



World
Health Day

2019

يوم الصحة
العالمي

Primary health care is a vital component in achieving the World Health Organization regional vision 2023 “Health for all by all”. This year the theme of World Health Day is primary health care and universal health coverage, which seeks to focus attention on the actions needed to make universal health coverage a reality for everyone and to ensure better health for all.

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 public health and 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.

المجلة الصحية لشرق المتوسط

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

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Editorial

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Many regions of the world continue to bear witness to the controversial and culturally sensitive subject of gender violence, whether the practice of female genital mutilation (FGM) or domestic aggression, and this issue of the Eastern Mediterranean Health Journal examines research on this topic in Sudan and India. Changing attitudes through education is the underlying theme in the Article “Opinions of university students about female genital mutilation” (1), whereby current gender-based attitudes to the practice of FGM are examined in order to assess how Sudan’s professional community of tomorrow can tackle the practice. Likewise, the issues of education and urbanization of society are some of the variables examined in the article “Gender-based violence in New Delhi, India: forecast based on secondary data analysis” (2) in an attempt to predict how gender-based violence materializes in various sections of society.

Continuing the theme of maternal and child health is a focus on how health systems development in the Islamic Republic of Iran has had an effect on caesarian section (CS) rate through the country’s Health Transformation Plan. The phenomenon of increasing CS rates has been witnessed within the Eastern Mediterranean Region, and elsewhere, with rising concern by the medical community as the move away from health-facility-based normal vaginal delivery. The article “Effects of the Health Transformation Plan on caesarian section rates in the Islamic Republic of Iran: an interrupted time series” (3) provides important data and analysis on this important topic.

Meanwhile, the issue of effective nutrition in schools is the focus of the article “Compliance with school nutrition policy in Riyadh, Saudi Arabia: a quantitative study” (4). Saudi Arabia has found itself prone to the problem of childhood obesity and the subsequent noncommunicable disease risk, and therefore the country has actively pursued a policy of reviewing school meals in an effort to reverse overweight and obesity among growing children through school-based health promotion and education. The article researches the effectiveness of the policy in the capital Riyadh and where weaknesses still remain.

The Region has, unfortunately, suffered further calamities both manmade and natural. Extreme

meteorological events in the Islamic Republic of Iran resulted in catastrophic flooding in areas of the country in early 2019, and the article “Communicable diseases management in disasters: an analysis in the Islamic Republic of Iran” (5) is a timely review of the problem of health systems degradation during periods of environmental upheaval through conflict or natural phenomena.

Mass movement of populations, whether as internally displaced persons (IDPs) or voluntary migration, has been phenomenal in the Region, especially during the past 2 decades. Countries suffering conflict, such as the Syrian Arab Republic, have witnessed massive internal displacement as well as population flows into neighbouring states such as Jordan and Lebanon, where strains on health and educational systems have become apparent. Moreover, many of these migrants attempt to reach Europe via dangerous sea crossings at the hands of exploitative people smugglers. This situation is exacerbated by migrant flows primarily from Sub-Saharan Africa via Libya in an attempt to reach Mediterranean European nations. Until recently, Italy had been a major recipient of illegal migration where the problem of communicable disease outbreaks in reception camps has led to urgent need for screening of arrivals, as detailed in the article “Screening for infectious diseases in newly arrived asymptomatic immigrants in southern Italy” (6).

The approaching Holy Month of Ramadan in the Islamic world highlights the issue of combining religious fasting and medical care as examined in the timely article “Comparing time restricted feeding and Islamic fasting” (7). Moreover, the physiological effects of fasting are researched with regard to diabetes during pregnancy in the article “Fasting and post-prandial plasma glucose screening for gestational diabetes mellitus” (8).

Looking forward, the May issue of the Eastern Mediterranean Health Journal will examine the health needs of refugees, anaemia in Jordan, the Egyptian health map, and infection control practices in blood banks in Pakistan, among other issues of public health interest.

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Opinions of university students about female genital mutilation in Sudan

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Abstract

Background: Female genital mutilation/cutting (FGM/C) is an illegal tradition commonly practiced in Sub-Saharan Africa and the Middle East. Despite a globalized world and developing social media, this harmful practice is currently still being implemented.

Aims: We aimed to evaluate the opinions of university students regarding FGM/C.

Methods: This descriptive study included 821 students who studied at Nyala University, Sudan, in January 2016. The students were questioned for the following: age, faculty, reasons for female circumcision, effects of female circumcision on female sexual functions and their views about the circumcision for their daughter.

Results: The rate of FGM/C among female university students was 80.1%. Although 73% of the male students prefer to marry uncircumcised women, they also reported that FGM/C should be continued to be performed, and their future daughters should be circumcised (64.5%). Female students were against FGM/C for their future daughters (77.6%).

Conclusions: This study shows that even educated individuals demand FGM/C in spite of knowing the harm. It is therefore suggested continuing educational studies on this subject.

Keywords: Female genital mutilation, survey, university students, female circumcision, Sudan

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Introduction

Female genital mutilation/cutting (FGM/C) refers to all procedures that include cutting, rupturing, sewing or removing the female external genital organs in accordance with traditional rules (1,2). Although it is called female circumcision in the countries where it is performed, in the medical literature due to the physical and psychological detrimental consequences this procedure is defined as mutilation (2,3).

The World Health Organization (WHO) has defined four main categories of such mutilation: 1) Partial or total removal of the clitoris and/or the prepuce (clitoridectomy); 2) partial or total removal of the clitoris and the labia minora, with or without excision of the labia majora (excision); 3) narrowing of the vaginal orifice with creation of a covering seal by cutting and appositioning the labia minora and/or the labia majora, with or without excision of the clitoris (infibulation); and 4) unclassified: all other harmful procedures to the female genitalia for non-medical purposes, for example, pricking, piercing, incising, scraping and cauterization (4).

According to current knowledge, more than 125 million women in the Middle East and Africa have undergone FGM/C. It is also estimated that more than 100 000 ethnic immigrant women from these countries have also undergone FGM/C in Europe (5,6). Each year

there are two million new practices throughout the world (2). More than 90% of girls in Northern Sudan are subjected to the most severe form of FGM/C (type 3) (7).

Religion plays an important role in Sudan, with (97%) of the country's population adhering to Islam. Although it is a cultural practice and not connected to religion, at the village level those who commit the practice offer a mix of cultural and religious reasons for the practice. It is not completely known when and for what reason FGM/C was initiated. However, it was practiced in Ancient Egypt according to examination of mummies and recorded descriptions by Ancient Greek historians (8). In many African countries, virginity is the prerequisite for a marriage; FGM/C and especially its infibulation form (Type 3) decreases sexual desire in the female and thus the probability of premarital or extramarital sexual intercourse is also decreased. According to another claim, men insist on FGM/C for marriage and this fact leads to the consolidation of such a tradition in the population over the years.

FGM/C is usually performed secretly under unhygienic conditions with the aid of non-sterile tools, without anaesthesia and using knives, razor blades, or pieces of broken glass (9–11). The three most important early complications are pain, bleeding and infection (12). The late complications are infertility, vesicovaginal fistula, menstrual problems, chronic urinary track

infections, chronic pelvic pain, increased risk of maternal and fetal morbidity and mortality due to prolonged childbirth (13,14).

Despite all efforts and legislation to stop FGM/C, it is observed that the procedure still has a high rate of prevalence. Since university students are expected to be better educated compared to the whole population, the present study was planned to determine the opinions of university students regarding FGM/C.

Methods

This cross-sectional descriptive type study included 409 male and 412 female students who were educated in various programmes of Nyala University in the State of South Darfur, Sudan. Questionnaires were distributed to the students in the classrooms over a period of four weeks in January 2016. Three volunteer female medical students questioned the females, and three volunteer male medical students questioned the males. Questionnaires were completed during face-to-face interviews. Response rate was 88% among all students. Students were questioned on the following: age, faculty of study, reasons for FGM/C, effects of FGM/C on female sexual function, and their views about FGM/C for their possible daughter in the future. Separately, male students were questioned about the preference of a female having undergone FGM/C for marriage; while female students were questioned about whether they had already undergone FGM/C. Questionnaire forms were prepared in English and in Arabic. The content validity of the instrument was confirmed in the scale's content validity index (S-CVI), which was 0.88. Cronbach's alpha was used to evaluate the stability and internal consistency of the tool. The overall Cronbach's alpha of this questionnaire was 0.73. Informed consent was obtained from all participants. The Nyala University Ethics Committee approved the study protocol and survey. Statistical analyses of the data were performed using the Statistical Package for the Social Sciences (SPSS) software version 22.0. and by applying the Chi square test.

Results

Age, departments of students, and genital status of female students are illustrated in Table 1. The rate of FGM/C was 80.1%, and 93% of female students underwent the procedure between 5 and 12 years of age, with a mean age of 7.97 ± 2.49 . All participating students were Muslim. The perspectives of the two groups regarding the reasons for FGM/C were different, as shown in Table 2. Male students mostly indicated religious beliefs as the most important reason (59.7%), while it was reported to be the least important reason by female students (10.9%). Female students mostly indicated traditional beliefs as the most important reason for FGM/C (64.2%). The difference in views between sexes was statistically significant ($P < 0.001$).

Both groups reported that FGM/C negatively affects female sexual function (males 87.8%, females 89.1%). However, male students reported that FGM/C should be performed and their daughters should undergo the

Table 1: Age, circumcision history and academic departments of students.

	Males (n = 409)	Females (n = 412)
Age (mean \pm SD)	21.8 \pm 2.69	19.5 \pm 1.95
Faculty of medicine	33	55
Faculty of engineering	181	93
Faculty of education	12	55
Faculty of veterinarian	118	95
Economics	23	81
Law	42	33
Circumcision	NA	330 (80.1%)
No circumcision	NA	82 (19.9%)
Age at circumcision (mean \pm SD)	NA	7.97 \pm 2.49

NA: Not applicable

procedure in the future (64.5%), whereas female students reported that they were against such a procedure for their daughter in the future (77.6%). This ratio was higher among female students who had undergone FGM/C (85.1%). The difference between sexes for this question was statistically significant ($P < 0.001$). Although male students emphasized the necessity of FGM/C their daughter, they reported that they would prefer to marry women who had not undergone FGM/C (73%). There were also statistically significant differences between faculties and opinions about FGM/C of a future daughter. Most of the students who studied medicine (84%) and education (72%) were against FGM/C of their future daughter, whereas the ratio fell in economics (55%), law (53%), engineering (51%) and veterinary (49%).

Discussion

FGM/C is a widely performed procedure in Africa. It is estimated that approximately three million girls undergo FGM/C each year (14,15). WHO, UNICEF, United Nations (UN) and many other organizations that are against the procedure have been studying its prevention procedure for many years and there are currently ongoing studies. Sudan is the first African country that banned FGM/C, with Type 3 (infibulation) outlawed in 1946, according to the Sudan penal code. In 1974, new legislation meant that FGM/C performers and those who allow it are sentenced to imprisonment for up to five years (16). However, all these efforts and legal regulations have not stopped this procedure and FGM/C is still widely performed in Sudan. The ratio of FGM/C in married Sudanese women was reported to be 89% (6). This ratio is reported to be 65% in the Darfur district, but reaches 99% in some northern states (17). In the current study the rate of FGM/C among female university students was 80.1%. This result was equally as high as previously reported for community -based ratios and thus, it indicates that family social status and level of education does not affect the decision to perform FGM/C.

