration of ≥ 3.5 g/dL (diagnostic of thalassaemia trait), the couple are referred to a local designated health centre for genetic counselling. At-risk couples attend as many counselling sessions as they need to reach an informed decision about marriage (an average of 2.5 sessions, range 1–5). Those who marry after counselling are referred to their local health centres or health houses for follow up until they have completed their family (*24*). Recently, there has been great success in the field of bone-marrow transplantation of thalassaemia major patients in the Islamic Republic of Iran (*25*), but obviously improving the screening programmes is a better way to deal with the issue than this complicated and expensive procedure.

To the authors' knowledge, there are no reports of iron-deficiency anaemia, G6PD and β-thalassaemia trait in migrating nomads from other countries with which to compare out results.

Conclusions

According to our results, we should be aware of the signs and symptoms of anaemia and common haematological disorders associated with anaemia (such as G6PD) in this population. The relatively high prevalence of β-thalassaemia trait seems to be a major potential risk in our area and a careful application of the Iranian thalassaemia programme seems to be needed. As iron-deficiency anaemia is a prevalent disease in migrating Arab nomads, establishment of educational programmes for these tribes is necessary. Early diagnosis and treatment is mandatory in the prevention of mortality and morbidity in this neglected population and we call on the Ministry of Health to pay special attention to this group.

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Oral health status of 12-year-old male schoolchildren in Medina, Saudi Arabia

A. Bhayat[1] and M.S. Ahmad[1]

الحالة الصحية للفم لدى الذكور من أطفال المدارس البالغين من العمر 12 عاماً في المدينة المنورة بالمملكة العربية السعودية

أحمد بهيات، محمد سامي أحمد

الخلاصة: أفادت دراسات من المملكة العربية السعودية بأن انتشار تسوس الأسنان بين الأطفال يرتفع نسبياً بالمقارنة مع بلدان نامية أخرى. لذا، فإن الهدف من هذه الدراسة هو تحديد حالة نظافة الفم ومؤشر التسوس البليغ لدى الذكور البالغين من العمر 12 عاماً في المدينة المنورة. ففي دراسة تحليلية مستعرضة شارك فيها 360 طالباً من 4 مدارس للبنين تم تسجيل تسوس الأسنان، ووجود لويحات، والتهاب اللثة، والتسمم بالفلور، وسوء الإطباق، باستخدام طرق ومؤشرات معيارية. فكان متوسط الدرجات المحرزة لمؤشر الأسنان المنخورة والمقلوعة والمَحشوَّة هو 1.53 (±1.88). وكان انتشار التسوس منخفضاً (57.2٪)، لكن وسطي مؤشر التسوس البليغ كان مرتفعاً نسبياً [3.63 (±1.66)]. وكان انتشار اللويحات والتهاب اللثة مرتفعاً (82.8٪ و70.8٪ على التوالي). وكان أعلى معدل للتسوس في الأرحاء (الأضراس) السفلية. ولم يتضح تسمم الأسنان بالفلور لدى أي من الأطفال، وكان لدى 82.5٪ منهم علاقة بين الفكين من الصنف الأول. وينصح الباحثون بوضع برامج توعية عن نظافة الفم في المدارس – إلى جانب برامج عن استعمال الفرشاة والخيط – بغية الحفاظ على صحة الفم وتحسينها لدى الأطفال الصغار في المملكة العربية السعودية.

ABSTRACT Studies from Saudi Arabia have reported that the prevalence of dental caries among children is relatively high compared with other developing countries The aim was to determine the oral hygiene status and significant caries (SiC) index of 12-year-old males in Medina . In a cross-sectional, analytical study 360 students participated from 4 boys' schools. Dental caries, plaque, gingivitis, fluorosis and malocclusion were recorded using standard methods and indices. The mean DMFT score was 1.53 (SD 1.88). Caries prevalence was low (57.2%) but the mean SiC index was relatively high [3.63 (SD 1.66)]. The prevalences of plaque and gingivitis were high (82.8% and 70.8% respectively). Lower molars had the highest rate of caries. No children presented with dental fluorosis and 82.5% had a class I jaw relationship. Oral hygiene awareness programmes at schools, together with brushing and flossing programmes, are recommended in order to maintain and improve the oral health of young children in Medina

Santé bucco-dentaire chez des garçons âgés de 12 ans à Médine (Arabie saoudite)

RÉSUMÉ Selon des études menées en Arabie saoudite, la prévalence de la carie dentaire chez l'enfant est relativement élevée par rapport à d'autres pays en développement. L'objectif était de déterminer l'état de santé bucco-dentaire et les valeurs d'indice de sévérité de l'atteinte carieuse (SiC, pour *Significant Caries index*) chez des garçons de 12 ans à Médine ; 360 élèves de quatre écoles de garçons ont participé à une étude transversale analytique. Les caries dentaires, le tartre, la gingivite, la fluorose et les malocclusions ont été enregistrés à l'aide de méthodes et indices standards. L'indice de dents cariées, absentes ou obturées (ou DCAO) moyen était de 1,53 (ET 1,88). La prévalence des caries était faible (57,2 %) mais l'indice SiC moyen était relativement élevé [3,63 (ET 1,66)]. La prévalence du tartre et de la gingivite était importante (82,8 % et 70,8 %, respectivement). Les molaires inférieures avaient le taux le plus élevé de caries. Aucun enfant ne souffrait de fluorose tandis que 82,5 % présentaient une malocclusion de classe I. Des programmes de sensibilisation à l'hygiène bucco-dentaire dans les établissements scolaires, associés à des programmes de brossage des dents et d'utilisation de fil dentaire sont recommandés afin de préserver mais aussi d'améliorer la santé bucco-dentaire des jeunes enfants en Arabie saoudite.

[1]*Department of Dental Public Health, Taibah University, College of Dentistry, Medina, Saudi Arabia (Correspondence to A. Bhayat: ahmedbhayat6@gmail.com).*

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Introduction

Good oral health is essential for the well-being and development of young children (*1*). The most common oral health disease affecting young children is dental caries, which is responsible for pain, speech impairment, sleep disturbances and eating and growth disorders (*2*). Studies from Saudi Arabia have reported a high prevalence of dental caries among children compared with other developing countries (*3*). In addition, these and other studies also reported high levels of oral diseases and poor oral hygiene and an urgent need for the introduction of therapeutic and preventive measures (*4,5*). Al-Malik and Rehbini showed high levels of dental caries and recommended the introduction of an effective oral health programme for schoolchildren (*6*).

The significant caries (SiC) index was developed as an adjunct to the decayed, missing and filled teeth (DMFT) index for the measurement of dental caries. Much of the literature has shown that the mean DMFT score does not accurately describe the prevalence of dental caries and often underestimates the burden of disease (*7–9*). Although there is a linear relationship between the mean DMFT and SiC indices, countries with mean DMFT between 1.0 and 8.5 were found to have mean SiC between 2.8 and 13.7 (*9*). This confirmed that, although the DMFT score of communities may meet some of the World Health Organization (WHO) guidelines, such as a DMFT < 3 for 12-year-olds, many of the included participants still have multiple carious lesions and require extensive dental treatment. Therefore, the mean DMFT does not always reflect the true level of dental caries and this could lead to the incorrect assumption that the rate of caries is low and there is no need for the implementation of oral health programmes. Hence the SiC index was developed to identify communities/populations with skewed DMFT scores and to help in the planning and monitoring of dental services and dental caries within communities (*7*).

No studies have reported on the oral health status of male 12-year-old children in Medina, Saudi Arabia, and this study aimed to provide baseline data which could assist in the planning of future oral health programmes. In addition, this was the first study to calculate the SiC index in 12-year-old male schoolchildren in Medina.

Methods

Study design and sampling

This was a cross-sectional study conducted on 12-year-old male schoolchildren. It was done between February 2013 and April 2013.

The sample size was calculated using an estimated population of 10 000 12-year-old children in Medina, of which 5000 were males. These estimates were calculated based on the number of schools present in Medina. The calculation was done with a confidence interval of 95% and a margin of error of 5% with an estimated prevalence of 80%. The total sample required was 357 children. It was assumed that each school would have approximately 100 children aged 12 years and therefore 4 schools were required. A list of schools was obtained from the Ministry of Education and the boys' schools were identified and stratified according to government and private funding. Two schools were then randomly selected from each stratum.

Ethical approval was obtained from the Taibah University Ethics Committee. The principal of each school was contacted and the details of the study were discussed. Once permission had been obtained, consent forms, together with a covering letter detailing the rationale of the study, were given to the children to give to their parents to sign at home. All those with signed consent were included and all information was confidential; no names were recorded on the data capture sheets.

Data collection

The clinical oral examinations were carried out in classrooms and performed under florescent room lighting with the subject sitting on a regular chair. A mirror or wooden spatula together with a round-ended probe was used according to the WHO criteria (*10*). The probe was only used when there was uncertainty regarding the presence of caries, as studies have shown that the use of a sharp probe could create cavitated lesions (*11*). For caries measurements, the DMFT index was used. If anyone had primary teeth present, these were not recorded as they were usually mobile and close to exfoliation. Plaque was recorded using the visible plaque index described by Ainamo and Bay (*12*). There were 2 categories, plaque absent or plaque clearly visible, scored as (0) or (1) respectively. Gingivitis was recorded using the Silness–Löe index (*13*). As no students had severe gingivitis and only 2 had moderate levels of gingivitis, these groups were combined with mild gingivitis. As a result, 2 groups were created, those with gingivitis present and those without gingivitis. Fluorosis was recorded using the Dean index (*14*) and malocclusions were classified according to Angle's classification (*15*). The SiC index was calculated in order to determine the mean DMFT score for the highest third of the sample (*7*).