Male students reported religious belief as the main reason for FGM/C, whereas female students considered

Table 2: Students' responses to questions

Question	Male n (%)	Female n (%)	χ^2	P
What do you think is the reason for female circumcision?			243.365	<0.001
Religion	244 (59.7)	45 (10.9)		
Traditions	101 (23.7)	264 (64.2)		
Social pressure	59 (14.4)	57 (13.9)		
Did not answer	5 (1.2)	45 (10.9)		
How does circumcision affect female sex life?			4.043	0.257
Negatively	359 (87.8)	366 (89.1)		
Positively	31 (7.6)	19 (4.6)		
Does not affect	13 (3.2)	17 (4.1)		
Did not answer	6 (1.5)	9 (2.2)		
Should your daughter be circumcised in the future?			149.638	<0.001
Yes	264 (64.5)	92 (22.4)		
No	145 (35.5)	319 (77.6)		
Do you prefer a circumcised spouse?				
Yes	60 (14.7)	NA		
No	299 (73)	NA		
Not important	50 (12.3)	NA		

NA: Not applicable

traditional beliefs to be the most important factor. However, many previous studies indicate that FGM/C is performed at high rates not only in Islamic countries but also in populations with different religious beliefs and in African populations that have no religious beliefs (18,19). It is also known that Islam's holy book, the Quran, does not have any mention in regard to the practice. Islamic scholars disagree on FGM/C; some say that no obligatory rules exist while others refer to the mention of female FGM/C in the Hadiths (sayings, actions and approvals of Islam's Prophet Muhammad). The part of the Quran cited as evidence in support of FGM/C is the same justification for male circumcision, which is confirmed from the way of life of the Prophet Muhammad. There is nothing to prove that females underwent FGM/C during their lifetime in the Islamic period and FGM/C is a cultural practice in communities that observe it, and it is wrong to associate Islam with such a harmful practice (20). It can therefore be understood from the responses of male students that inaccurate beliefs were present in regard to this subject. The opinions of female students about the reasons for FGM/C were similar to a previous study in which participants were selected randomly from those

who attended a hospital (21).

The main reason for FGM/C is the suppression of female sexuality in order to uphold the insistence for virginity, family honour and the belief that males hold a preference for women having undergone FGM/C for marriage. However, in the current study 73% of male students reported that they would prefer woman who had not undergone FGM/C for marriage. As a result, we can conclude that although male students were aware of the harmful effects of FGM/C on female sexual health, they could not exercise free will in this matter due to social pressure.

A substantial proportion of women subjected to FGM/C experience sexual dysfunction and the anatomical extent of FGM/C is related to its severity (22). In our study we found that 87.8% of male students and 89.1% of female students replied that FGM/C negatively affects the female's sex life. However, 64.5% of male students reported that they would have their daughters undergo FGM/C in the future; this is a self-contradicting result. Male students wished this procedure to be performed even though they were aware of its associated harm. Social pressure and conventions still play a very powerful role for families in Sudan. Some Sudanese people hold the belief that women who have not undergone FGM/C exhibit continual extreme sexual desire and run a high risk of being unfaithful to their husbands. As a result, such girls could be targets for abuse in their schools and social environments. Females that have not undergone FGM/C are often teased and called 'ghalfa', a term that refers to a promiscuous woman. Thus, it is considered that a woman will only be faithful if she has undergone FGM/C (6).

While attempting to achieve the presumed benefit a reduced libido, the procedure has a negative impact on a woman's overall sexual life. FGM/C deprives women of the ability to achieve sexual satisfaction and denies them their right to sexual health, sexual pleasure and the achievement of full psychophysical well-being (23). In order to protect their daughters from sexual abuse and with concern for their virginity before marriage, families choose to have their daughters undergo FGM/C. This persists despite the high level of awareness of the negative health effects of FGM/C that were recorded in the educated population. Our study shows that education did not overcome these beliefs and harmful cultural traditions. The majority of students in medicine and education declared they would not allow FGM/C of their future daughter, while students studying engineering and economics showed less negativity about the procedure and this could be due to ignorance about the subject. It is also noteworthy that nearly half of law and veterinary students did not oppose the FGM/C; it was expected the majority of such students would be against FGM/C because of their affiliation with jurisprudence and health sciences. This result implies that relevant education should be given before university.

Sudan is the first African country to put in place laws against FGM/C. One limitation of our study was that the

awareness of such legislation among students was not investigated. Additional studies are needed in order to evaluate this. A second limitation of our study is that we did not assess female students' experience with FGM/C and how this may have affected their response to the questionnaire.

Conclusion

FGM/C is a procedure that negatively affects women's sexual life and ability to achieve sexual satisfaction. It is accepted as an assault on the human rights of women by

WHO. However, it is still currently performed in quite high rates, as also determined in this study. It is clear that beliefs and traditions play a prominent role in this procedure, since even educated university students demand it to be performed in spite of knowing the harm. This indicates a need to develop effective strategies to increase knowledge toward FGM/C at school level. It is therefore concluded that educational studies on this subject and studies on awareness of legislation must be continued.

Funding: None.

Competing interests: None declared.

Opinion des étudiants concernant les mutilations sexuelles féminines au Soudan

Résumé

Contexte : Les mutilations sexuelles féminines/l'excision constituent une tradition illégale dont la pratique est courante en Afrique subsaharienne et au Moyen-Orient. En dépit de la mondialisation et du développement des médias sociaux, cette pratique néfaste est toujours en cours de nos jours.

Objectifs : Notre objectif consistait à évaluer l'opinion des étudiants de l'université concernant les mutilations sexuelles féminines/l'excision.

Méthodes : La présente étude descriptive a été effectuée auprès de 821 étudiants inscrits à l'Université de Nyala (Soudan), en janvier 2016. Les étudiants ont été interrogés sur les points suivants : âge, faculté, raisons justifiant l'excision, conséquences de cette mutilation sur les fonctions sexuelles de la femme et leur opinion concernant cette pratique pour leurs filles.

Résultats : Parmi les étudiantes, le taux de mutilations sexuelles féminines/de l'excision était de 80,1 %. Bien que 73 % des étudiants de sexe masculin déclarent préférer se marier avec des femmes non excisées, ils affirment également que la pratique des mutilations sexuelles féminines devrait être perpétuée et que leurs futures filles devraient être excisées (64,5 %). Les étudiantes se prononçaient contre la pratique des mutilations sexuelles/de l'excision pour leurs futures filles (77,6 %).

Conclusion : Cette étude montre que même les individus éduqués exigent la pratique des mutilations sexuelles féminines/de l'excision, bien qu'ils en connaissent la dangerosité. Nous recommandons donc de poursuivre les études à visée éducative sur ce sujet.

آراء طلاب الجامعة حول تشويه الأعضاء التناسلية للإناث (ختان الإناث) في السودان

مورات أكباس، أوزر بيرج، دينيز أرسلان، إرتوجرول غازي أوزي

الخلاصة

الخلفية: يعد تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث) عادة غير مشروعة تنتشر ممارستها في أفريقيا جنوب الصحراء والشرق الأوسط. وعلى الرغم من انتشار العولمة في العالم وتنامي وسائل التواصل الاجتماعي، لا تزال هذه الممارسة المؤذية جارية.

الأهداف: هدفنا إلى تقييم آراء طلاب الجامعة حول تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث).

طرق البحث: شملت هذه الدراسة الوصفية ٨٢١ طالباً يدرسون في جامعة نيالا، السودان، في يناير/ كانون الثاني ٢٠١٦. وتم توجيه أسئلة للطلاب عما يلي: العمر، والكلية، وأسباب ختان الإناث، وآثاره على الوظائف الجنسية لدى الإناث، وآرائهم حول ختان بناتهم.

النتائج: بلغ معدل تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث) بين طالبات الجامعة ٨٠,١٪. ورغم تفضيل ٧٣٪ من الطلاب الذكور الزواج من امرأة غير مختونة، إلا أنهم أشاروا إلى أن ممارسة تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث) يجب أن يستمر، وأنهم سوف يقومون بختان بناتهم في المستقبل (٥٤,٥٪). أما الطالبات فكن ضد ممارسة تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث) مع بناتهن في المستقبل (٧٧,٦٪).

الاستنتاجات: تؤكد هذه الدراسة أنه حتى الأفراد المتعلمين يطالبون باستمرار تشويه/ قطع الأعضاء التناسلية الأنثوية (ختان الإناث) رغم معرفتهم بأنها ممارسة مؤذية ومضرة. لذا يُقترح مواصلة إجراء دراسات تثقيفية حول هذا الموضوع.

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Compliance with school nutrition policy in Saudi Arabia: a quantitative study

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Abstract

Background: An evidence-based school nutrition policy that helps increase the availability and accessibility of healthy foods is needed in the Kingdom of Saudi Arabia.

Aims: This study investigated the compliance of selected schools with Saudi nutrition policy and assessed the nutritional value of food offered in such schools using the Institute of Medicine (IOM) standards.

Methods: A total of 76 boys public high schools were randomly selected from four areas in Riyadh, Saudi Arabia. Principals and canteen managers were interviewed using validated questionnaires. Schools were observed using a food checklist.

Results: Meals offered in Saudis schools come prepackaged with minimal cooking in schools. From a calorie perspective, there was not a significant difference between the food allowed and food not allowed. For the Saudi policy, 94.7% of the schools scored in between category 2 and 3 (moderate compliance). For the IOM standards, 96.1% of the schools scored in category 1 (low alignment).

Conclusions: While the Saudi policy is clear on what should not be served in school cafeterias, it fails to provide guidance on what must be served to improve the nutritional value of meals provided.

Keywords: Nutrition; school meals; breakfast; Institute of Medicine, policy

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Introduction

Childhood obesity is considered a pandemic in high-income as well as certain low-and middle-income countries. In the United States of America, the prevalence of obesity was 16.9% (38.1 million) among the youth (1). According to a Saudi national survey (n=19 317 children aged 5–18 years), the prevalence of overweight, obesity, and morbid obesity was 23.1%, 9.3% and 2%, respectively (2). In Riyadh, two cross-sectional studies showed that the proportion of obese children rose steadily from 3.4% in 1988 to 24.5% in 2005 (3). During that period, the mean BMI increased from 16.5 to 18.0 kg/m², and fat percentage jumped from 13.2 to 19.7% (3). Obese children are more likely to be obese during adulthood, and this increases the risk of health complications, such as cardiovascular diseases and metabolic syndrome, at an early age (4). Cardiovascular diseases were the leading cause of death among males and females in Saudi Arabia from 1990 until 2010 (5).

According to the World Health Organization (WHO) (2015), the primary cause of overweight and obesity is a lifestyle that leads to energy imbalance between calories consumed and calories expended (6). For example, consuming energy-dense foods, which are high in fat and sugar, and performing low physical activity could lead to obesity. Studies conducted in different regions of Saudi Arabia found a trend among adolescents of skipping breakfast and consuming more foods high in sugar and

fat rather than fiber and nutrient-dense foods such as fruits and vegetables (7–12). In Riyadh (Central Region) a study showed that the mean frequency intake per week of fruits and vegetables among adolescents aged 14–19 were 2.82 and 3.79 respectively (8). In addition, the mean frequency intake per week of sugar-sweetened drinks and sweets were 4.74 and 3.62 (9).

Moreover, according to WHO (2015), the high availability and accessibility of energy-dense foods with lack of supportive policies increase the consumption of these foods (10). In Saudi Arabia, the Ministry of Education (MoE) established the “Regulations of Health Conditions for School Canteens” in 2004 and updated the regulations in 2013 (11). This policy falls under the responsibilities of the General Administration of School Health (12). One of the five chapters is concerned with food offered in school canteens (13) and contains a list of banned food items, namely: confectioneries, chocolates, chips, soda, sport drinks, sweetened beverages, all meat products, and fried foods (14). We are not aware of other studies examining the effectiveness of the Saudi policy regarding this chapter on students’ weight and eating habits. It is believed that a lack of detail concerning the nutritional content of food that should be offered as detailed by the Saudi canteen policy could allow offering food that is high in fat and sugar.

Having school nutrition policies that help increase

the availability and accessibility of healthy foods is required. These policies could help in creating healthy school environments by providing healthy food choices. In the United States, several studies demonstrated the importance of a school nutrition policy that decreases the availability of energy-dense foods and increases the availability of healthy foods (13–17). The Institute of Medicine (IOM) school nutrition standards were used in this study since they offer recommendations for increasing the availability of nutritious foods and decreasing the availability of energy-dense foods in the United States (18). A review article that collected data from the Centers for Disease Control and Prevention (CDC) showed that schools in US states with policies more closely aligned with the IOM standards had low availability of the following foods: chocolate, candy, soda, sports drinks, and caffeinated foods or beverages (19).