There were 6 calibrated examiners and the inter- and intra-examiner reliability was measured by re-examining every 10th patient. The intra-examiner reliability was ≥ 0.95 while the inter-examiner reliability ranged between 0.85 and 0.96. All pupils received a referral form indicating the type of treatment that they required based on the results of the clinical examination. This included oral hygiene instructions, regular follow-up visits with the dentist, restorations, extractions and polishing.

Data analysis

The data were analysed using *SPSS*, version 15 software package. The descriptive analysis included means, medians and standard deviation (SD) together with frequencies and proportions.

Results

A total of 420 pupils received consent forms and of these 360 (85.7%) completed them and were included in the study. All participants were males, the mean age was 12.1 (SD 0.97) years and just over half (190, 52.7%) were from private schools. The mean DMFT score was 1.53 (SD 1.88) and the median was 1.00. The prevalence of caries was 57.2% and the combined mean SiC score was 3.63 (SD 1.66). There was a statistically significant difference between the mean SiC scores of the the government- and private-school children ($P < 0.001$) (Table 1). There was also a significant difference between the government- and private-school children in the number of decayed and filled teeth and total DMFT scores, but not in the number of missing teeth. Children in government schools had more caries and higher total DMFT scores, but fewer filled teeth compared with children in private schools.

Both government- and private-school children showed similar patterns of caries on molars (Figure 1). The caries rate was higher on the lower molars (36 and 46) than on the upper molars and there were significantly more children with caries on molar 26 in the government compared with private schools ($P = 0.04$).

Most of the pupils presented with plaque (82.8%) and gingivitis (70.8%). A significant majority of respondents had a class I jaw relationship (82.5%) ($P = 0.04$). None of the students were diagnosed with fluorosis (Table 2).

There was a strong association between the presence of plaque and gingivitis ($P < 0.001$) (Table 3).

Discussion

The prevalence of caries in this study (57.2%) was within the range reported by Al Agili in a review of caries prevalence in Saudi Arabia (56–84%) (*3*). A disturbing result is that almost 60% of children examined had at least one decayed tooth in their mouth. This has serious implications for the future in terms of treatment and rehabilitation. Preventive programmes should be implemented early in the school years in order to reduce this level.

The mean DMFT score in this study (1.53) was much lower than the range reported in the systematic review by Al Agili (1.67–2.89) (*3*). Possible reasons for this low score could be that the studies in his review were done more than 5 years ago. Since then much has changed as a result of social and political developments and economic growth in Saudi Arabia. This has possibly resulted in more people being able to access health services, an increase in the utilization of fluoridated toothpaste and an improvement of the public's oral health knowledge. These factors could have led to an improvement in oral hygiene and dietary intake which could have reduced the burden of oral diseases. Another possible reason is that previous research included males and females, whereas the current study was limited to males only. Studies have shown that females tend to have more dental caries than males (*16*) and the exclusion of females from the current study could have resulted in the lower DMFT score. The DMFT score of 1.53 was similar to other Middle Eastern countries such as Libya [1.68 (SD 1.86)] (*16*) and different parts of Islamic Republic of Iran [0.7 (SD 1) to 1.5 (SD 1.8)] (*17*).

Although this population had a mean DMFT < 3, the SiC index was 3.63. This shows that although the mean DMFT seemed to be low, there were still some individuals with very high DMFT scores. If the SiC index were not calculated, and only the DMFT index was used, it could have given a false impression of the caries status of this population and underestimated the actual need for dental treatment in this cohort of pupils. Other countries that have achieved the WHO goal of a DMFT < 3 have also reported high

Table 1 Mean decayed, missing and filled teeth (DMFT) index and significant caries (SiC) index of 12-year-old boys by type of school attended

Variable	Total ($n = 360$)	Private school ($n = 190$)			Government school ($n = 170$)			*P*-value
DMFT index	Mean (SD)	Mean (SD)	Median	Range	Mean (SD)	Median	Range	
Decayed	1.30 (1.82)	0.98 (1.47)	0	7	1.65 (2.10)	1	12	< 0.001[a]
Missing	0.02 (0.17)	0.02 (0.16)	0	2	0.02 (0.19)	0	2	0.567[a]
Filled	0.21 (0.64)	0.28 (0.73)	0	4	0.14 (0.51)	0	4	0.016[a]
Total	1.53 (1.88)	1.28 (1.55)	1	12	1.81 (2.15)	1	12	0.045[a]
SiC index	3.63 (1.66)	3.09 (1.21)	3	5	4.24 (1.89)	4	10	0.001[b]

[a]Mann-Whitney test; [b]Student t-test.
SD = standard deviation.

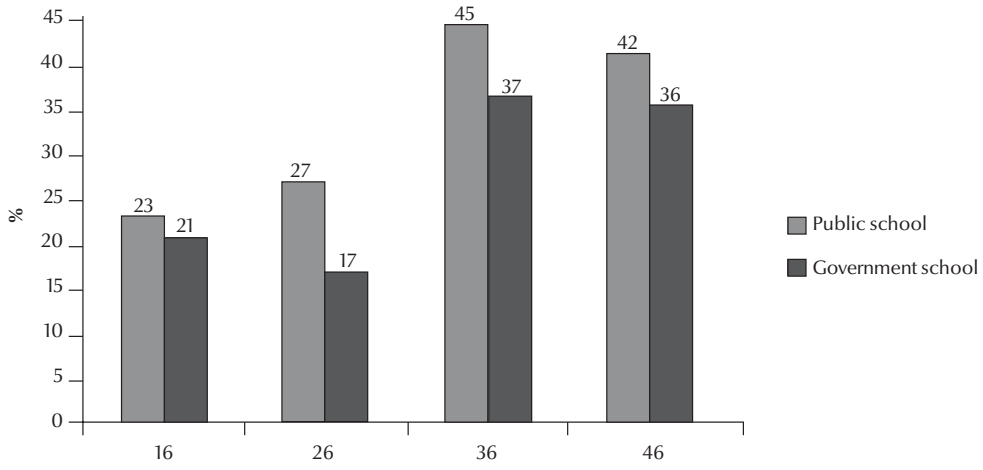

Figure 1 Prevalence of caries on first permanent molars of 12-year-old boys according to type of school attended (*n* = 360)

SiC score and this illustrates one of the weaknesses of the DMFT index as confirmed by Nishi et al. (*9*). A possible reason for the SiC index not being used previously in other Saudi Arabian studies could be that the DMFT score was > 3. Hence there was no need to calculate the SiC index and therefore comparisons of SiC scores between the current study and other Saudi studies are not possible.

The students who attended private schools had significantly lower levels of caries than those attending government schools. This could be attributed to the better home environment, levels of knowledge, access to dental services and oral hygiene practices in these schoolchildren, as reported by other authors (*18,19*). The decayed component was significantly higher in government-school children while the filled component was significantly higher in the private cohort. This implied that those attending the private schools had more access to dental services and received more restorations compared with government-school children. Studies done in Saudi Arabia and abroad have shown a direct relationship between utilization of dental services and the socioeconomic status and educational level of the parents (*20,21*). As a result, private-school children visited the dentist more often and received treatment for their carious teeth in the form of fillings. This reduced their decayed component and increased their filled component of the DMFT index. The SiC index was also significantly

Table 2 Prevalence of oral conditions in 12-year-old boys by type of school attended

Variable	Total (*n* = 360)		Private school (*n* = 190)		Government school (*n* = 170)		χ^2	*P*-value
	No.	%	No.	%	No.	%		
Plaque								
Absent	62	17.2	26	13.7	36	21.2	3.53	0.06
Present	298	82.8	164	86.3	134	78.8		
Gingivitis								
Absent	105	29.2	59	31.1	46	27.1	0.69	0.41
Present	255	70.8	131	68.9	124	72.9		
Malocclusion								
Class I	297	82.5	153	80.5	144	84.7	0.72	0.04
Class II	33	9.2	22	11.6	11	6.5		
Class III	30	8.3	15	7.9	15	8.8		
Fluorosis								
Absent	360	100.0	190	100.0	170	27.6		
Present	0	0.0	0	0.0	0	0.0	0.89	0.34

Table 3 Association between the presence of plaque and gingivitis in 12-year-old boys (*n* = 360)

Plaque	Gingivitis			
	Absent		Present	
	No.	%	No.	%
Absent	53	14.7	9	2.5
Present	52	14.4	246	68.3

$\chi^2 = 114.98$; $P < 0.001$.

higher among the government-school children; this indicates that the caries among these children was more severe compared with private-school children.

The prevalences of plaque (82.8%) and gingivitis (70.8%) were similar to another Saudi study and this could be due to poor oral hygiene practices and irregular brushing patterns by students (*22*). The strong association between those with plaque and gingivitis could be explained by the fact that those with higher plaque levels would have more inflammation and hence a higher likelihood of gingivitis.

The lower molars were more commonly affected by caries than the upper molars and this was consistent with another study (*23*). Possible reasons include their early eruption, the presence of deep pits and fissures, their larger occlusal surface and gravity (*24*).

The vast majority of respondents had a class I jaw relationship (82.5%) and this was similar to other studies, which reported a prevalence of between 77% and 90% (*25,26*). It must be noted, however, that these and most other studies that determined the prevalence of malocclusion were done on children attending orthodontic clinics. Hence direct comparisons cannot be made.

No child was diagnosed with fluorosis and this could be due to the fact that most of the population of Medina consumes bottled water.

There were some limitations to the study. A total of 360 pupils agreed to participate out of 420. Many of the pupils were absent on the days of the screening and hence could not be included in the study. At one of the schools, the scheduled screening date was set for the last week before the mid-term vacation; hence many pupils were absent. This could be one explanation for not having a higher response rate. Schools in Saudi Arabia are segregated according to sex. Males are not allowed to enter the female schools and vice versa. Since the examiners were males, the sample consisted of males and these results are therefore not representative of all 12-year-olds in Medina. Since the DMFT index only measures frank caries, early lesions or white spots were not classified as carious and this could have underestimated the burden of dental caries in this population.

Conclusions

Although the caries prevalence was low compared with other Saudi Arabian studies, the SiC index was relatively high. Many students had poor oral hygiene, which was confirmed by the high prevalence of plaque and gingivitis. The lower molars were more commonly affected by caries compared with the upper molars. Children in government schools had significantly more caries than their counterparts in private schools. No children were diagnosed with fluorosis.

We recommend conducting a similar study for female schoolchildren in Medina to identify the burden of disease among them. The results also indicate that there is a need for oral hygiene awareness programmes at schools, together with brushing and flossing programmes, in order to maintain and improve oral health of young children in Saudi Arabia. Teachers should be informed about the importance of oral hygiene so that they can monitor and maintain oral hygiene programmes.

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Short communication

Pattern of beverage intake and milk and dairy products sufficiency among high-school students in Kuwait

M.F. Nassar,[1] A.M. AbdelKader,[2] F.A. Al-Refaee[3] and S.S. Al-Dhafiri[4]

طراز تناول المشروبات وتناول ما يكفي من الحليب ومنتجات الألبان لدى طلاب المدارس الثانوية في الكويت

مي فؤاد نصار، علاء محمد عبد القادر، فواز عبد الله الرفاعي، سارة صباح الظفيري

الخلاصة: إن استهلاك كميات كبيرة من المشروبات الغازية قد تَرافَقَ بانخفاض في تناول الحليب والأطعمة الغنية بالكالسيوم وارتفاع في مؤشر كتلة الجسم (BMI). وقد هدفت هذه الدراسة إلى استكشاف طراز تناول المشروبات لدى طلاب المدارس الثانوية الكويتية. فتم ملء استبيان حول المعارف والمواقف والممارسات المتعلقة بتناول المشروبات والحليب ومنتجات الألبان من قِبَل 190 طالباً كويتياً بأعمار 16-18 سنة، وتم حساب مؤشر كتلة الجسم لـ 181 منهم. وقد تبيّن أن تناول المشروبات الغازية المحلاة – وبدرجة أقل عصائر الفواكه المعلبة - قد أثّر على تناول ما يكفي من الحليب ومنتجات الألبان لدى عينة طلاب المدارس الثانوية في الكويت. وعلى الرغم من أن مؤشر كتلة الجسم لم يكن مرتبطاً بعدم كفاية الحليب والألبان، فإن كثيراً من الطلاب الذين يعانون من فرط الوزن والسمنة أظهروا ممارسات غير صحيحة. ويوصي الباحثون بالتثقيف التغذوي لطلاب المدارس الثانوية حول أهمية الحليب ومنتجات الألبان، وكذلك مخاطر الإفراط في تناول المشروبات الغازية المحلاة والعصائر المعلبة للوقاية من وباء السمنة المنتشر في الكويت.

ABSTRACT High consumption of soft drinks has been associated with lower intakes of milk and calcium-rich foods and higher body mass index (BMI). This study aimed to explore the pattern of beverage intake among Kuwaiti high-school students. A questionnaire on knowledge, attitudes and practices concerning beverages and milk and dairy products intake was completed by 190 Kuwaiti students aged 16–18 years and BMI was calculated for 181 of them. Intake of sweetened carbonated beverages and to a lesser extent packaged fruit juices affected the sufficiency of milk and dairy products intake among the sample of high-school students in Kuwait. Although BMI was not related to milk and dairy insufficiency, more of the overweight and obese students displayed incorrect practices. Nutritional education of high-school students on the importance of milk and dairy products as well as the hazards of excess sweetened carbonated beverages and packaged juice is recommended to prevent the obesity epidemic prevailing in Kuwait.

Caractéristiques de la prise de boissons sucrées et suffisance des apports en lait et produits laitiers chez des élèves d'établissements du secondaire au Koweït

RÉSUMÉ Une consommation élevée de boissons sucrées a été associée à une réduction des apports en lait et aliments riches en calcium ainsi qu'à une élévation de l'indice de masse corporelle. L'étude visait à explorer les caractéristiques de la prise de boissons sucrées chez des élèves du secondaire au Koweït. Un questionnaire sur les connaissances, les attitudes et les pratiques concernant la prise de boissons sucrées, de lait et de produits laitiers a été rempli par 190 élèves du Koweït âgés de 16 à 18 ans, et l'indice de masse corporelle a été calculé pour 181 d'entre eux. La prise de boissons gazeuses sucrées et dans une moindre mesure de jus de fruit préemballés affectait la suffisance des apports en lait et en produits laitiers au sein de l'échantillon d'élèves du secondaire au Koweït. Si l'indice de masse corporelle n'était pas lié à des apports en lait et produits laitiers insuffisants, les élèves en surpoids et obèses étaient plus nombreux à avoir de mauvaises pratiques. Une éducation nutritionnelle des élèves du secondaire sur l'importance du lait et des produits laitiers ainsi que sur les dangers de l'abus de boissons gazeuses sucrées et de jus de fruit préemballés est recommandée afin de prévenir l'épidémie d'obésité prévalente au Koweït.

[1]Department of Paediatrics, Faculty of Medicine, Ain Shams University, Cairo, Egypt (Correspondence to M.F. Nassar: maie_nassar@yahoo.co.uk). [2]Department of Paediatrics, Faculty of Medicine, University of Mansoura, Mansoura, Egypt. [3]Department of Paediatrics; [4]Department of Food and Nutrition, Al-Adan Hospital, Ministry of Health, Kuwait.

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Introduction

The dietary habits of schoolchildren and adolescents in Arab countries are nowadays characterized by a low intake of fresh fruits, vegetables and milk with a high intake of carbonated beverages and so-called "fast foods" (*1*). In Saudi Arabia, carbonated beverages and canned fruit drinks were shown to comprise 26% and 25% respectively of adolescents' daily fluid consumption (*2*). Harrington's review noted that soft drinks' consumption in the United States (US) had increased by 300% in the last 20 years (*3*). As children and teenagers get older, boys and girls drink less milk and more soft drinks and fruit juice (*4*). Vartanian et al. reported that intake of soft drinks was also associated with lower intakes of milk, calcium and other nutrients, with an ensuing increased risk of several medical problems such as diabetes (*5*). Additionally, Wyshak demonstrated an association between carbonated beverage consumption and bone fractures (*6*). More recently, Martin-Cavlo et al. (*7*) and Nasreddine et al. (*8*) found a strong and significant association between consumption of sugar-sweetened carbonated beverages and a risk of obesity in children and adolescents.

Although data concerning obesity and beverages intake in the Arab region are abundant, research concerning beverage consumption and its effect on the intake of milk and dairy foods is scarce. This study was therefore designed to explore the pattern of beverage intake among high-school students in Al-Ahmadi Governorate, Kuwait, and its effect on the consumption of milk and other dairy products. A secondary objective was to study any relationship between this pattern of beverage intake and the body mass index (BMI) of students.

Methods

Study design and sample

The study was performed on 98 girls and 92 boys aged 16–18 years, enrolled from government high schools in Al-Ahmadi Governorate, Kuwait, between 1 March and 31 May 2013. Out of 240 high-school students who attended a scientific lecture on healthy eating behaviour in their schools, 190 (79.2%) were entered in the study.

Data collection

A dietary questionnaire on nutritional knowledge, food choices and eating behaviour was constructed in simple Arabic language, based on the work of Parmenter and Wardle (*9*) and Turconi et al. (*10*). Initially, a pilot study was done by introducing the questionnaire to 10 students chosen at random to assess their comprehension of such data. The questionnaire was modified accordingly and administered to the remaining students.

All questions were multiple choice or Yes/No responses. The questionnaire collected data on the students' sociodemographic characteristics and assessed their knowledge about the benefits and the recommended intake of milk and dairy products (2 items); their attitudes to milk and dairy products, i.e. whether they enjoyed consuming them (1 item); and their practices towards milk and other beverages, i.e. sources of milk (home, school), what kinds of milk drunk (cow, soy, camel, goat, milk food supplements), preference for full-or low-fat milk, preference for drinking milk or sugar-sweetened beverages, reasons for choosing milk (5 items). A student's attitude was rated as positive if he or she preferred milk and other dairy products, enjoyed drinking them, believed in their benefits and had no concerns about consuming them. Practice was judged to be correct if milk and other dairy products were available and consumed in preference to other beverages.

A food frequency sheet was included for students to estimate their most recent intake of milk and other dairy products and compare it with the recommended daily allowance (3 cups/day) (*11*). Regarding fluid milk, intake of 2 cups/day was considered sufficient (*12,13*). The daily frequency of packaged fruit juice and carbonated beverages use was documented, and consumption was categorized as: heavy > 12 ounces (~ 355 mL)/day, moderate 8–12 ounces (~ 236–355 mL)/day or mild < 8 ounces (~ 236 mL)/day (*14,15*).