The purpose of this study is threefold: first, to investigate the compliance of randomly selected boys' public high schools with the Saudi policy chapter "Meals and beverages offered in school canteens"; second, to assess the nutritional content of food offered as breakfast in Saudi boys' public high schools based on IOM school nutrition standards; and third, to determine the differences between schools' alignment scores and their location and report if they are adopting the Saudi policy.

Methods

Sample and procedures

In this study, 76 public high schools were randomly and evenly selected from four areas in Riyadh (19 north, 19 south, 19 east, and 19 west). In each area, simple randomization methods were used in the selection of the 19 schools to avoid sampling and non-coverage errors. This study included only boys' public high schools in Riyadh, Saudi Arabia. The sample size was measured with 95% confidence level and with $\pm 5\%$ margin of error. According to the Saudi Central Department of Statistics and Information (CDSI) (2015), there are 120 boys' public high schools in Riyadh city (20). Our sample size represents 63.3% of the total population.

Two research assistants were trained by principle investigators on the protocol of data collection. Both the school principal or representative and canteen managers were interviewed to investigate the compliance of their school with the Saudi policy regarding "Meals and beverages offered in school canteens." Our observations were used to assess the type of foods offered in the selected boys' public high schools in Riyadh; this information was used to estimate nutritional content of the foods such as calories, fat, saturated fat, trans-fat, sugar, sodium, and caffeine by using IOM school nutrition standards (18,21).

Measurements

The following scoring system was used: 0 indicated that the school did not meet the standards' requirement, and 1 indicated that it did meet the requirement. Schools were categorized into quartiles based on their compliance with

the Saudi policy. The banned food list consists of eight items: confectioneries, chocolates, chips, soft drinks, energy drinks, sweetened drinks, meat products, and fried foods (8). The possible total scores ranged from 0 to 8, with 0 representing a low compliance score and 8 representing a high compliance score. The total possible scoring range in each quartile was:

- Quartile 1 (compliance score from 0 to 2), which is equivalent to 0–25.0%
- Quartile 2 (compliance score from 3 to 4), which is equivalent to 25.1–50.0%
- Quartile 3 (compliance score from 5 to 6), which is equivalent to 50.1–75.0%
- Quartile 4 (compliance score from 7 to 8), which is equivalent to 75.1–100.0%

For assessing the nutritional compositions of food offered in the selected schools using IOM standards, the CDC's scoring system was used (18), which ranges from 0–2, with 0 indicating the food item did not meet the standards' requirement, 1 indicating that the food item partially met the standards' requirement, and 2 indicating that the food item met the standards' requirement. The IOM standards consist of 13 elements: four Standards for Nutritive Food Components, two Standards for Nonnutritive Food Components, five Standards for the School Day, and two Standards for the After-School Setting (21). Four IOM standards (marketing, allowing, and providing foods or beverages for high school students after school, and comparing à la carte entrée items with the National School Lunch Program [NSLP]), are not relevant to the Saudi school system and were excluded in our study. Breakfast and lunch meals are usually offered in US schools (22), whereas only breakfast is usually offered in Saudi schools (8,23). The nine selected relevant standards consist of 21 variables (18). The possible total scores ranged from 0 to 42, with 0 representing a low alignment score and 42 representing a high alignment score. The total possible scoring range in each quartile was:

- Quartile 1 (alignment score from 0 to 10.5), which is equivalent to 0–25.0%
- Quartile 2 (alignment score from 10.51 to 21), which is equivalent to 25.1–50.0%
- Quartile 3 (alignment score from 21.01 to 31.5), which is equivalent to 50.1–75.0%
- Quartile 4 (alignment score from 31.51 to 42), which is equivalent to 75.1–100.0%

The questionnaires for both the schools' principals and canteen managers were designed to measure the schools' compliance with the Saudi school nutrition policy regarding "Meals and beverages offered in school canteens." In these questionnaires, some questions were adopted from validated questionnaires used in a previous study (24). These questionnaires were validated by experts in nutrition, policy evaluation, research design, and statistics (consensual validity). In our study,

observational notes and food check list were designed to assess the nutritional compositions of food offered in the selected schools. Food items offered in schools were analyzed based on the manufacturer food labels. Permission to conduct data from public Saudi schools was granted from the Saudi Ministry of Education (reference no. 3496858). The Human Research Protection Program (HRPP) at Texas Tech University ethically approved this study (registration no. 504382).

Data Analysis

Data were statistically analyzed by SPSS statistics 22 software. The homogeneity of the demographic data among schools' location (North, South, West, and East) was tested. The primary study goal was to measure the differences between schools' compliance and alignment scores among schools' area and the schools' principals report if they adopted the Saudi policy (adopting schools vs. non-adopting schools). A *t*-test was used to measure any significant difference between means of the two groups, while One Way ANOVA was used to test significant difference among means of more than two groups. The significance power and effect size of the difference between schools' compliance and alignment scores among schools' area were also measured. A chi-square test of independence was run to examine the relation between

schools' locations and their alignment score categories for each of the IOM standards. Differences were considered statistically significant when $P < 0.05$.

Results

A total of 152 participants were interviewed from 76 boys' public high schools; half of those were school principals and half were canteen managers. Most school principals ranged in age from 30 to 40 years (42.1%) or from 41 to 50 (51.4%). A bachelor's degree was the highest educational level for slightly more than three quarters (78.9%) of the school principals. 21.1% of the school principals had ≥ 5 years' experience of working as principals, 46.1% of them had between 5 to 10 years' experience, and 23.7% of them had between 11 to 15 years' experience. Younger school principals were more likely to be in the Northern and Southern regions of Riyadh χ^2 (15, $N = 76$) = 23.801, $P < 0.05$, with no significant difference in other demographic characteristics. Therefore, the four groups based on school locations are almost homogeneous. Other demographic characteristics for both the interviewed school principals and the visited schools are provided in Table 1.

For the Saudi school nutrition policy, 44.7% (25) of the schools scored in category 2, 50% (38) of the schools scored in category 3, and 5.3% (4) of the schools scored in category 4. There is no significant correlation between

Table 1 Demographic characteristics of participating schools (n=76) and their principals (n=76)

Variables	% (n)	Mean (SD)	Range	P values
School location				
North of Riyadh	25% (19)			
South of Riyadh	25% (19)			
East of Riyadh	25% (19)			
West of Riyadh	25% (19)			
Principals' age range				
(30-40)	42.1% (32)			0.013 ^{*a}
(41-50)	51.4% (39)			
(51-60)	6.5% (5)			
Principals' education level				
Bachelor Degree	78.9% (60)			0.979 ^a
Master Degree	21.1% (16)			
Principals' experience				
< 5 years	21.1% (16)			0.528 ^a
5-10 years	46.1% (35)			
11-15 years	23.7% (18)			
16-20 years	5.3% (4)			
> 20 years	3.9% (3)			
Number of students enrolled		340.42 (105.93)	140-580	0.164 ^b
Number of students registered in the Saudi social security system		14.22 (12.80)	0-50	0.267 ^b
Graduation rate		0.89 (0.05)	0.80-0.99	0.191 ^b

^aP values of chi-square test regarding the differences among schools' locations. P values of Fisher's exact test were reported because some of the expected cells were < 5.

^bP values of One-Way ANOVA test regarding the differences among schools' locations.

^{*}Significance level at $P < 0.05$.

the schools' compliance with the Saudi policy regarding "Meals and beverages offered in school canteens" and demographical variables. There were no significant differences between schools' locations and schools' compliance scores with the Saudi policy regarding the banned foods list, $F(3, 72) = 1.296, P = 0.282$. There was no statistically significant difference between adopting schools (5.25 ± 1.42) and non-adopting schools (4.67 ± 1.11) in regards to their compliance scores with banned foods list in the Saudi policy, $t(74) = 1.578, P = 0.119$. This result was reported from t test with assumed equal variance, Levene's $F(1, 74) = 0.941, P = 0.335$.

For the IOM standards, 96.1% (73) of the schools scored in category 1, and 3.9% (3) of the schools scored in category 2. There is no significant correlation between the alignment scores to the IOM standards and the demographical variables. There were significant differences between schools' locations and schools' alignment scores to the IOM school nutrition standards, $F(3, 39.555) = 4.245, P = 0.011$ (see Table 2). This significant result was reported from Welch test because of unequal variances, Levene's $F(3, 72) = 4.209, P = 0.008$. According to the Tukey post hoc test, schools located in the East of Riyadh had significantly higher alignment scores to the IOM standards compared to schools located north of Riyadh ($1 \pm .363$ scores, $P = 0.036$) and schools located south of Riyadh ($1 \pm .363$ scores, $P = 0.036$). Schools in the east of Riyadh were more diligent in prohibiting carbonated, fortified, and flavoured waters, $\chi^2(3, N = 76) = 12.179, P < 0.01$ (see Table 3). There was no statistically significant difference between adopting schools (8.75 ± 1.21) and non-adopting schools (9.06 ± 1.18) with regards to their alignment scores to IOM school nutrition standards, $t(74) = -0.838, P = 0.405$. This result was reported from t test with assumed equal variance, Levene's $F(1, 74) = 0.312, P = 0.578$.

The significance power of Welch test was calculated based on the sample size in each group and their effect sizes. The effect sizes were measured based on the means and standard deviation differences between the groups according to school locations. The effect size (Cohen's d) of schools located east of Riyadh compared to schools located north of Riyadh was 1.0115. This effect size and sample size, equal to 19 in each group, yield power equal to 0.86, which is acceptably high. In addition, the effect size (Cohen's d) of schools located east of Riyadh compared to schools located south of Riyadh was 0.825. This effect size

and sample size, equal to 19 in each group, yield power equal to 0.697, which is also acceptably high. Moreover, the normality of the schools' alignment scores to IOM standards was statistically tested by Shapiro-Wilk test. The results showed that the schools alignment scores to IOM standards were significantly normal, $W(76) = .873, P = 0.000$.

Concerning food offered in schools, all 76 schools offered prepackaged food, namely: cheese puffs, apple puffs, plain croissant, cheese croissant, and zaatar croissant (roasted thyme with sesame seeds). These prepacked foods contain more energy, fat, and saturated fat than what is recommended by IOM standards (see Table 4). Compared to a sample of commonly banned foods in the Saudi policy, these prepacked foods provide similar total calories and percentage of total calories from fat per portion as packaged (see Table 5). This comparison did not look at other nutrients.

Eleven schools indicated that they prepared fried foods such as fried potatoes and while two schools reported preparing 100% fresh fruit juices. Three of the 76 schools had vending machines that carried some or all of the following: bottled plain water, whole fat milk, flavoured whole fat milk, artificially flavoured drinks, chips, candies, prepackaged cakes, and chocolate bars. Although bottled water was available for sale in all schools, 63 schools had working water fountains. Cakes and muffins were available in 75 schools, confectionaries were available in 73 schools, and biscuits and cookies were available in 71 schools. Chips were available in 40 schools, which is slightly above half of the selected schools. None of the 76 schools carried fruits or vegetables.

Discussion

The results showed that the compliance score of most of the selected schools in Riyadh (94.7%) with the requirements of the Saudi policy regarding "Meals and beverages offered in school canteens" ranged from 25% to 75%. These results indicated moderate compliance of boys' public high schools in Riyadh to the Saudi policy. Although no percentage was reported, a similar trend was found in the Gulf region. According to the World Cancer Research Fund (2015), the compliance of Kuwaiti public schools with banned foods monitored by the Kuwaiti Ministry of Education was not high (26).

The results also showed that the alignment of the majority of the selected schools in Riyadh (96.1%) met

Table 2 ANOVA results for the difference between school Location and school alignment scores with IOM school nutrition standards

Schools Locations	N	Mean	SD	F value	P value
North of Riyadh	19	8.58a	1.07	4.245d	0.011*
South of Riyadh	19	8.58b	1.46		
East of Riyadh	19	9.58a,b	0.90		
West of Riyadh	19	9.31	0.95		

^{a,b}denotes significant group differences in the Tukey post hoc test. ^d Welch test was used because of unequal variances.

* Significance level at $P < 0.05$.