Anthropometric measurements were obtained by the main researcher according to the methods of Lee and Nieman (*16*), and BMI was calculated using the standard formula (*17*).

Data analysis

The collected data were statistically analysed using *SPSS*, version 20. Descriptive statistics were done for categorical data by numbers and percentages and for continuous data using mean and standard deviation (SD) and median and interquartile range (IQR). The prevalence of intake for a certain items was calculated as the number of cases per 100 students. The chi-squared and Fisher exact tests were used to compare the frequency of qualitative variables among the different groups.

Results

Beverages intake and milk and dairy products knowledge, attitudes and practice

A total of 190 students provided data on beverages intake and nutritional practices: 92 (48.4%) males and 98 (51.6%) females. The mean age of the students was 17.3 (SD 0.7) years; median age was 17 (IQR 17–18) years.

Sufficient milk and dairy products intake was reported by 30.0% and 45.3% of the studied students respectively. Out of all the studied students 36.8% preferred low-fat milk and other dairy products over full-fat types. Regarding the beverages consumed, 91.6% drank regular sugar-sweetened beverages and the rest preferred noncalorie-sweetened ("diet") beverages.

Table 1 shows a significant insufficiency in daily milk intake among drinkers of sweetened carbonated beverages ($P = 0.019$); this was more common in males than females but not significantly so ($P = 0.063$). Higher rates of milk insufficiency were seen with higher intakes of packaged fruit juices, but this also did not reach

Table 1 Daily frequency of beverages intake and daily sufficiency of of milk and dairy products intake among students

Beverages intake[a] by sex	Milk intake[b]				χ^2	*P*-value	Dairy products intake[c]				χ^2	*P*-value
	Sufficient		Insufficient				Sufficient		Insufficient			
	No.	%	No.	%			No.	%	No.	%		
Carbonated beverages												
Males												
Mild	14	43.8	18	56.2	5.520	0.063	17	53.1	15	46.9	4.289	0.117
Average	6	17.6	28	82.4			16	47.1	18	52.9		
Heavy	7	26.9	19	73.1			7	26.9	19	73.1		
Females												
Mild	17	39.5	26	60.5	2.872	0.238	24	55.8	19	44.2	3.029	0.220
Average	5	23.8	16	76.2			7	33.3	14	66.7		
Heavy	8	23.5	26	76.5			15	44.1	19	55.9		
All students												
Mild	31	41.3	44	58.7	7.921	0.019	41	54.7	34	45.3	4.730	0.094
Average	11	20.0	44	80.0			23	41.8	32	58.2		
Heavy	15	25.0	45	75.0			22	36.7	38	63.3		
Packaged fruit juice												
Males												
Mild	11	35.5	20	64.5	1.299	0.522	19	61.3	12	38.7	7.182	0.028
Average	8	30.8	18	69.2			11	42.3	15	57.7		
Heavy	8	22.9	27	77.1			10	28.6	25	71.4		
Females												
Mild	13	41.9	18	58.1	3.853	0.146	12	38.7	19	61.3	1.409	0.494
Average	8	33.3	16	6.7			13	54.2	11	45.8		
Heavy	9	20.9	34	79.1			21	48.8	22	51.2		
All students												
Mild	24	38.7	38	61.3	4.835	0.089	31	50.0	31	50.0	1.672	0.433
Average	16	32.0	34	68.0			24	48.0	26	52.0		
Heavy	17	21.8	61	78.2			31	39.7	47	60.3		
Tea and coffee												
Males												
Mild	11	35.5	20	64.5	0.951	0.622	14	45.2	17	54.8	1.999	0.368
Average	10	27.8	26	72.2			18	50.0	18	50.0		
Heavy	6	24.0	19	76.0			8	32.0	17	68.0		
Females												
Mild	16	35.6	29	64.4	5.345	0.069	22	48.9	23	51.1	1.234	0.540
Average	13	35.1	24	64.9			15	40.5	22	59.5		
Heavy	1	6.2	15	93.8			9	56.2	7	43.8		
All students												
Mild	27	35.5	49	64.5	4.447	0.108	36	47.4	40	52.6	0.375	0.829
Average	23	31.5	50	68.5			33	45.2	40	54.8		
Heavy	7	17.1	43	82.9			17	41.5	24	58.5		

[a]Beverages intake: mild < 8 ounces (~236 mL)/day; moderate 8–12 ounces (~236–355 mL)/day; heavy > 12 ounces (~355 mL)/day (14,15).
[b]Milk intake: sufficient ≥ 2 cups/day; insufficient < 2 cups/day (12,13).
[c]Dairy intake: sufficient ≥ 3 cups/day; insufficient < 3 cups/day (11).

statistical significance (P = 0.089). A similar trend for milk insufficiency was noticed among the heavy tea and coffee drinkers but, again, without statistical significance (P = 0.108). Table 1 also shows that although higher intake of different kinds of beverages was more common in students with dairy intake insufficiency, there was no statistically significant relationship with drinking carbonated beverages, packaged fruit juices or tea and coffee. However, we found a significantly higher intake of packaged fruit juice in male students with dairy insufficiency (P = 0.028), an effect which was not evident among female students (P = 0.494).

Assessment of knowledge regarding milk and dairy products needs and functions showed that 59.5% of students had correct knowledge of the needs while 81.6% had correct knowledge regarding the function. No statistical significant differences were detected when comparing the knowledge of needs or function with respect to sufficiency of other dairy products and milk intake, BMI and sex [data not shown].

Table 2 underscores that significantly more students with sufficient milk intake than those with insufficient intake reported correct practices (59.6% versus 40.6%) (P = 0.024). Similarly 54.7% of students with sufficient dairy products intake had correct practice versus 39.4% of those with insufficient dairy intake and this was close to statistical significance (P = 0.051).

Regarding attitudes 69.0% of the studied students had a positive attitude towards milk and dairy products intake. More students with sufficient milk and dairy intake had a positive attitude than those with insufficient intake, and for milk the relationship nearly reached statistical significance (P = 0.059 for milk and P = 0.379 for dairy products).

BMI and beverages and milk and dairy products intake

Of the surveyed students, 181 had their weight and height assessed; 9 (4.7%) students (1 male and 8 females) refused weight measurement. Among these 87 students (48.1%) had normal weight, 50 (27.6%) were overweight, 21 (11.6%) were underweight, and 23 (12.7%) were obese. Although more male students were overweight and obese compared with female students, there was no significant difference in BMI between the sexes (P = 0.078) [data not shown].

There were no significant differences in BMI among students with respect to dairy intake (P = 0.264), milk intake (P = 0.180), drinking carbonated beverage (P = 0.231), packaged fruit juice usage (P = 0.591) or tea and coffee intake (P = 0.418) [data not shown].

Table 2 shows that although more obese (66.0%) and overweight (53.2%) students reported incorrect practice compared with normal (47.1%) and underweight (46.7%) students this result did not reach statistical significance (P = 0.183).

Discussion

The present study revealed a statistically significant insufficiency in daily milk intake among students who drank sweetened carbonated beverages, an effect which was more evident in males than females. Although carbonated beverages intake did not significantly affect dairy products intake, package fruit juice intake in males was significantly associated with dairy insufficiency. Blum et al. reported significant decreases in milk consumption in children who consumed soft drinks (*18*). Marshall et al. also found that milk intakes were inversely associated with intakes of juice drinks, carbonated drinks and added-sugar beverages (*19*). Recently, Libuda et al. reported that the consumption of all soft drinks has a bone catabolic effect and was negatively associated with total protein and milk consumption (*20*).

The current study showed that 27.6% of the included students were overweight while 12.7% were obese, figures which are close to the reported prevalence of obesity in the USA (16.9% in children and adolescents in 2009–10) (*21*). In Kuwait, Al-Refaee et al. also published close figures in a younger coherent (21.3% were at risk of overweight and 14.4% were overweight) (*22*).

There was no significant difference in BMI among the studied students with respect to milk or dairy intake. In the United Arab Emirates, Kerdaki et al. reported a low prevalence of daily consumption of milk yet could not correlate this with overweight among female schoolchildren (*23*). On the other hand in Portugal, Abreu et al. found an inverse association between milk intake and both BMI and percentage body fat in adolescent girls (*24*), but, elsewhere, there is only moderate quality evidence that dairy products supplementation stimulates linear growth (*25*). Our findings are consistent with Lin et al. in Hong Kong who reported a lack of association between milk or other dairy products consumption and BMI and suggested that the negative association observed in Western populations may be due to confounding by socioeconomic status (*26*).

The current study found no significant difference in BMI and the amount of carbonated beverages, packaged fruit juices or tea and coffee consumed. Similarly, Rajeshwar et al. reported no significant association between soft drinks consumption and BMI (*27*). The consumption of sugar-sweetened beverages has been linked to rising rates of obesity in the USA as these drinks are less satiating than solid foods (*28*). A study from Saudi Arabia reported an association between sugar-sweetened carbonated beverages intake and BMI in 10–19-year-old boys and that their beverage intake correlated with poor dietary choices (*29*).

Poor knowledge did not seem to affect milk and dairy intake among the studied high-school students, but more

Table 2 Daily sufficiency of milk and dairy products intake and body mass index (BMI) category, in relation to practice among students

Milk/dairy sufficiency[a,b] and BMI category[c] by sex	Practice[d]				χ^2	*P*-value
	Correct		Incorrect			
	No.	%	No.	%		
Milk intake						
Males						
Sufficient	16	59.3	11	40.7	3.017	0.082
Insufficient	24	36.9	41	63.1		
Females						
Sufficient	18	60.0	12	40.0	1.514	0.219
Insufficient	30	44.1	38	55.9		
All students						
Sufficient	34	59.6	23	40.4	5.081	0.024
Insufficient	54	40.6	79	59.4		
Dairy products intake						
Males						
Sufficient	23	57.5	17	42.5	4.697	0.030
Insufficient	17	32.7	35	67.3		
Females						
Sufficient	24	52.2	22	47.8	0.154	0.695
Insufficient	24	46.2	28	53.8		
All students						
Sufficient	47	54.7	39	45.3	3.799	0.051
Insufficient	41	39.4	63	60.6		
BMI category						
Males						
Underweight	3	50.0	3	50.0	1.424	0.700
Normal	19	45.2	23	54.2		
Overweight	10	35.7	18	64.3		
Obese	8	53.3	7	46.7		
Females						
Underweight	8	53.3	7	46.7	5.276	0.153
Normal	27	60.0	18	40.0		
Overweight	7	31.8	15	68.2		
Obese	3	37.5	5	62.5		
All students						
Underweight	11	52.4	10	47.6	4.848	0.183
Normal	46	52.9	41	47.1		
Overweight	17	34.0	33	66.0		
Obese	11	47.8	12	52.2		

[a] *Milk intake: sufficient ≥ 2 cups/day; insufficient < 2 cups/day (12,13).*
[b] *Dairy intake: sufficient ≥ 3 cups/day; insufficient < 3 cups/day (11).*
[c] *BMI categories: underweight < 18.5 kg/m²; normal 18.5–24.9 kg/m²; overweight 25–29.9 kg/m²; obese > 30 kg/m².*
[d] *Practice: correct when milk was chosen over other, sweetened beverages.*

students with sufficient milk intake reported correct practices. It was also evident that more males who had insufficient milk and dairy intake reported incorrect practices, with more obese and overweight students displaying improper practice too. Luckily, the attitude of the majority of students (69.0%) towards milk and dairy products was positive. Du et al. indicated that milk had a beneficial effect on bone mass and suggested that promotion of milk consumption should be considered for achieving optimal bone mineral content (*30*).

In conclusion, the intake of sweetened carbonated beverages and to a lesser extent packaged fruit juices are affecting the sufficiency of milk and dairy intake among our high-school student sample in Al-Ahmadi, Kuwait. While our results cannot be generalised to the overall high-school student population in Kuwait, they may suggest a wider problem as our students are not untypical of Kuwait high-school students. Although BMI was not related to insufficient milk and dairy intakes, more overweight and obese students displayed incorrect practices. This emphasizes the importance of improving nutrition practices to achieve the goal of prevention of the obesity epidemic in Kuwait. We thus recommend nutritional education of high-school students, laying stress on the milk and dairy products needed as well as the dangers of excess sweetened carbonated beverages and packaged juice intake. This recommendation is coupled with a plea for government and nongovernmental decision-makers to highlight the magnitude of improper beverage consumption and warn against its hazards.

Competing interests: None declared.

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Regional Committee decisions

The World Health Organization (WHO) Regional Committee for the Eastern Mediterranean is WHO's decision-making body in the Eastern Mediterranean Region. It meets annually with representation from all Member States of the Region. A main function of the Committee is to formulate policies and strategies that provide Member States with guidance on action that needs to be taken to promote and protect health in the Region. This section, Regional Committee Decisions, serves to highlight selected resolutions and decisions of the Committee to inform and update readers of the key actions related to the regional health priorities to be undertaken by countries and WHO.

Resolutions of the Sixty-first Session of the Regional Committee, October 2014

EM/RC61/R.1 Annual report of the Regional Director for 2013

The Regional Committee,

Having reviewed the Annual report of the Regional Director on the work of WHO in the Eastern Mediterranean Region for 2013, the progress reports requested by the Regional Committee, and the proposed programme budget 2016–2017[1];

Recalling resolutions EM/RC59/R.6 on WHO managerial reform; EM/RC60/R.1 on the annual report of the Regional Director 2012; EM/RC59/R.3 on health systems strengthening, EM/RC60/R.2 on universal health coverage, EM/RC60/R.6 on saving the lives of mothers and children, EM/RC60/R.7 on the regional strategy for the improvement of civil registration and vital statistics systems 2014–2019 and EM/RC60/R.8 on monitoring health situation, trends and health system performance; World Health Assembly resolution WHA64.10 on strengthening national health emergency and disaster management capacities and the resilience of health systems, resolutions EM/RC52/R.2 and EM/RC57.R2 on emergency preparedness and response and regional emergency solidarity fund and EM/RC59/R. 1 on the annual report of the Regional Director 2011;

Noting with concern the disproportionate allocation of funding between the four operational budget segments;

Acknowledging the efforts of the Regional Director to shift resources from regional to country level;

Reaffirming its commitment to pursuing universal health coverage based on the values and principles of primary health care and the right to affordable and quality health services, adopting a multisectoral approach;

Noting the progress made in assessing the status of civil registration and vital statistics systems, and in developing core indicators during the past two years;

Concerned also at the magnitude of the crises and emergencies prevailing in the Region and the lack of adequate emergency preparedness and capacity to respond;

1. **THANKS** the Regional Director for his report on the work of WHO in the Region and commends its practical focus;
2. **ACKNOWLEDGES** the progress made in the five key priority areas endorsed by the Regional Committee in its Fifty-ninth session;
3. **COMMENDS** the progress made by the Member States with a high burden of maternal and child mortality in implementing their maternal and child health acceleration plans;
4. **ENDORSES** the regional framework for health information systems and core indicators (annexed to this resolution);
5. **ADOPTS** the annual report of the Regional Director for 2013;
6. **CALLS ON** Member States to:
   - 6.1 Engage fully in the ongoing debate concerning the WHO reform process, given its impact on country programmes;
   - 6.2 Advocate with the Executive Board at its 136th session and the Sixty-eighth World Health Assembly to increase substantially the proportion of the budget allocated for the segment on technical support to countries;

1 EM/RC2/61, EM/RC3/61, EM/RC3/61 Annex 1, EM/RC4/61, EM/RC61/INF.DOCs 6–1, EM/RC6/61, EM/RC7/61 and EM/RC61/Tech. Disc.2.

7. **CALLS FURTHER** on Member States to:

7.1 Implement the regional framework for health information systems and report regularly on the core indicators starting from 2015;

7.2 Consider implementing the regional framework for action on advancing universal health coverage in the Eastern Mediterranean Region, and develop and implement a national road map for universal health coverage based on the regional framework for action;

8. **URGES** Member States to:

8.1 Take necessary action to implement previous resolutions on emergency preparedness and response;

8.2 Strengthen the capacity of health systems to prevent, mitigate, prepare for, respond to and recover from emergencies and crises following a whole-health and multisectoral approach, with special emphasis on reinforcing technical capacity in preparedness;

8.3 Promote and, when possible, establish and test intercountry agreements for mutual assistance in case of a major emergency exceeding the coping capacity of the affected country;

8.4 Contribute to the Emergency Solidarity Fund by allocating to it a minimum of 1% of the WHO country budget in addition to other voluntary contributions whenever possible;

8.5 Contribute to the establishment of a regional logistics hub to stockpile vital medicines, medical supplies and other critical equipment needed for deployment to affected countries and communities at the onset of emergency;

8.6 Develop a national cadre of emergency management experts and contribute, mainly through the secondment of such experts, to the regional surge roster of experts for rapid deployment in emergencies.

9. **REQUESTS** the Regional Director to:

WHO reform

9.1 Continue his efforts to improve the effectiveness and efficiency of WHO programme management tools and compliance instruments across the Region in order to further promote transparency and provide more effective technical support to Member States;

9.2 Advocate for the implementation of a full staff rotation and mobility scheme across the Organization, and not only within the Region;

9.3 Report to the next session of the Regional Committee on the progress made in implementing Regional Committee resolution EM/RC59/R.6 which requested Member States to consider the possibility of increasing the level of assessed contributions to the Organization through collective action in the governing bodies.

Emergency preparedness and response

9.4 Build on the positive experience of establishing a sub-regional emergency support team in Amman to develop sub-regional offices, along the models and practices in other WHO regions;

9.5 Establish an advisory group on emergency preparedness and response and ensure WHO organizational readiness for emergencies and crises by closely following up with Member States on the implementation of related resolutions and specifically, the establishing of a Regional Emergency Solidarity Fund, a regional logistics hub to ensure the pre-positioning of critical medical supplies, and a regional surge roster of experts for rapid deployment in emergencies.