Table 3 Results of cross-tabulation of school location and alignment score categories with Prohibited carbonated, fortified, and flavoured waters standard

Schools Locations	Prohibited carbonated, fortified and flavoured waters standard		χ^2	P - value
	Did fully meet the standard	Did not meet the standard		
North of Riyadh	10	9	12.179	0.007*
South of Riyadh	9	10		
East of Riyadh	16	3		
West of Riyadh	17	2		

*Significance level at $P < 0.01$

< 25% of IOM standards. Similar results, reported by the CDC (2012), found that high schools in 25 out of 39 US states had an alignment score that ranged from 0% to 25%. The present study found that none of the selected schools in Riyadh met the IOM recommendations for the percentage of total energy, fat, and saturated fat in foods offered as breakfast in school canteens. Results showed that foods available in the selected schools in Riyadh contain more energy, fat, and saturated fat than what is recommended by IOM standards. These results concur with a study conducted in the United States that 73.8%, 36.2%, and 71.2% of students aged 5–13 years selected foods that exceeded the upper limit of the IOM recommendations with total energy, fat, and saturated fat, respectively (27).

This study found that most prepackaged foods offered as breakfast in the selected boys' public high schools in Riyadh were energy-dense snacks such as cakes and muffins (98.7%), confectionaries (96%), biscuits and cookies (93.4%), and chips (52.6%). These results confirm the findings of a study conducted in the southern region of Saudi Arabia, which found that 87% of the food items available in the school canteens in Abha were energy-dense foods such as confectionaries, chips, cakes, cookies, pudding, and ice cream (28). Similarly, in the United States, a study found that 44%, 23%, and 20% of 494 high schools offered doughnuts, biscuits, and muffins, respectively for breakfast (29).

The results of the present study found that neither sports drinks nor soft drinks were available in the selected schools in Riyadh. However, soft drinks were available in schools in Abha (28). The present study found that whole milk and flavoured whole milk were available in all selected schools in Riyadh. This result was consistent with Togoo et al. (2012), as whole milk and flavoured whole milk were also available in schools in Abha (28). On the contrary, schools in the United States offered more low-fat milk than whole-fat milk for breakfast (29). The present study also found that fresh fruit was not available in all selected boys' public high schools in Riyadh. However, based on the student reports, fresh fruit was available in 13% of the schools in Abha (28). In the United States, 50% of 494 high schools offered fresh fruit for breakfast (29).

The results of this study showed that schools in the east of Riyadh were more diligent in prohibiting carbonated, fortified, and flavoured waters compared to schools in the north and south of Riyadh. Results also showed that 24 out of 76 schools in Riyadh offered carbonated, fortified and flavoured waters, since these beverages were not listed in the Saudi policy as banned beverages. Offering these types of beverages could compete with the consumption of potable water in schools. The present study showed that bottled water was available for sale in all schools, and 63 out of 76 schools had working water fountains. In the United states, a study revealed that increasing the availability of competitive beverages and

Table 4 Mean percentage of total calories from fat, saturated-fat and sugar from a sample of common allowed prepacked foods compared to IOM recommendations

Food items	Mean ^a percentage of total calories from fat per portion as packaged	Percentage above IOM standards for total calories from fat ($\geq 35\%$)	Mean ^a percentage of total calories from saturated- fat per portion as packaged	Percentage above IOM standards for total calories from saturated- fat ($\geq 10\%$)	Mean ^a percentage of total calories from sugar per portion as packaged	Percentage above IOM standards for total calories from sugar ($\geq 35\%$)
Cheese puffs	54%	19%	16%	6%	40%	5%
Apple puffs	46%	11%	16%	6%	51%	16%
Plain croissant	52%	17%	13%	3%	42%	7%
Cheese croissant	51%	16%	17%	7%	42%	7%
Zaatar ^b croissant	45%	10%	12%	2%	41%	6%

^aThe mean percentage of total calories from fat, saturated-fat, and sugar of prepacked foods from various food manufacturers.

^bRoasted thyme with sesame seeds.

Table 5 Mean of total calories and mean percentage of total calories from fat of a sample of allowed prepacked foods compared to a sample of common banned foods according to Saudi policy

Food Items	Allowed food items ^a					Banned food items				
	Cheese puffs	Apple puffs	Plain croissant	Cheese croissant	Zaatar ^b croissant	Chocolates ^c	Cakes ^c	Biscuits ^c	Sodas ^d	Chips ^e
Mean ^f of total calories per portion as packaged (kcal)	228	217	210	208	232	242	192	236	180	160
Mean ^f percentage of total calories from fat per portion as packaged	54%	46%	52%	51%	45%	45%	41%	39%	—	55%

^aNutritional information per 100 g portion.

^bRoasted thyme with sesame seeds.

^cNutritional information per 50 g portion.

^dNutritional information per 12 US fl oz can, which is equivalent to 360 ml can.

^eNutritional information per 28 g portion.

^fThe mean of total calories and the mean percentage of total calories from fat of prepacked foods from various food manufacturers.

limiting the access to free water could be barriers in promoting potable water consumption in schools (30).

Limitations

There were several limitations with our study. First, this study focused only on Riyadh and our study's results cannot be generalized to schools in other cities in Saudi Arabia. Second, our study excluded female schools because only female investigators were allowed access, and the study was conducted by a male investigator. Therefore, we cannot generalize our study's results to female schools in Riyadh. Third, our study focused only on public high schools, and we cannot generalize our study's results to public elementary, public middle, and private schools in Riyadh. However, it is believed that this study is the first of its kind that investigates the compliance of boys' public high schools with the Saudi policy regarding "Meals and beverages offered in school canteens." It is also the first of its kind that uses IOM's school nutrition standards in the assessment of the Saudi policy and the nutritional content of foods offered as breakfast in boys' public high schools in Riyadh. Because the power of our sample size was measured, the significance reached is acceptable and the normality of the data was not violated; thus, our results can be generalized to male public high schools in Riyadh.

Conclusion

This study showed that the boys' public high schools in Riyadh had a moderate compliance to the Saudi policy regarding "Meals and beverages offered in school canteens." The Saudi Ministry of Education was effective in banning soda and sports beverages in Riyadh, since none of the selected public schools offered these drinks. However, the Saudi Ministry of Education needs to improve compliance of public schools in Riyadh with other banned food items and increase the availability of nutri-

tious foods such as whole grains, fruit and vegetables. Further studies are required to investigate the compliance of public schools with the other four chapters of the Saudi policy. The present study also showed that the selected schools in Riyadh have a low alignment with IOM standards. This is to be expected, since the Saudi policy regarding "Meals and beverages offered in school canteens" lacks detail on nutritional content of food items allowed in school canteens compared to IOM standards. The present study showed that a sample of commonly offered prepacked foods provide similar total energy and percentage of total calories from fat per portion as packaged when compared to foods from the banned list in the Saudi policy. Therefore, permitted and banned food items in the Saudi policy need to be expanded based on evidence-based standards such as the IOM.

Although the selected schools had moderate compliance with the Saudi policy and that all schools banned soft drinks and energy beverages, 84% of schools reported that they did not adopt the Saudi policy. The reasons behind this discrepancy are unknown, as this study was not designed to examine this. Two studies showed that lack of funds, awareness, coordination, cooperation, resources, training and enforcement are possible barriers to implementing the school wellness policies in the United States and adopting nutrition guidelines in schools in Canada (31,32). In addition, two non-school studies conducted in Kenya and Nigeria showed that poor communication between policy-makers and policy implementers is a possible barrier to the low or moderate compliance to a policy (33,34). A similar finding was reported in a Saudi study that poor communication between the Saudi Ministry of Health and health workers is one of the identified problems that face healthcare delivery in Saudi Arabia (25). Therefore, follow-up qualitative studies, such as focus groups, are required to identify barriers to adopting and implementing the Saudi policy.

In order to offer healthy foods in schools in the six Gulf Cooperation Council (GCC) countries, the United Nations International Children's Emergency Fund (UNICEF) (2014) provided recommendations to their governments (35). The recommendations include introduction of a law that bans unhealthy items sold in school canteens, establishing a School Health Committee, and incorporating health education sessions as a mandatory component of the new school curriculum (35). Although the Saudi policy has a list of certain banned foods, our study showed that this list is not enough to ensure offering healthy foods and snacks for breakfast in

schools. The present study showed that most of the food offered in the selected boys' public high schools were energy-dense foods that were high in fat and sugars. Therefore, it is highly recommended for policy-makers in the Saudi Ministry of Education to develop the Saudi policy regarding "Meals and beverages offered in school canteens" based on evidence-based standards such as the IOM. It is also recommended that the Saudi Ministry of Education source specialized nutritional advice in order to develop the Saudi policy.

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Competing interests: None declared.

Respect de la politique nutritionnelle en milieu scolaire en Arabie saoudite : étude quantitative

Résumé

Contexte : Le Royaume d'Arabie saoudite doit mettre en place une politique nutritionnelle en milieu scolaire qui repose sur des bases factuelles afin d'accroître la disponibilité et l'accessibilité d'aliments sains.

Objectifs : La présente étude a pour objectif d'examiner le respect par un certain nombre d'écoles de la politique de nutrition mise en place en Arabie saoudite et d'évaluer la valeur nutritionnelle des aliments proposés dans ces écoles à l'aide des normes de l'Institute of Medicine (IOM).

Méthodes : Au total, 76 établissements secondaires publics de garçons ont été sélectionnés au hasard dans quatre quartiers de Riyad (Arabie saoudite). Les proviseurs et les responsables de cantine ont été interrogés à l'aide de questionnaires validés. Une liste de contrôle des aliments a été utilisée pour observer les établissements scolaires.

Résultats : Les repas proposés dans les établissements scolaires saoudiens sont livrés sous forme préemballée et ne nécessitent qu'une remise en température sur place. Du point de vue des calories, aucune différence notable n'a été notée entre les aliments autorisés et les aliments non autorisés. En ce qui concerne la politique mise en place par le Royaume d'Arabie saoudite, le score obtenu par 94,7 % des établissements se situait entre la catégorie 2 et la catégorie 3 (niveau de conformité modéré). Pour ce qui est des normes de l'IOM, le score obtenu par 96,1 % des établissements se situait dans la catégorie 1 (niveau de conformité faible).

Conclusions : Bien que la politique mise en place par le Royaume d'Arabie saoudite indique clairement les aliments qui ne doivent pas être servis dans les cantines scolaires, elle ne formule pas d'orientations sur les aliments à privilégier pour améliorer la valeur nutritionnelle des repas fournis.

الامتثال لسياسة التغذية في المدارس في المملكة العربية السعودية: دراسة كمية

خالد الديان، ماري موري

الخلاصة

الخلفية: يجب وضع سياسة تغذية قائمة على البراهين في المدارس تساعد على زيادة توافر الأغذية الصحية والحصول عليها في المملكة العربية السعودية.

الأهداف: حققت هذه الدراسة في امتثال المدارس المحددة لسياسة التغذية السعودية، وقيمت القيمة التغذوية للأغذية المقدمة في هذه المدارس باستخدام معايير المعهد الطبي.

طرق البحث: تم اختيار ٧٦ مدرسة ثانوية حكومية للبنين بشكل عشوائي من أربع مناطق في مدينة الرياض، المملكة العربية السعودية. وتم إجراء مقابلات مع مديري المدارس ومديري المطاعم المدرسية باستخدام الاستبيانات المتحقق من صحتها. وتمت مراقبة المدارس باستخدام قائمة مرجعية للأغذية.

النتائج: تأتي الوجبات المقدمة في المدارس السعودية معلبة مسبقاً لا تحتاج إلا القليل من الطهي في المدارس. ومن ناحية السعرات الحرارية، لا توجد أي فروق جوهرية بين الطعام المسموح به والطعام غير المسموح به. وبالنسبة للسياسة السعودية، وقعت ٧٩,٤٪ من المدارس بين الفئتين ٢ و ٣ (امتثال متوسط). أما بالنسبة لمعايير المعهد الطبي، وقعت ٩٦,١٪ من المدارس في الفئة ١ (مواءمة منخفضة).

الاستنتاجات: بينما تُعد السياسة السعودية واضحة بشأن ما لا ينبغي تقديمه في مطاعم المدارس، لم توفر إرشادات بشأن ما يجب تقديمه لتحسين القيمة التغذوية للوجبات المقدمة.