EM/RC61/R.2 Global health security – challenges and opportunities with special emphasis on the International Health Regulations (2005)

The Regional Committee,

Having reviewed the technical paper on global health security – challenges and opportunities with special emphasis on the International Health Regulations (2005);[1]

Recalling World Health Assembly resolutions WHA55.16 on the global public health response to natural occurrence, accidental release or deliberate use of biological and chemical agents or radionuclear material that affect health, WHA59.15 on the Strategic Approach to International Chemicals Management, WHA59.16 on amendments to the statutes of the Codex Alimentarius Commission, WHA64.5 on pandemic influenza preparedness, and Regional Committee resolutions EM/RC53/R.3 on the regional strategy on preparedness and response for human pandemic influenza, EM/RC57/R.2 on emergency preparedness and response and EM/RC59/R.4 on national core capacities for the International Health Regulations (2005);

Recognizing that global, regional and national health security is dependent on all States Parties complying with and implementing the International Health Regulations (2005) and that the outbreak of Ebola Virus Disease in West Africa has exposed gaps in all-hazard preparedness and response;

Recognizing also that assessment, monitoring and reporting by States Parties on the implementation of the International Health Regulations (2005) are essential for the proper planning and coordination of support to States Parties to meet and maintain the obligations;

Gravely concerned by the emergency situation in many parts of the Region and the evolving and significant public health threats in the Region over the past three years, and by the lack of preparedness of States Parties to meet emerging threats to health security as shown in the serious gaps in the core capacities required for implementation of the International Health Regulations (2005);

1. **URGES** States Parties to:
   - 1.1 Comply with previous resolutions of the World Health Assembly and the Regional Committee on the International Health Regulations (2005) and formally commit to meeting the June 2016 target within the context of global health security;
   - 1.2 Make implementation of the Regulations one of the highest national priorities and allocate the necessary budget, human resources and other required operational and logistical assets;
   - 1.3 Ensure the availability of a strong intersectoral coordination mechanism with high-level representation from all stakeholders in order to accelerate implementation of the Regulations;
   - 1.4 Further enhance cross-border collaboration for surveillance of and response to public health events, including by entering into bilateral or multilateral agreements or arrangements concerning prevention or control of international transmission of disease at ground crossings in accordance with Article 57 of the Regulations;
   - 1.5 Urgently undertake a comprehensive assessment of their capacity to deal with a potential importation of Ebola, including through use of the checklist presented during the Regional Committee, in order to identify the main gaps and address them;
2. **REQUESTS** the Regional Director to:
   - 2.1 Support countries in developing integrated preparedness and response plans complemented by effective multisectoral coordination mechanisms;
   - 2.2 Encourage and facilitate dialogue between States Parties to enhance cross-border collaboration and promote mutual support;
   - 2.3 Continue to monitor progress in building, maintaining and strengthening core capacities and prepare an annual report to be shared with the Regional Committee and States Parties.

1 Document no. EM/RC61/Tech.Disc.1

EM/RC61/R.3 Noncommunicable diseases: scaling up implementation of the Political Declaration of the United Nations General Assembly

The Regional Committee,

Having reviewed the technical paper on the implementation of the political declaration of the United Nations General Assembly on the prevention and control of non-communicable diseases and follow-up on the high-level meeting of the General Assembly on the comprehensive review and assessment of the progress achieved in the prevention and control of noncommunicable diseases, held in July 2014; [1]

Recalling United Nations resolution 66/2 on the political declaration of the high-level meeting of the General Assembly on the prevention and control of non-communicable diseases, and resolution EM/RC59/R.2 on the commitments of Member States to implement the political declaration based on a regional framework for action;

Recalling also Regional Committee resolution EM/RC60/R.4 which requested the Regional Director to update the regional framework for action and develop process indicators;

Cognizant that the roadmap of commitments from Heads of State and Government included in the 2011 political declaration, based on the pillars set out in the global strategy for the prevention and control of noncommunicable diseases adopted by the World Health Assembly in 2000,[2] continues to guide national policy on noncommunicable diseases;

Further recalling United Nations resolution A/RES/68/300 on the outcome document of the 2014 high-level meeting of the General Assembly on the comprehensive review and assessment of the progress achieved in the prevention and control of non-communicable diseases, which prioritizes a set of time-bound commitments from Member States to be implemented between 2014 and 2018,[3] and in particular to consider, by 2015, setting national targets for 2025, taking into account the nine voluntary global targets for noncommunicable diseases;[4]

Concerned by the absence, in the outcome document, of an accountability and monitoring component and a set of process indicators, amenable to application across country settings, to assess the progress made at country level in the implementation of the roadmap of commitments included in the political declaration, which would enable the United Nations Secretary-General and the WHO Director-General to report in 2017 to the General Assembly on the progress made in implementing the political declaration and outcome document;

Recognizing that progress in the prevention and control of noncommunicable diseases has been insufficient and highly uneven, due in part to their complexity and challenging nature, and that continued and increased efforts are essential for achieving a world free of the avoidable burden of noncommunicable diseases;[5]

Welcoming the continued efforts of the Regional Director to raise global and regional awareness of the magnitude of the problem and to strengthen global action against noncommunicable diseases;

1. **ENDORSES** the updated regional framework for action (annexed to this resolution) on the commitments of Member States to implement the roadmap of commitments from Heads of State and Government included in the political declaration;

2. **URGES** Member States to:
   - 2.1 Move from commitment to action through accelerating and scaling up implementation of the strategic interventions in the updated regional framework for action;
   - 2.2 Implement the WHO recommendations on marketing of foods and non-alcoholic beverages to children;
   - 2.3 Support the Regional Director's initiative to protect public health and promote healthy lifestyles, with a special focus on countering the largely unopposed commercial practices that promote unhealthy products, particularly those targeting children;

1 EM/RC5/61 Rev.1
2 Resolution WHA53.17
3 In accordance with paragraph 30 of resolution A/RES/300/68
4 In accordance with paragraph 30(a)(i) of resolution A/RES/300/68
5 In accordance with paragraph 13 of resolution A/RES/300/68

2.4 Encourage and enhance people's involvement in the prevention and control of noncommunicable diseases, with a view to promoting self-care;

3. **REQUESTS** the Executive Board at its 136th session to invite the Director-General to develop a set of process indicators, for consideration by the Sixty-eighth World Health Assembly, to assess the progress made at national level in the implementation of the Political Declaration, which would enable the United Nations Secretary-General and the Director-General to report in 2017 to the high-level meeting of the General Assembly in 2018 on the prevention and control of noncommunicable diseases;

4. **REQUESTS** the Regional Director to:

4.1 Convene a side-event at the 136th session of the Executive Board, as well as the Sixty-eighth World Health Assembly, to brief Member States on the updated framework for action and process indicators adopted by the Regional Committee for the Eastern Mediterranean at its Sixty-first session;

4.2 Support Member States to carry out detailed assessment of their progress in implementing the commitments in the updated regional framework for action and to address gaps identified in the assessment;

4.3 Establish mechanisms for continuing exchange of experiences and good practices between countries;

4.4 Support Member States in their preparations for the second comprehensive review by the General Assembly in 2018, including in the generation and tracking of data on process indicators and in the development and implementation of country roadmaps;

4.5 Report to the Regional Committee at its Sixty-second, Sixty-third and Sixty-fourth sessions on the progress of Member States in the prevention and control of noncommunicable diseases, based on the process indicators.

World Health Organization
Regional Office for the Eastern Mediterranean

Framework for action to implement the United Nations Political Declaration on Noncommunicable Diseases, including indicators to assess country progress by 2018

Updated October 2014, based on resolutions EM/RC59/R.2 & EM/RC60/R.4. Annex to resolution EM/RC61/R.3

Commitments	Strategic interventions	Process indicators
In the area of governance	Each country is expected to: • Integrate noncommunicable diseases into national policies and development plans • By 2015, establish a multisectoral strategy/plan and a set of national targets and indicators for 2025 based on national situation and WHO guidance • Increase budgetary allocations for noncommunicable disease prevention and control including through innovative financing mechanisms, such as taxation of tobacco, alcohol and other unhealthy products • Periodically assess national capacity for prevention and control of noncommunicable diseases using WHO tools	Country has: • An operational multisectoral national strategy/action plan that integrates the major noncommunicable diseases and their shared risk factors • Set time-bound national targets and indicators based on WHO guidance • A high-level national multisectoral commission, agency or mechanism to oversee engagement, policy coherence and accountability of sectors beyond health • Increased budgetary allocations measured by tracking and reporting on health expenditures on prevention and control of major noncommunicable diseases, by source, per capita
Commitments	**Strategic interventions**	**Process indicators**
In the area of prevention and reduction of risk factors	Each country is expected to: • Accelerate implementation of the WHO Framework Convention on Tobacco Control (WHO FCTC) and ratify Protocol to Eliminate Illicit Trade in Tobacco Products • Ensure healthy nutrition in early life and childhood including breastfeeding promotion and regulating marketing of foods and non-alcoholic beverages to children • Reduce average population salt intake per WHO recommendations • Virtually eliminate trans-fat intake and reduce intake of saturated fatty acids • Promote physical activity through a life-course approach • Implement the best buys to reduce the harmful use of alcohol	Country is implementing: • At least three of the six demand-reduction measures (MPOWER) in the WHO FCTC • WHO International Code for Marketing of Breast-milk Substitutes • WHO recommendations on marketing of foods and non-alcoholic beverages to children • Measures to reduce salt content in at least one highly-consumed food item • Regulatory measures to eliminate industrially produced *trans*-fat in the food supply and to replace saturated fatty acids with polyunsaturated fatty acids in food products • Public awareness campaigns through mass media on diet and physical activity
Commitments	**Strategic interventions**	**Process indicators**
In the area of surveillance, monitoring and evaluation	Each country is expected to: • Implement/strengthen the WHO surveillance framework that monitors mortality and morbidity, risk factors and determinants, and health system capacity and response • Integrate the three components of the surveillance framework into the national health information system • Strengthen human resources and institutional capacity for surveillance, monitoring and evaluation	Country has: • A functioning system for generating reliable cause-specific mortality data on a routine basis • An operational population-based cancer registry • A STEPS survey or a comprehensive health examination survey every 5 years • A framework to monitor effective coverage of hypertension and diabetes treatment
Commitments	**Strategic interventions**	**Process indicators**
In the area of health care	Each country is expected to: • Implement the best buys in health care • Improve access to early detection and management of major noncommunicable diseases and risk factors by including them in the essential primary health care package • Improve access to safe, affordable and quality essential medicines and technologies for major noncommunicable diseases • Improve access to essential palliative care services	Country has: • Provision of drug therapy, including glycaemic control, and counselling for eligible persons at high risk to prevent cardiovascular events • Government approved evidence-based guidelines/protocols for early detection and management of major noncommunicable diseases through a primary care approach • Availability of essential medicines and technologies for major noncommunicable diseases and risk factors in public primary health care facilities

Note: WHO tools are available to support implementation of the strategic interventions

Emergency preparedness and response

Preamble

The Eastern Mediterranean Region (EMR) is experiencing an unprecedented number of major emergencies and crises which impose a huge burden on the affected countries However, the level of emergency preparedness and the capacity for crisis response and recovery remain low, especially with regard to the health sector (among other society sectors). A lack of adequate preparedness for emergencies, leaves communities unprotected and vulnerable to the wide range of health risks such situations can generate, with potentially devastating consequences. It was therefore important to raise this issue at the Sixty-first session of the Regional Committee for the Eastern Mediterranean in October 2014 and this technical discussion paper (EM/RC61/Tech.Disc.2 Rev.1) reproduced below served to highlight the need for Member States to enhance their national capacity to manage emergency risks and consolidate their humanitarian response.

Introduction

Every year, natural and man-made hazards, societal unrest, armed conflict and other emergencies threaten the lives, livelihoods and health of millions of people. Political instability and civil conflict also threaten health security, rolling back the progress in health gains made over years of progressive development. Along with the growing frequency of natural hazards and conflict, new and emerging health threats continue to evolve with geographical and political boundaries powerless to prevent them spreading. Recent examples include pandemic influenza, Ebola and the Middle East respiratory syndrome coronavirus (MERS-CoV).

The WHO Eastern Mediterranean Region, home to over 500 million people, is no exception to this global trend. The risks posed by earthquakes, floods, drought, and chemical and radiological events are compounded by complex humanitarian crises, political instability and armed conflict which have become all too common in recent years and are devastating parts of the Region. In the past two years, 13 countries in the Region have experienced large-scale emergencies, affecting more than 42 million people.

Most recently, with the upsurge in violence and conflict millions of Iraqis have been displaced and have sought shelter in host communities. The needs of over 250 000 registered Syrian refugees in northern Iraq have further stretched the capacity of health authorities and aid agencies. Equally challenging is the situation in Gaza where access to hospitals and clinics is restricted for millions of Palestinians because of insecurity. Hospitals, clinics and ambulances have been significantly damaged or destroyed by military strikes. Even before the current situation escalated, health authorities were reporting major shortages of essential medicines and consumables. Several hospitals are also experiencing high levels of debt due to limitation of resources.

In the face of such existing and emerging health threats, across the Region, national capabilities to improve health security need to be built up in such a way that health systems and, ultimately, communities are protected from, prepared for, and resilient to the wide range of risks. This requires strengthening, in conjunction with all related sectors, of the emergency health preparedness and response systems, at local, state and national levels, following an all-hazard and whole-health approach.

The objective of this paper is to re-emphasize the need for Member States to develop national capacity to ensure self-reliance in managing emergency risks and consolidating humanitarian response, as an integral part of national and regional health security.

Managing all-hazard emergencies

The all-hazard approach to emergency preparedness and response lies at the heart of the sustained capability of every country's health sector to mitigate and manage emergency events. It is broadly divided into two areas.

a) Emergency risk management

Emergency risk management is purely developmental and consists of capacity development at national and local levels to manage any emerging event or hazard to which the community is vulnerable with a multisectoral approach. It covers four categories of risk:

- biological risk: epidemics or pandemics;
- technological risk: hazardous chemical releases, radiological emergencies, transport accidents and infrastructure failure;
- natural risk: hydrometeorological and geological hazards; and
- societal risk: social unrest, conflict, displacement and mass gatherings.

Apart from causing higher than normal morbidity, mortality and displacement, such risks may also cause – in a short period of time – social and economic disruption, and often challenge the long-term health development goals of a country.

One of the primary responsibilities of any government is to protect the health and safety of its people along the

three key elements of health security: prevention and mitigation wherever possible; early detection; and timely and effective response.

A key lesson learnt from managing health crises in the past decade is that effective response to emergencies cannot be achieved by having 'stand-by' systems that are activated only when they are urgently needed. It can only be achieved by strengthening day-to-day detection, risk mitigation and response programmes so that they can be scaled up quickly when needed. The ultimate goal of such a long-term developmental focus is both to promote self-reliance for emergency risk management and to address everyday health challenges.

b) Humanitarian response and recovery

The second area of work of the all-hazard approach focuses on humanitarian action. It is aimed at providing and maintaining access to vital health services and relief in the aftermath of an emergency or a crisis where the existing local or national capacity becomes overwhelmed. Health care and the responsiveness of the overall health system are considered imperative for saving lives during this phase. At the onset of an emergency or a crisis, and at the request or acceptance of the affected country, this action may be guided by relevant resolutions of the United Nations General Assembly and World Health Assembly which trigger relief operations. A range of surge capacities, including foreign response experts, supplies and relief items, are managed through a central response mechanism led by the United Nations.

If national institutions and systems are well prepared, and ready to lead the coordination of international humanitarian interventions, the benefits to affected countries of such humanitarian response and recovery functions are quick recovery and rehabilitation of health services and, often, health investments in areas of national interest. Indeed, these recovery functions, if properly coordinated and managed, not only support communities to rebuild their lives after emergencies. They can also help communities to develop resilience to future health crises, to advocate for the voices of those affected to be heard and to build on experiences gained during the response and recovery phases.

Way forward

Despite the escalation in the number and type of emergencies across the Region, the capacity of Member States to prevent, detect and respond to health threats remains alarmingly unadapted and in many cases rudimentary. The level of emergency preparedness and the capacity for crisis response and recovery remain fragmented, grossly uncoordinated and generally low, especially with regard to the health sector.

Heavy reliance on international health support in times of emergency and crisis exposes countries to several strategic risks and may further weaken community and national ability to cope with such events in future. Member States need to give priority to, and take the lead in, developing national, intercountry and regional capacity for effective response in order to promote national and regional self-reliance, as well as mutual intercountry assistance. This can be achieved through a) better prepared health systems; b) strong multisectoral coordination; and c) pragmatic strategies/policies for coordinating foreign aid, including medical teams, supplies etc.

Priority actions for consideration

With the goal of increasing the resilience of countries to emergencies, disasters and other health crises, and subsequently ensuring effective public health response to such destructive events, a set of strategic priorities are outlined here for consideration by Member States.

a) At national level

The national health system must have the resilience and capacity to prevent, mitigate, respond to and recover from major emergencies and catastrophic events. The foundation for such a national capacity comprises: a well trained health work force acquainted with emergency response; the functional ability of hospitals and health centres to withstand the impact of natural and man-made hazards; the necessary policies and legislation governing emergency health action; and well established coordination mechanisms with other key sectors based on contingency plans.

The following key elements should guide national strategy in this area.

- Promote an integrated and institutionalized approach that will build national health security based on an all-hazard, whole-health and multisectoral collaborative framework.
- Build functional partnerships with regional institutions/countries to develop the capacity of the health workforce, including community volunteers, for emergency preparedness and response.
- Ensure the safety of health facilities based on hazard analysis through assessment and development.
- Develop the evidence base for health emergency and risk management, collaborating with regional research and academic institutions.

b) At regional level

As and when emergencies, disasters and other crises overwhelm national capacities, Member States should be able to tap into regional and international expertise, logistics and material aid to support national and local health response programmes. Past experiences in the Region illustrated the power of solidarity as health care workers provided

support in Gaza, Iraq, Libya, Syrian Arab Republic, Yemen and other countries during the respective crises there. Other capacities and lines of support exist through deployment of field hospitals and mobile clinics. Such capacities need to be mapped, strengthened, organized and coordinated for future use. Finally, financial resources are the key to mounting any response. Despite the Region's diversity of wealth, health appeals continue to be grossly underfunded. Mechanisms endorsed by previous sessions of the Regional Committee, such as the regional solidarity fund, should be implemented and scaled up to meet the growing health needs in the Region.

Consequently, and in order to complement the country and intercountry response capacity, the following actions are urgently needed at regional and international level.

- Build a regional cadre of trained public health experts to respond to future health threats through proper selection and training and formal agreement with respective countries and employers for rapid deployment.
- Formalize the establishment of a global hub for logistics and operations in Dubai in order to improve WHO's surge capacity in responding to emergencies, ensuring rapid deployment of regional stockpiles and logistic support to affected countries.
- Promote the development and signature of memorandums of understanding for mutual aid between countries of the Region as well as between WHO and its Member States.
- Urgently advance the implementation of the Regional Emergency Response fund as decided by the Regional Committee in 2006 and confirmed in 2013.

Conclusion

The Eastern Mediterranean Region shoulders the biggest share of major emergencies and crises in the world. Member States can, and must, achieve self-reliance in crisis management through ensuring proper risk reduction and emergency preparedness, as well as through concrete arrangements for prompt and efficient mutual aid that can be deployed when an affected country calls for it. The health sector can show the way in this direction. Political will and committed efforts to secure human, material and financial resources will ensure the achievement of this common goal. A well structured emergency preparedness and response programme, with the requisite expertise and tools of work, is the way to achieve this target. Only when such measures are in place will the Region be able to talk confidently about national and regional health security based on an all-hazard and whole-health approach.