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Comparison of time-restricted feeding and Islamic fasting: a scoping review

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Abstract

Background: Research on the health benefits of fasting is growing; this includes time-restricted feeding and Islamic fasting.

Aims: This article aims to review and highlight the similarities and differences between time-restricted feeding and Islamic fasting during Ramadan.

Methods: A scoping review was undertaken to identify relevant articles that answered the research question: what are the similarities and differences in characteristics of time-restricted feeding and Islamic fasting? MEDLINE/PubMed was searched using the terms: time-restricted feeding, and weight. Inclusion criteria were: original research and review articles; written in English; and published between the years 2000 and 2017.

Results: A total of 25 articles that answered the research question were included in the review: 15 original research papers and 10 reviews. The findings suggest that Ramadan fasting is a form of time-restricted feeding in the contemporary context because of the period when eating is not allowed. The fasting duration reported in time-restricted feeding ranged from 4 to 24 hours, which is longer than that of Islamic fasting which is between 8 and 20 hours. Both time-restricted feeding and Islamic fasting have been found to have positive health effects, including weight reduction.

Conclusion: Time-restricted feeding and Islamic fasting have many similar characteristics and reported positive health effects.

Keywords: Fasting, time-restricted feeding, eating, Islam

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Introduction

Fasting is a spiritual practice in several faiths and has been researched as a treatment for some medical conditions such as hypertension and cancer (1,2). In addition, research on fasting for other health reasons is increasing, such as its use as an effective and reasonably safe method to lose weight (3). Most of these were experimental studies carried out in laboratories using animals. However, several studies on humans have been conducted to monitor food intake, for example monitoring of predetermined allowable calories or time-restricted feeding.

The literal definition of fasting is voluntarily refraining from consuming food for a certain length of time. In the current literature on fasting, the definition varies, and includes consuming only water (1) and sometimes juices (also known as modified fasting), consuming 25% of baseline energy needs (4) and consuming less than 500 calories within 24 hours (also known as a very-low-calorie diet).

Other terminology is used in research on fasting such as intermittent fasting and nocturnal eating. Intermittent fasting means a cycle of a period of fasting and one of non-fasting – the interval between these two periods ranges from a few hours to 24 hours or more (5). Intermittent

fasting includes at least two variants – time-restricted feeding and intermittent energy restriction. Time-restricted feeding means allowing food consumption during a much smaller period of time than people are normally used to (6), while intermittent energy restriction is an eating pattern of regular daily periods of restricted energy intake followed by periods of unrestricted energy intake (6). Among the most commonly used fasting patterns are alternate-day fasting, two-day-a-week fasting (5:2) and duration fasting ranging from 5 to 40 days. However, comparative research on the effects restricted food intake and fasting on weight loss is still sparse in clinical settings and at the community level.

None of the contemporary definitions of fasting is the same as the definition of Islamic fasting, either the compulsory month-long fasting during the month of Ramadan (Ramadan fasting) or voluntary fasting (Sunnah fasting). In Islamic fasting, Muslims refrain from consuming both food and water from sunrise to sunset. Therefore, the duration of daily fasting varies according to the time from sunrise to sunset in a particular location. In countries located near the equator, the duration of fasting is about 14 hours and the allowable feeding time is about 10 hours. However, in countries further away from the equator, the duration of fasting varies according

to the season – longer in summer (more than 20 hours) and shorter in winter (less than 8 hours) (7).

The number of days for compulsory fasting during Ramadan is 28 or 29 days (one lunar month), while the number of days for voluntary fasting varies. The more commonly practised voluntary fasting includes two-days-a-week fasting (5:2) on Mondays and Thursdays, 3-days-a-month fasting and alternate-day fasting. Other days on which Muslims are encouraged to perform voluntary fasting are 6 days in the month of syawal and the day of arafah (associated with the Hajj pilgrimage).

Although Islamic fasting has some of the same elements as time-restricted fasting, there is no restriction on energy or calorie intake and the duration of fasting is compulsory for one lunar month a year and voluntary for several days a year.

This review attempts to highlight the similarities and differences between time-restricted feeding and Islamic fasting and their effects on weight and health.

No ethical clearance was sought for this study as it was a review of the literature.

Methods

A scoping review methodology was chosen as a framework to map the relevant literature. The framework consists of the following main stages: identifying the research question; identifying relevant studies using a systematic literature search based on the formulated research question; selecting the studies; tabulating the findings; and collating, scrutinizing, summarizing and reporting the results (8,9).

This review was divided into two parts. The first part was guided by the research question “What are the characteristics and findings of research on current time-restricted feeding which is not Ramadan fasting?” The second part was guided by the question “What are the findings of published systematic reviews of Ramadan fasting?” The literature search was conducted on 16 May 2017. The electronic databases, MEDLINE/PubMed were searched using the Boolean operator “AND”. The search terms used were: “time-restricted feeding” and “weight” (one of the most common studied outcome variable) (10). Inclusion criteria for the articles were: original research and review article; written in the English; and published between the years 2000 and 2017. We also searched on Google and hand-searched for other documents.

The selection of articles was done in three stages. The first stage was reviewing the titles of studies. After exclusion of duplicates and non-relevant titles, the second stage was reviewing the titles and the abstracts. After further exclusions, the final stage was reviewing the full texts of the articles retained. The data recorded for the original research articles were: author and year of publication, title of article, subject of the intervention (humans or animal), feeding period and duration of time-restricted feeding.

For the question of part one, the search yielded 43 articles and nine more articles from other sources. After

duplications were removed, 45 articles were screened in more depth. After this, 23 articles were removed because they did not study time-restricted feeding or the effects of interest. Of the 22 articles remaining, 15 were original research (6,11–24) and six were reviews (3,5,10,25–27). For the question of part two, three systematic reviews were selected (28–30). A summary of the selected research articles is given in Table 1 and includes the feeding time, duration of time-restricted feeding and type of diet.

Results and discussions

Feeding time and diurnal variation

Among the six human research studies on time-restricted feeding, the shortest feeding time was 4 hours (11–14). The others were 8 and 12 hours (15,16). The 4-hour feeding times were all in the evening (the 4 hours started between 16:00 and 18:00 and end between 20:00 and 24:00) (11–14). The 8-hour feeding time was from 13:00 to 21:00, and the 13-hour feeding time was from 06:00 to 19:00 (15,16). The feeding times in the animal experiments were generally longer, between 8 and 12 hours; in five experiments the feeding time was 8 hours (17–21), in one experiment it was 9 hours (22), in three it was 12 hours (21,23,24) and in one experiment the hours varied (6).

In contrast, the period for Islamic fasting in general is between 8 and 20 hours. The feeding time varies according to the location and time of year. The shortest feeding time is about 4 hours in summer while it is 16 hours in winter. In most countries, the feeding time is about 10 hours. Thus, the Islamic fasting is never for 24 hours, not even for Muslims in the North and South poles where there are 24 hours of daylight in summer and 24 hours of night in winter, because Muslims in these parts of the world can follow the timing for fasting of the nearest country that has a shorter day or night, and this is generally still between 8 and 20 hours of fasting (7).

The other aspect that has been studied in time-restricted feeding is the time of feeding either in the dark cycle/inactive phase or vice versa, in other words, the circadian variation in feeding pattern. In three animal studies, feeding during the dark phase was studied (18,21,22). Most of the feeding times in time-restricted feeding research were during day time and lasted up to midnight for both animals and humans. There is no human study on circadian variation however it is similar to the feeding pattern in Islamic fasting. Food and drink are consumed after sunset and can be consumed until sunrise when total abstinence from food and water starts; this is known as dark phase in time-restricted feeding experiments.

A review of night-time eating reported that eating at night is harmful as it makes one susceptible to obesity (31). However, a more recent review reported that for some types of food such as protein, pre sleep nutrient intake does not cause weight gain and is even linked to potential benefits (25). Furthermore, another study suggested that nocturnal timing can prevent obesity and rectify the harmful effects of a high-fat diet in mice (26).

Table 1 Original research articles selected for the time-restricted feeding study which were not Ramadan fasting

Author, year (reference)	Title	Human/ animal	Feeding time	Duration	Feeding type
Tinsley et al., 2016 (11)	Time-restricted feeding in young men performing resistance training: A randomized controlled trial	Human	4 hours (any 4 hours between 16:00–24:00)	8 weeks	Calorie intake unrestricted
Stote et al., 2007 (12)	A controlled trial of reduced meal frequency without caloric restriction in healthy, normal-weight, middle-aged adults	Human	4 hours (17:00–21:00)	8 weeks	Calories for weight maintenance
Halberg et al., 2005 (13)	Effect of intermittent fasting and refeeding on insulin action in healthy men	Human	4 hours (17:00–21:00)	15 days (7 days fasting) (alternate days)	Usual macronutrient meal
Soeters et al., 2009 (14)	Intermittent fasting does not affect whole-body glucose, lipid, or protein metabolism	Human	4 hours (18:00–22:00)	15 days (7 days fasting) (alternate days)	Standard diet
Moro et al., 2016 (15)	Effects of eight weeks of time-restricted feeding (16/8) on basal metabolism, maximal strength, body composition, inflammation, and cardiovascular risk factors in resistance-trained males	Human	8 hours (13:00–21:00)	8 weeks	100% energy need
LeCheminant et al., 2013 (16)	Restricting night-time eating reduces daily energy intake in healthy young men: a short-term cross-over study	Human	13 hours (6:00–19:00)	2 weeks	Normal diet, night eating restriction
Duncan et al., 2016 (17)	Restricting feeding to the active phase in middle-aged mice attenuates adverse metabolic effects of a high-fat diet	Animal	8 hours	21 and 25 weeks	High-fat diet
Chung et al., 2016 (18)	Time-restricted feeding improves insulin resistance and hepatic steatosis in a mouse model of postmenopausal obesity	Animal	8 hours	7 weeks	High-fat diet, nocturnal feeding
Manzanero et al., 2014 (19)	Intermittent fasting attenuates increases in neurogenesis after ischemia and reperfusion and improves recovery	Animal	8 hours	3 months/12 weeks	High-fat diet
Hatori et al., 2012 (20)	Time-restricted feeding without reducing caloric intake prevents metabolic diseases in mice fed a high-fat diet	Animal	8 hours	18 weeks	Calorie intake not reduced
Sundram et al., 2016 (21)	Time-restricted feeding reduces adiposity in mice fed a high-fat diet	Animal	8 and 12 hours	5 days/week for 5 weeks	High-fat diet, dark cycle
Olsen et al., 2017 (22)	Time-restricted feeding on weekdays restricts weight gain: A study using rat models of high-fat diet-induced obesity	Animal	9 hours	5 days/week for 9 weeks	High-fat diet, dark phase
Melkani et al., 2017 (23)	Time-restricted feeding for prevention and treatment of cardiometabolic disorders	Animal	≤ 12 hours	Monitoring, 7 week	Calorie intake not reduced
Gill et al., 2015 (24)	Time-restricted feeding attenuates age-related cardiac decline in <i>Drosophila</i>	Animal	12 hours	5–7 weeks	Standard corn-meal diet
Chaix et al., 2014 (6)	Time-restricted feeding is a preventative and therapeutic intervention against diverse nutritional challenges	Animal	Varying hours	12 weeks	Standard diet

Duration of fasting and meal frequency

The duration of fasting in the time-restricted feeding research varied, ranging from 2 to 25 weeks. Among the research on human, the shortest duration was 2 weeks (16), while the longest was 8 weeks (11,12,15). However, among the animal experiments, the longest duration was 25 weeks (16). In Islamic fasting, the longest duration of compulsory fasting is only a month (4 weeks) during Ramadan. Thus, the longest consecutive fasting time in Islamic fasting is less than in most of the time-restricted feeding research on human or animal's experiment that we reviewed.

The pattern of the duration of fasting in time-restricted feeding studies also varies. In general, the fasting is consecutive days but in two studies with humans, it was alternate days (13,14). As for the pattern in voluntary Islamic fasting, there are many variations as this fasting is unrestricted and undertaken according to the wishes and ability of the person. It could be fasting for one or two specific days a week or three days a month or on alternate days.

As explained earlier, Islamic fasting, particularly in Ramadan, has both a circadian cycle of feeding (eating at night only) and a reduction in daily meal frequency (not more than twice or three times a day). In Ramadan fasting, Muslims do not usually eat all night and meal frequency is restricted to twice or three times between the period of sunset and sunrise: at the time of breaking fast (sunset), after the voluntary night prayers before sleeping and during pre-dawn meal. Reducing meal frequency to only once daily has been shown to significantly reduce fat mass without affecting most physiological variables such as heart rate, body temperature and blood metabolites (32). Thus, reducing meal frequency among Muslims who eat more than three meals outside of Ramadan could result in similar benefits (32).

Calorie and water restriction

As mentioned earlier, the definition of fasting varies. Among the more commonly known definition of fasting in the contemporary non-Islamic context, fasting is restricting consumption to only water or allowing a certain amount of low-calorie intake food. The time-restricted feeding studies with humans included in this review did not restrict calorie intake. The animal experiments also had no calorie restrictions; most used a high-fat diet or the same amount of calories (6,17–24). Similar to most time-restricted feeding studies, Islamic fasting has no calorie restrictions.

However, Islamic fasting does not allow water consumption. Therefore, the stress to the physiological system during Islamic fasting is different from that of the contemporary, non-Islamic fasting. During fasting, dehydration certainly occurs; however, studies have shown it to be safe for healthy individuals (33), and no adverse effects have been reported for people with chronic kidney disease and diabetes and pregnant women, even though they are not obliged to fast (28,34–37). However

caution is advised for people with moderate to severe chronic kidney disease (28).

Health benefits

Although there are few studies on time-restricted feeding, especially on humans, research has shown health benefits and were highlighted in systematic reviews. Most research on time-restricted feeding has focused on body weight as one of the study variables. The main health benefits identified from time-restricted feeding research related to weight are: reduction in energy intake (11,18), reduction in weight, and prevention of excessive body weight gain (6,18,22,23). Other health benefits are: reduction in body fat (15), improvement in glucose tolerance and insulin resistance (6,18), cardiometabolic benefits (24). Similarly, research on Islamic fasting has also focused on weight, in addition to the effects of fasting on blood lipid profile and glucose tolerance. Systematic reviews of Ramadan fasting showed weight reduction and improved blood lipid profiles (29,30,38).

In general, research on time-restricted feeding and Islamic fasting shows weight reduction. Prevention of weight gain, or weight maintenance, has been studied in time-restricted feeding but this has not been well studied in Islamic fasting. However, a study promoting voluntary Islamic fasting after Ramadan showed post-Ramadan weight gain was controlled (39,40). Examples of other variables studied in time-restricted feeding are body fat and blood cholesterol, which showed overall improvement, and these findings are similar to findings in Ramadan fasting. Thus, even without any restriction on calorie intake or type of food in Islamic fasting, there were some noteworthy health benefits.

Conclusions and recommendations

Ramadan fasting is a type of time-restricted feeding because the time period of feeding is restricted in Ramadan fasting, similar to the time-restricted feeding in the contemporary, non-Islamic fasting. In fact, in one of the systematic reviews of time-restricted feeding documented that among 11 human studies, nine were on Ramadan fasting (27).

There is some empirical evidence of the health benefit of time-restricted feeding and Islamic fasting (compulsory Ramadan fasting and voluntary fasting), including weight reduction. However, Islamic fasting does not involve much dietary intervention or restriction and does not incur any additional costs, whereas some dietary interventions have special diet bars or snacks, or low calorie formulas which could be expensive. Therefore, it is recommended that Islamic fasting is further studied at clinical and community levels to ascertain if it could be considered a strategy to improve health and weight management, especially in the global Muslim community.

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Comparaison entre la prise alimentaire limitée dans le temps et le jeûne islamique : étude de portée

Résumé

Contexte : La recherche sur les bienfaits du jeûne pour la santé se développe ; ceci inclut la prise alimentaire limitée dans le temps et le jeûne islamique.

Objectifs : Le présent article a pour objectif de passer en revue et de souligner les similitudes et les différences entre la prise alimentaire limitée dans le temps et le jeûne islamique pendant le Ramadan.

Méthodes : Une étude de portée a été entreprise pour identifier les articles pertinents qui répondaient à la question de recherche : quelles sont les similitudes et les différences dans les caractéristiques de la prise alimentaire limitée dans le temps et du jeûne islamique ? Des recherches ont été réalisées sur MEDLINE/PubMed en utilisant les termes : prise alimentaire limitée dans le temps et poids. Les critères d'inclusion étaient les suivants : articles de recherche originaux et analyses, rédigés en anglais et publiés entre 2000 et 2017.

Résultats et discussion : Au total, 25 articles correspondant à la question de recherche ont été inclus dans l'analyse : 15 articles de recherche originaux et 10 analyses. Les résultats laissent penser que le jeûne du Ramadan est une forme de prise alimentaire limitée dans le temps dans le contexte contemporain en raison de la période où l'alimentation n'est pas autorisée. La durée du jeûne signalée dans les cas d'alimentation à durée limitée variait de 4 à 24 heures, ce qui est plus long que dans le cas du jeûne islamique, qui dure entre 8 et 20 heures. On a constaté que la prise alimentaire limitée dans le temps et le jeûne islamique ont des effets positifs sur la santé, y compris la perte de poids.

Conclusion : L'alimentation limitée dans le temps et le jeûne islamique présentent de nombreuses caractéristiques similaires ainsi qu'un effet positif sur la santé constatés.

مقارنة التغذية المقيدة بالوقت والصيام الإسلامي: مراجعة استكشافية

سورياني بنت إسماعيل، روزليزا عبد المناف، ادلينا محمود

الخلاصة

الخلفية: البحوث حول الفوائد الصحية للصيام آخذة في الازدياد؛ وهذا يشمل التغذية المقيدة بالوقت والصيام الإسلامي.

الأهداف: هدفت هذه المقالة إلى مراجعة أوجه التشابه والاختلاف بين التغذية المقيدة بالوقت والصيام الإسلامي خلال شهر رمضان وتبسيط الضوء عليهما.

طرق البحث: أجريت مراجعة استكشافية لتحديد المقالات ذات الصلة التي أجابت على سؤال البحث: ما هي أوجه التشابه والاختلاف في خصائص التغذية المقيدة بالوقت والصيام الإسلامي؟ بُحِثَ في مدلاين وبمبد باستخدام المصطلحات: التغذية المقيدة بالوقت، والوزن. وكانت معايير الإدراج هي: البحوث الأصلية ومقالات المراجعات؛ المكتوبة باللغة الإنجليزية؛ والمنشورة بين عامي ٢٠٠٠ و٢٠١٧.

النتائج: لقد أدرج في المراجعة ما مجموعه ٢٥ مقالة أجابت على سؤال البحث: ١٥ ورقة بحثية أصلية و ١٠ مراجعات. وتشير النتائج إلى أن صيام رمضان يعتبر شكلاً من أشكال التغذية المقيدة بالوقت في السياق المعاصر بسبب الفترة التي لا يسمح خلالها بتناول الطعام. وتراوحت فترة الصيام المُبلَّغ عنها في التغذية المقيدة بالوقت من ٤ إلى ٢٤ ساعة، وهي أطول من فترة الصوم الإسلامي التي تتراوح بين ٨ و٢٠ ساعة. ووجد أن كلاً من التغذية المقيدة بالوقت والصيام الإسلامي لهما آثار صحية إيجابية، بما فيها تخفيض الوزن.

الاستنتاجات: إن التغذية المقيدة بالوقت والصيام الإسلامي يتشابهان في العديد من الخصائص والتأثيرات الصحية الإيجابية التي أبلغ عنها.

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Screening for infectious diseases in newly arrived asymptomatic immigrants in southern Italy

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Abstract

Background: Screenings for infectious diseases in asymptomatic immigrants currently takes place when receiving new arrivals.

Aims: We describe the frequency of infections in a cohort of newly arrived asymptomatic immigrants in Southern Italy.

Methods: We studied a cohort of 238 Sub-Saharan African and Asian men hosted at a reception centre (CARA) in Foggia between January and December 2015. The tuberculin skin test for diagnosis of latent tuberculosis infection (LTBI) and serology/virology testing for HBV, HCV, HIV were performed.

Results: From this cohort, 205 individuals agreed to be tested for serological/virological markers only, while 82 agreed to be tested for LTBI only; 49 people agreed to have both tests. Among those tested for virological markers, 23/205 (11.2%) were HBsAg positive; 12/23 (52.2%) individuals had chronic active hepatitis; 77/205 (37.6%) individuals had only anti-HBc positivity. HCV infection was present in 8/205 (3.9%) individuals, and chronic HCV infection, was diagnosed in only two people. Only 2/205 (1.0%) individuals presented with anti-HIV and HIV-RNA positivity. We found LTBI in 29.6% of TB-tested individuals.

Conclusions: Asymptomatic immigrants are at increased risk for some infections, mainly HBV and tuberculosis.

Keywords: epidemiology, infectious diseases, LTBI, newly arrived immigrants, Italy

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Introduction

The last 20 years has seen considerable migration from low- and middle-income countries to high-income nations, primarily the United States of America and Western Europe. On 1 January 2016, the number of people living in a European Union (EU) member state who were citizens of nonmember countries was 20.7 million. In Italy this represented about 4 million people or 6.7% of the population (1). This remarkable increase in people whose living conditions are often considerably disadvantaged has sometimes led to problems, not only of a socioeconomic and security nature but also in regard to sanitation and health. In fact, while most tropical diseases are absent or appear sporadically in Italy (2,3), it was observed that the prevalence/incidence of other pathologies such as HBV/HCV/HIV/TB have changed their epidemiology over the years, in accord with the immigration phenomenon. Some infections have been directly imported, in both latent and active forms. Others have been contracted by immigrants because of living conditions/habits, with an increase in some infectious diseases such as HIV (3), TB (4) and viral hepatitis (5,6) and sometimes co-infections (6).

Southern Italy has been, and still is, a major destination for illegal immigration (African, Middle Eastern and Asian) from the North African coast (7). On

arrival, the immigrants are hosted in reception centres (CARA), which are distributed in various parts of Italy. Most are young and healthy individuals, but they are often considered a source of certain infectious diseases such as Ebola, SARS etc., occasionally resulting in unjustified prejudice because of their geographic origin, ethnicity, health conditions at the departure point, and the migratory route (8–10). Therefore, the identification and treatment of any imported asymptomatic infections could reduce their incidence/prevalence and modify their outcome. This can have a significant clinical and psychological impact, both for the individual affected and for public health (10).

The health service for immigrants in Italy, particularly for clandestines, is not adequate and most assistance is currently provided by religious or lay volunteer groups. Only recently have hospitals and local health services initiated the creation of outpatient clinics for immigrants, including soliciting the help of cultural workers and interpreters (10). In such a challenging scenario, the team of volunteer doctors participating in this study have been screening immigrants hosted in the CARA in Foggia (Apulia, Southern Italy) for infectious diseases for several years.

The aim of this research, conducted in 2015, was to determine the possible presence of HIV/HBV/HCV/TB infections in a cohort of asymptomatic immigrants who

were temporarily guests at the CARA in Foggia, and to measure the burden of latent or active infections which are potentially harmful for the individuals' health and transmissible to the community.

Methods

Participants and tests

Between January and December 2015 we screened 238 asymptomatic immigrants for HIV/HBV/HCV/TB. Before screening, all guests at the CARA (728 persons) were informed about the purpose of the study and invited to participate. Subsequent recruitment was on a voluntary basis; the recruitment of minors was mediated by tutors. The study was reviewed and approved by the general manager and the medical director of the CARA, and written informed consent, provided in 4 languages (English, French, Arabic and Italian), was obtained from each participant. All study procedures conformed with the Helsinki Declaration (1975, amended 2008).