Note

Following the discussions of this paper and other tabled issues by the Regional Committee, the Committee approved resolution EM/RC61/R.1 in which Members States were urged to strengthen their preparedness for and ability to respond to emergencies in order to build self-reliance in managing emergency risks, and to cooperate with countries of the Region itself to consolidate the humanitarian response capability at the country and regional level.

The full text of this and the other resolutions of the Sixty-first Session of the Regional Committee is available on pages 745 to 750 of this issue.

WHO events addressing public health priorities

MERS-CoV: new initiatives in research and scaling up infection prevention and control measures in healthcare settings

Approaches to dealing with the threat of MERS-CoV

The novel coronavirus now known as Middle East respiratory syndrome coronavirus (MERS-CoV) is responsible for a respiratory disease that so far killed over 300 people since the virus emerged between April and June 2012. Since that time, sporadic cases, small clusters and large outbreaks have been reported in several countries. Concerns about the gaps in knowledge about MERS-CoV and how it is transmitted have prompted several new initiatives in the Eastern Mediterranean Region (EMR), involving WHO and other international health partners, to improve research, infection control and training.

Recent evidence suggests that camels and possibly bats may harbour the virus. Although finding the animal reservoir of MERS-CoV is an important step in understanding the origin of the virus, an immediate need is for more research to understand the route and mode of transmission of the virus to humans from animal sources, and the types of exposures that result in infection. As recent evidence has also shown that poor infection control measures in healthcare settings can result in amplification of outbreaks caused by MERS-CoV and any other novel infections of zoonotic origin, appropriate and systematic infection prevention and control practices need to be considered for all health facilities to prevent any healthcare-associated transmission of these infections. Finally, the emergence of MERS-CoV and recent re-emergence of a number of other communicable diseases in the Region highlight the need to develop a network of technical institutions and agencies in the EMR which would be ready for rapid deployment in the event of any outbreaks. WHO has thus held a number of events in 2014 to address these needs.

Multi-country research into risk factors for MERS-CoV infection

What do we know already?

While there is evidence that MERS-CoV has been circulating widely for more than two decades in camels in the Middle East,[1] it remains unclear how humans get infected from camels, as more than three-quarters of total laboratory-confirmed human cases of disease due to MERS-CoV reported to WHO have not had a history of direct contact with camels or any other animals.[2] Clearly, further research is needed to study the route of transmission and exposures that result in human infection from animals.

Drawing up the protocol for a multi-country case–control study

At a meeting held in Cairo in December 2013 a research agenda for MERS-CoV was determined.[3] As a follow-up to this, WHO organized a technical consultative meeting in Riyadh, Saudi Arabia in March 2014, to finalize the protocol for conducting a multicountry case–control study on MERS-CoV in the affected countries. The meeting was attended by representatives from the ministries of health and ministries of agriculture of the affected countries in the Region (Jordan, Saudi Arabia, Kuwait, Oman, Qatar, Tunisia and the United Arab Emirates), the UN Food and Agriculture Organization, the World Organization for Animal Health, WHO collaborating centres as well as other international health agencies involved in the global response to MERS-CoV.

Aims and design of the study

The case-control study has been designed to be able to combine data from the participating countries by applying the same study design and data collection tools consistently across all the countries. Countries will collaborate closely with WHO and implementation will be supported by an international team of experts and national focal points.

Several possibilities for human exposure to the virus exist, including: direct contact with an infected animal; contact with or consumption of unprocessed animal products; contact with the environment where an infected animal has recently been; or consumption of a food or beverage contaminated by animal excreta. All of these have been implicated in other zoonotic infections. Determining the

1 Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, de Wit E, et al. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. mBio. 2)5;2014):e14–00884.

2 The WHO MERS-CoV Research Group. State of knowledge and data gaps of Middle East respiratory syndrome coronavirus (MERS-CoV) in humans. PLoS Curr. 2013 Nov 5;12. doi: 10.1371/currents.outbreaks.0bf719e352e7478f8ad85fa30127ddb8.

3 WHO-EM/CSR/068/E (http://applications.emro.who.int/docs/IC_Meet_Rep_2014_EN_15224.pdf?ua=1, accessed 11 September 2014).

exposure risk factors for MERS-CoV that result in transmission to humans will enable the affected countries to formulate appropriate public health measures that can be implemented to interrupt transmission.

The proposed case-control study therefore aims to identify non-human exposures that lead to human infection from MERS-CoV and to describe other risk factors for infection, such as pre-existing medical conditions. It will use a case–control study design that examines the differences in types of exposures between human cases with laboratory-confirmed MERS-CoV infection and healthy controls in order to determine the risk associated with that exposure. Because exposures vary greatly by season and memory of exposures can be forgotten over time, the study will focus on recently reported laboratory-confirmed primary cases only. Data will be collected through a detailed questionnaire about participants' living conditions, behavioural factors, animal exposure and types of food consumed (especially meat and milk from camels and other animals).

How will we use the findings?

WHO is coordinating with countries to ensure that the study is conducted simultaneously in all the countries where human cases of MERS-CoV have recently been reported. Studies are currently underway in Saudi Arabia but the results may not be available soon as, in order to avoid recall biases, only recently reported primary cases with a known or unknown exposure to camels are being enrolled in the study. The data collected from this study will also be used to refine/update recommendations for surveillance and case definitions, to characterize the key epidemiological transmission features of MERS-CoV, to help understand the spread, severity, spectrum of disease, impact on the community and to inform operational models for implementation of countermeasures such as case isolation, contact tracing and quarantine.

Scaling up infection prevention and control measures for MERS-CoV

Evidence for poor infection control measures

In the face of a recent spike of infection from MERS-CoV reported in the United Arab Emirates and in Saudi Arabia between March and June 2014, the Member States of the Region have pledged to urgently scale up infection prevention and control measures in healthcare facilities. Recent outbreaks of MERS-CoV have been fuelled by large-scale transmissions in hospitals in Jordan, Saudi Arabia and the United Arab Emirates with significant numbers of healthcare workers also reported to have been infected. A recent WHO mission to Saudi Arabia to investigate the spike of MERS-CoV infections, conducted in late April 2014, concluded that poor infection control practices by health-care workers as well as a lack of systematic and consistent application of infection prevention and control practices in health facilities had exacerbated the hospital outbreak of MERS-CoV.

Preparedness plan for health facilities

In light of the above, WHO organized an urgent meeting of infection control experts in Riyadh, Saudi Arabia in June 2014. The meeting was attended by participants from 12 Member States in the Region as well as other experts from WHO Collaborating Centres for Infection Prevention and Control. The participating countries, through a consultative process, finalized the essential components of a health-facility preparedness plan for improving infection prevention and control measures and practices for MERS-CoV and any other novel respiratory disease, taking into consideration the reasons behind the amplification of outbreaks of MERS-CoV in the hospitals of Jordan, Saudi Arabia and the United Arab Emirates.

The meeting concluded with countries pledging to scale up their infection control measures in health facilities and WHO offering assistance to help countries establish national programmes for infection control.

Training on outbreak response for GOARN partners

Need for early detection of disease outbreaks

Established in April 2000, the Global Outbreak Alert and Response Network (GOARN) is a WHO network comprising institutions and health agencies that have the capacity to contribute technical resources for international disease outbreak response operations. The emergence of MERS-CoV and recent re-emergence of yellow fever, Rift Valley fever, dengue fever, Crimean–Congo haemorrhagic fever and cholera in the Region exemplify that outbreaks are not predictable. The only way to minimize their health impact is to detect these outbreaks early and respond rapidly and effectively.

Building team leadership and coordination skills for outbreak response

In March 2014, the Regional Office hosted the first pre-deployment course on international outbreak response for regional partner institutions of GOARN. A total of 24 participants, selected mostly from health institutions and the ministries of health of the Region, attended the course at the Dead Sea, Jordan. This training course was part of WHO's efforts to establish the regional arm of GOARN. The aim is to develop a network of technical institutions and agencies in the Region that can offer multidisciplinary experts who would be ready for rapid deployment in the event of any outbreaks in the Region that necessitated an international response. The creation of this network will also enable the Regional Office to effectively fulfil its alert and response responsibilities through establishing a mechanism for rapid deployment. The course involved a scenario-based simulation exercise

intended to build team leadership and coordination skills for outbreak response operations in the field.

Following conclusion of this pre-deployment course, the Regional Office has established a roster of experts who can be called for deployment in the event of an outbreak that requires international response. A number of these trained experts from the roster were deployed in some countries of the Region during May–June 2014 to respond to hospital outbreaks caused by an increasing number of hospital-acquired infections of MERS-CoV. Some of these experts were also recently deployed to West Africa as part of the GOARN team for international outbreak response to Ebola virus disease. This training has offered the Regional Office an opportunity to keep a team of trained experts on stand-by should there be any need for surge in the event of an importation of cases of Ebola virus disease in the Region.

Correspondence

Editor-in-chief
EMHJ
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: emhj@emro.who.int

Subscriptions and Distribution
Enquiries regarding subscriptions and distribution of the print edition of EMHJ should be addressed to: Printing and Marketing of Publications at: email: pam@emro.who.int; tel: (+202) 2276 5000; fax: (+202) 2670 2492 or 2670 2494

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