At the time of enrolment, all participants were interviewed using a questionnaire to obtain demographic and clinical information. None of the screened participants reported previous exposure to infectious diseases, nor vaccination for hepatitis B, nor vaccination or anti-tuberculosis prophylaxis. All enlisted participants went through complete clinical tests and, if necessary, we proceeded with further diagnostic tests and treatment. In addition, we implemented a strategy to prevent any transmission to other immigrants and indigenous populations who lived in close contact with infected persons. Diagnoses of infections were made using standard commercial tests. The health examination performed for all asymptomatic immigrants was based on systematic screening that included serological and virological examination for selected infections: HIV, HBV, HCV virus, and a check for possible latent tuberculosis infection (LTBI) using the tuberculin skin test (TST).

Statistical analysis

Categorical data are presented as absolute numbers and proportions. Continuous variables were summarized as mean and standard deviation (SD), and categorical variables as absolute and relative frequencies. Differences in the mean values for continuous variables (age, HBV genotypes) were evaluated by the Student t-test for independent samples. The Chi-squared test was applied to compare categorical variables (ethnicity, HIV/HCV antibodies, HBV markers and TST positivity); $P < 0.05$ was considered statistically significant.

Results

Demographic characteristics

One hundred and thirty-two (132) of the 238 participants enrolled in the study (55.5%) came from Sub-Saharan African countries (54.2% from East Africa, 35.9% from West Africa, 10.8% from Central Africa) and 106 (44.5%) were from Asia, mainly from the Indian subcontinent and Pakistan. The mean age was 25.1 (SD 5.7; range 13–40) years. All of the participants were men since the population of the CARA was exclusively male. Subjects had been in Italy for a mean period of 36 days (range 7–118 days) (Table 1). Among the study population, 205/238 immigrants (86.1%; 111 Africans, 94 Asians) agreed to be tested only for serological/virological markers (HBsAg/anti-HBc, anti-HCV, anti-HIV) and 82 individuals agreed to be tested for TB (TST). Only 49 participants agreed to have both tests (Table 2).

HBV infection

Among the individuals we tested, 23/205 (11.2%) were HBsAg positive: 17/23 (73.9%) Africans and 6/23 (26.1%) Asians ($P = 0.03$); 16 patients were anti-HBe positive while 7 (2 of whom were Asians) presented with HBV-wildtype (HBsAg/HBeAg positive). Chronic active HBV (CHB) infection, with HBV-DNA detectable using real-time polymerase chain reaction testing, was present in 12/23 (10 Africans and 2 Asians, $P = 0.03$; 52.2%) HBsAg positive individuals (mean level 1 374 231 copies/mL, range

Table 1 Baseline characteristics of immigrant patients according to geographical origin, and the pathologies for which they were screened, Italy, 2015

Geographical origin	Patients	Screened for HBV, HCV and HIV	Screened for TB	Screened for HBV, HCV, HIV and TB
Africa	132	111	56	27
East Africa	71	59	28	16
West Africa	47	41	14	6
Central Africa	14	11	7	7
Asia	106	94	26	22
Pakistan	43	41	17	14
Bangladesh	26	21	3	3
India	16	12	3	3
Other countries	21	20	3	3
Total	238	205	82	49

74 651–13 875 247). Nine CHB patients presented e-minus mutant virus and 3 had HBV-wildtype virus. Genotype distribution among all CHB/HBV-DNA positive patients was: 5/12 genotype E (51.7%), 3/12 genotype A (25.0%), 2/12 genotype D (16.7%), 1/12 genotype B (8.3%), and 1/12 genotype C (8.3%). Genotypes E, A and D were associated with the African subgroup while genotypes C and B were associated with the Asian subgroup.

A significant statistical difference was observed between genotype E and the other genotypes ($P = 0.02$); the difference in prevalence between genotypes A, B, C and D ($P = 0.08$) was modest. We found 77 individuals (37.6%) had anti-HBc positivity (OBI), a bio-marker of previous HBV infection. The prevalence among sub-Saharan Africans was 66.2% (51/77), compared with 33.8% (26/77) among Asians ($P = 0.03$). All participants denied having previous HBV vaccinations in their country of origin. Five out of 77 participants (with slight hypertransaminasaemia) had HBV-BNA positivity with a low viral load (mean level 1275 copies/mL, range 471–5743); genotyping was not performed.

HCV infection

Infection with HCV was present in 8/205 individuals (3.9%): 3/8 (37.5%) were Africans and 5/8 (62.5%) were Asians ($P = 0.02$). Chronic HCV infection, with the presence of HCV-RNA detectable by real-time polymerase chain reaction testing, was diagnosed in only 3 Asian patients; HCV genotyping was performed in these individuals: 2 presented with genotype 1a and 1 with genotype 3.

HIV infection

Only 2/205 (1.0%) individuals presented anti-HIV antibodies, and subsequently we were able to detect HIV-RNA; 1 was African and the other was Asian. The HIV-positive immigrants were not aware of their serologic status before their arrival or, at least, they did not acknowledge sero-positivity for HIV. Neither of the 2 patients showed an AIDS-defining disease or other clinical symptoms at the time of screening; only 1 patient developed pulmonary active tuberculosis during the first month of follow-up.

Table 2 Epidemiological and clinic features of infectious diseases among immigrant patients according to region of origin, Italy, 2015

Epidemiological and clinic features	Total No.	Origin									P-value ^a
		Africa (Af)	East Africa	West Africa	Central Africa	Asia (As)	Pakistan	Bangla- desh	India	Other coun- tries	
HBsAg+	23	17	6	4	7	6	2	2	1	1	0.03 ^b
HBeAg+	7	3	2	1		4	1	1	1	1	
HBV-DNA+, HBsAg+, OBI	17	13	4	5	4	4		2	1	1	0.03 ^b
Genotype	12										
A	3	3	2	1							
B	1						1				
C	1									1	
D	2				2						
E	5		1	3	1						0.02 ^c
CHB	12	10	2	3	5	2	1			1	0.03 ^b
OBI	77	51	19	16	16	26	11	3	5	7	0.03 ^b
HCV+	8	3	1	2		5	1	1	3		0.02 ^d
CHC	3					3	1		2		
Genotype	3										
1						2	1		1		
3						1	1				
HIV+	2	1				1					
Virological coinfection	5	2 (1 B, 1 C)				2 (1 B, 1 C)					
LTBI TST+	21	15	3	7	5	6	1	3		2	0.02 ^b
TB & hepatitis coinfection	5	3	1	1	1	2		2			

OBI = anti-HBc; CHB = chronic active HBV; LTBI = latent tuberculosis infection; TST = tuberculin skin test.

^aWhen the value of P is not specified, the parameters compared are not statistically significant.

^bAf vs As.

^cE vs all.

^dAs vs Af.

Viral co-infections

Five patients (3 Africans and 2 Asians) showed HBV-HCV co-infection: in 4 cases HBV infection was prevalent, while in 1 case HCV virus infection prevailed. Co-infection for HIV-HBV-HCV was present only in the HIV-positive African participant.

Latent tuberculosis infection

Only 82/238 (34.5%) individuals in the study population agreed to undergo the tuberculin test (56/82, 76.7% Africans and 24/82, 29.3% Asians) ($P = 0.02$). Among patients tested with TST, 11 (8 Africans and 3 Asians) did not return for the control. The TST was positive (> 10 mm) in 21 (29.6%) of the remaining 71 individuals. The prevalence of LTBI was significantly greater among Africans (71.4%; 15/21) than among Asians (28.6%; 6/21) ($P = 0.02$). One of the TST-positive subjects was also HIV-positive. None of the patients who were TST-positive presented radiological or microbiological signs of active pulmonary tuberculosis. All data are described in Table 2.

Discussion

The ever-increasing presence of immigrants fosters feelings of fear in the native Italian population; fear that they may introduce new and unfamiliar diseases such as SARS, MERS, Ebola, dengue, etc., or pathologies which are no longer present or have almost been eradicated from the country (11). Many of these infections may be asymptomatic for long periods and manifest themselves later in life as active diseases. This means that the incidence of certain illness may increase in host countries despite autochthonous cases declining (12).

Infection with HBV is prevalent in immigrants, particularly in people coming from Sub-Saharan African areas with a high rate of infection ($> 8\%$). This figure is most likely a result of the lack of or incomplete prophylactic vaccination in the country of origin and risky sexual behaviour (13–15). In our study we evaluated the prevalence, the typology of HBV-infection and the degree of disease, based on genotype. Our findings (HBsAg positive rate: 11.2%) reflect the current prevalent migratory flow to our geographic area, which is mostly represented by people coming from Sub-Saharan Africa. In contrast, HBV infection is rarely observed in Asian immigrants (16–18). These data, showing the differences in infection rates due to ethnicity, highlight the epidemiological pattern of the prevalence of HBV based on country of origin (13,19–21). Among our participants, more than half had CHB, indication of a previous infection, with a clear majority from Sub-Saharan Africa (10/12 patients). The prevalence of HBV infection was similar in African children (< 16 years) and adults. This result leads us to postulate that the infection may occur at an early age (by vertical transmission or in childhood), in contrast with what has been observed in Western countries (17).

Most cases were infected with genotype E, which is almost exclusively disseminated in Sub-Saharan Africa

(18,21). Other HBV genotypes were also found, like D, B, C, A, thus reflecting different areas of origin (22–24). This redistribution of HBV genotypes represents an important change in the epidemiology of infection. In Italy, this increases the number of subjects infected with a “different” hepatitis despite the risk of reinfection with a virus of a different genotype for the Italian population being low because HBV vaccination protects from all HBV genotypes. A high proportion of patients (37.56%) had only anti-HBc (OBI), a marker that can be indicative of either natural or artificial immunization or occult active hepatitis. This clinical situation seems to be quite frequent among individuals from Sub-Saharan Africa (18,24).

Careful evaluation of OBI in the immigrant population is important because OBI can be transmitted through transfusion, organ transplantation or haemodialysis; OBI may reactivate and cause acute hepatitis in immune-compromised patients; it may contribute to the progression of hepatic fibrosis in patients with other chronic liver diseases and constitute a risk factor for hepatocellular carcinoma (25–27). Therefore, it is evident that immigrants with OBI may, if not carefully controlled, represent a risk for themselves and for the indigenous population. Currently there is no agreement on how to classify and manage individuals with OBI. Some authors suggest testing for HBV-DNA when alanine aminotransferase (ALT) levels are elevated (28), while others recommend the test only if there are other risk factors for liver disease, even with normal ALT levels (28,29). We decided to check for HBV-DNA only in 5 participants who had high levels of serum ALT.

The prevalence of HCV-infection in Europe reliably indicates that about 1% of the total population is affected, albeit with regional differences (16). However, from research carried out in different countries it emerged that immigrants seem to have a very high risk of contracting HCV-infection after their arrival in host countries (30). In Italy, the prevalence of HCV among immigrants varies with both the period and the area of research (different ethnicities), but generally it is higher than that of the local population: it ranged from 2.7% in 2008 in Verona (31) to 15.2% in 2015 in Sicily (32), with a national prevalence of 4.0–5.6%. In this study on newly arrived immigrants the prevalence was 3.9%; the patients were mainly Asians, especially Pakistani (5.3%), while among Africans the rate was lower (2.7%).

Such differences, as deduced from the reported risk factors, seem to be related to intravenous drug addiction, more common among the screened Asians than the Africans (9). Another risk factor was the high percentage of sexually transmitted infections (33), since all the screened HCV-positive Africans were infected via this route. An additional risk factor could have been infection via blood transfusion, blood derivative products or following invasive procedures (surgery, endoscopic tests, etc.) performed with inadequately sterilized instruments (34,35). These events are not infrequent in some Asian countries, where, although public health care systems

are accessible, they are not always at a level to prevent nosocomial infections. In contrast, in many parts of Africa, mainly in Sub-Saharan Africa, due to an almost total absence of a health care system, the possibility of carrying out invasive procedures or blood transfusions is very small. Consequently, although such a situation impedes the provision of adequate health care to people, it certainly generates comparatively lower rates of diffusion of hepatitis C virus (11,34,35).

Screening for HIV is systematically recommended in individuals coming from countries and communities where HIV prevalence is $\geq 0.1\%$, such as immigrants from Sub-Saharan African and Asian countries. In fact, in these populations the risk of HIV-infection is greater than in the native population and in particular, the incidence of new HIV diagnoses in Italy is estimated to be 8 times higher in immigrants than in Italians (21). However, in our screened population, the overall prevalence of HIV-infection was 1.0%, which is quite low considering that the rate of HIV-infections in the majority of the native countries of the immigrants is much higher than in Western countries, including Italy. These data confirm, after many years, previous findings from our research group that highlighted that newly arrived immigrants (< 2 months) had a 1.5% prevalence of HIV-infection (36).

This low rate could possibly be explained by the statistical bias known as the “healthy migrant effect,” for which immigrants are “positively selected” from among their original population as individuals more apt to embark on such a strenuous migratory project. These migrant health advantages, however, tend to vanish over time due to high-risk behaviours. Regarding HIV-infection, the preponderance of young, sexually active males is already a risk factor, enhanced by contacts between parties belonging to the same ethnic group. Therefore, despite the high incidence of infection in immigrants resident in the country reported in previous studies, the low prevalence of HIV infection in our cohort of recently arrived individuals seems to suggest that HIV-infection is more often acquired during their stay in the host country rather than imported from the country of origin (37–39).

Active tuberculosis (TB) is an increasing problem among immigrants living in Western countries (40). It may be the clinical expression of a new infection acquired in the host country or more often the reactivation of a latent form (LTBI) brought from their country of origin (40,41). Also, in Italy it has been shown that, in recent years, > 50% of new cases of TB affect immigrant subjects (41,42). This LTBI represents a state of equilibrium in which the host can control the infection, but cannot completely eradicate the bacteria. This is related to a persistent

immune response to stimulation by *Mycobacterium tuberculosis* antigens; therefore, infected individuals can be entirely asymptomatic. The greatest danger is in reactivation (active TB after remote infection) cases and the subsequent silent spread to close contacts. Therefore, patients with LTBI are the largest reservoir for potential transmission.

A high prevalence of LTBI with rates of 52–72%, and elevated risk for TB reactivation with rates of 7.8%, was observed in immigrants within the first 2–5 years of arrival (43,44), making tuberculosis the most relevant infectious disease currently. This is predominantly among immigrants from highly endemic areas such as Sub-Saharan Africa and the Indian subcontinent. The peculiar aspect of this study is the population screened, consisting of recent immigrants residing in Italy for no longer than 3 months. Only a minority of screened immigrants (82/238) volunteered for the TST, and 11 of those (13.4%) did not turn up to be checked, perhaps for fear of expulsion. The prevalence of positivity for TST was of 29.6%, a rate lower than what has been observed in other studies (43,44). This low rate of positivity could be due to errors in the administration and reading of TST as the technique was performed “in the field” and not in a hospital setting, and subjectivity is one of the main limitations for the TST, even though it was performed by trained personnel. The presence of immunosuppression could also influence TST results, even if only a few studies are available (44). Our results were not influenced by HIV-related immunosuppression because only 1 patient was HIV positive, with a low viral load; but other causes of immunodeficiency such as malnutrition and fatigue cannot be excluded for the most recently arrived subjects due to the hardships of their migratory journey.

Conclusions

Most immigrants are healthy people, but they can also constitute a population at risk because they might be asymptomatic carriers of infections that might be activated at a later time. It is important to determine the presence of pathologies for the immigrants themselves and for the potential public health implications. Therefore, every country that welcomes immigrants must implement affordable and cost-effective screening protocols. These programmes should be characterized by the principles of equality and respect for the immigrants, and be aimed at both the health of the individual and that of the host community. Such programmes could follow the example of Italy, where many public health facilities have voluntarily opened outpatient clinics dedicated to immigrants.

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Dépistage de maladies infectieuses chez les immigrants asymptomatiques nouvellement arrivés en Italie du Sud

Résumé

Contexte : Le dépistage de maladies infectieuses chez les immigrants asymptomatiques est actuellement effectué lors de l'accueil de nouveaux arrivants.

Objectifs : La présente étude a pour objectif de décrire la fréquence des infections dans une cohorte d'immigrants asymptomatiques nouvellement arrivés en Italie du Sud.

Méthodes : Nous avons étudié une cohorte de 238 hommes originaires d'Afrique subsaharienne et d'Asie hébergés dans un centre d'accueil (CARA) à Foggia, entre janvier et décembre 2015. Le test cutané à la tuberculine permettant de diagnostiquer l'infection tuberculeuse latente ainsi que le test sérologique/virologique pour l'infection par le VHB, le VHC et le VIH ont été réalisés.

Résultats : Dans cette cohorte, seuls 205 individus ont accepté de se soumettre aux tests de recherche des marqueurs sérologiques/virologiques, tandis que 82 autres ont choisi de réaliser seulement le test de dépistage de l'infection tuberculeuse latente ; 49 personnes ont accepté les deux tests. Parmi les hommes ayant fait le dépistage des marqueurs virologiques, 23 sur 205 (11,2 %) étaient positifs à l'AgHBs ; 12 sur 23 (52,2 %) avaient une hépatite active chronique ; 77 sur 205 (37,6 %) étaient uniquement positifs pour l'anticorps anti-HBc. Sur les 205 individus, 8 (3,9 %) présentaient une infection par le VHC et une infection chronique par le VHC n'a été diagnostiquée que chez deux personnes. Seuls deux (1,0 %) individus sur 205 étaient positifs au test anti-VIH et à l'ARN du VIH. Une infection tuberculeuse latente a été détectée chez 29,6 % des personnes ayant effectué le test de dépistage de la tuberculose.

Conclusions : Les immigrants asymptomatiques présentent un risque accru face à certaines infections, principalement l'hépatite C et la tuberculose.

فحص المهاجرين الجدد عديمي الأعراض للتحقق من الإصابة بالأمراض المعدية في جنوب إيطاليا

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الخلاصة

الخلفية: يجري حاليًا فحص المهاجرين عديمي الأعراض للتحقق من إصابتهم بالأمراض المعدية لدى قدومهم.

الأهداف: وصف معدل تكرار الإصابة بالعدوى لدى مجموعة من المهاجرين عديمي الأعراض القادمين حديثًا في جنوب إيطاليا.

طرق البحث: قُمنَا بدراسة مجموعة مكونة من ٢٣٨ رجلًا آسيويًا ومن أفريقيا جنوب الصحراء الكبرى الذين وصلوا إلى مركز استقبال (كارا) في مدينة فوجيا، في الفترة بين يناير/كانون الثاني وديسمبر/كانون الأول ٢٠١٥. وأجري اختبار التوبركولين الجلدي لتشخيص عدوى السل الخافي، والاختبار المصلي/الفيروسى لفيروس التهاب الكبد B و C وفيروس نقص المناعة البشرية.

النتائج: وافق ٢٠٥ شخصًا من هذه المجموعة على الخضوع لفحص العلامات المصلية/الفيروسية فقط، بينما وافق ٨٢ آخرون على خضوعهم لفحص عدوى السل الخافي فقط؛ ووافق ٤٩ آخرين على الخضوع لكلا الاختبارين. ومن بين الأشخاص الذين خضعوا لفحص العلامات الفيروسية، كانت نتيجة ٢٣ شخصًا من أصل ٢٠٥ (١١,٢ %) موجبة في فحص الجلوبيولين المناعي لالتهاب الكبد (HBsAg) (B)؛ بينما تأكدت إصابة ١٢ شخصًا من أصل ٢٣ (٥٢,٢ %) بالتهاب الكبد المزمن النشط؛ أما ٧٧ شخصًا من أصل ٢٠٥ (٣٧,٦ %) كان نتيجةهم موجبة فقط في فحص ضد المُستضدَّ اللبِّي لالتهاب الكبد B. وتأكدت إصابة ٨ أشخاص من أصل ٢٠٥ (٣,٩ %) بفيروس التهاب الكبد C، وشخص فردين فقط بالتهاب الكبد C المزمن. وكانت نتيجة شخصين فقط من أصل ٢٠٥ (١,٠ %) موجبة في فحص الأجسام المضادة لفيروس نقص المناعة البشرية وحض الـ RNA لفيروس نقص المناعة البشرية. كما وجدنا عدوى السل الخافي في ٦,٢٩ % من الأشخاص الذين خضعوا لفحص السل.

الاستنتاجات: يُعدُّ المهاجرون الذين لا تبدو عليهم أعراض المرض في خطر متزايد للإصابة ببعض حالات العدوى، لا سيَّما فيروس التهاب الكبد B والسل.

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Effects of the Health Transformation Plan on caesarean section rate in the Islamic Republic of Iran: an interrupted time series

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Abstract

Background: In recent decades, the rate of caesarian section (C-section) has increased in the Islamic Republic of Iran. A reform in the Iranian health system – the Health Transformation Plan (HTP) – was launched in 2014 in which one of the objectives of HTP is decreasing the rate of C-section.

Aims: This study aimed to assess the effects of the Health Transformation Plan (HTP) on the C-section rate in the Islamic Republic of Iran.

Methods: This study was an interrupted time series analysis that used segmented regression analysis to assess the immediate and long-term effects of the HTP on C-section rate in two groups of hospitals affiliated and not affiliated to the Ministry of Health and Medical Education (MoHME) in Kurdistan province. Study samples were selected using the data on monthly C-section rate collected over a period of four years.

Results: We observed significant decreases in C-section rate immediately after the HTP in both groups of hospitals by 0.0629 and 0.0013, respectively ($P < 0.05$). In the long run, we observed no significant decrease in the regression slope of C-section rate in both groups.

Conclusions: The implementation of HTP decreased the C-section rate. However, the reduction does not meet expectations.

Keywords: Health system reform, caesarean section, financial incentive, Iran

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Introduction

In recent years, the Islamic Republic of Iran, like many countries of the world, has observed an increase in the rate of caesarian section (C-section) (1–3). Between 2000 and 2013 the C-section rate increased from 35% to 56.1% (1,4,5), while the acceptable rate of C-section recommended by the World Health Organization (WHO) is between 10% and 15% (4,6). The rapid increase in the rate of C-section can be attributed to both clinical and non-clinical factors. Among the non-clinical factors that can affect a physician's decision for C-section are training and fear of malpractice claims (6–9), as well as opportunity for higher income (10). On the other hand, the mother's level of education, ethnicity, income, and insurance status are also contributing factors (11,12).

The growing number of unnecessary C-sections can result in many problems; for example, it not only increases healthcare costs but also augments the risk of mortality and morbidity in mothers and neonates, which in turn affects public health (13). In recent years, in order to reduce the rate of C-sections in the Islamic Republic of Iran, the Ministry of Health and Medical Education (MoHME) has suggested a number of reforms. For instance, it is recommended to change the educational curriculum

of midwives and the content of obstetric residency programmes as well as revise their postgraduate training courses. It is also suggested to develop guidelines for outpatient and inpatient obstetrical emergencies and even make changes to medical legislation. However, the C-section rate has still not declined (5).

Previous studies have shown that cost variation is another factor that affects the decision regarding the mode of delivery. As C-section is financially more rewarding and requires less time per birth than a vaginal delivery, physicians are motivated to over-utilize C-section (14–17). Thus, changes in the reimbursement system with respect to the cost of delivery may change the decision of physicians and mothers regarding the mode of delivery. In recent years in the Islamic Republic of Iran, the mean cost of C-section delivery has been almost twice as much as that of vaginal delivery. According to health experts, it is one of the reasons that motivates obstetricians and gynaecologists to perform C-section without any indication (18).

An overview of the Iranian healthcare system

In the Islamic Republic of Iran, public, private, quasi-public and charity sectors provide healthcare services. Primary healthcare services are provided by the government

through an extensive healthcare network and are offered free of charge. Over 93% of second and third level healthcare services are provided by clinics, centres and hospitals affiliated to MoHME, with other centres affiliated to the Social Security Organization (SSO) and the private sector. Centres affiliated to MoHME and SSO, respectively, are classified as public sector and quasi-public sector. SSO not only provides health services, but is also one of the largest insurance agencies in the country. Social security insurance holders who attended the centres affiliated to SSO receive the majority of services free of charge, but other insurance holders have to pay a portion of the costs (19,20).

The Islamic Republic of Iran has three main insurance organizations including the Iranian Health Insurance Organization (IHIO), SSO, and Armed Forces Insurance Organization (AFIO). IHIO and SSO have multiple insurance schemes, which cover both compulsory and optional insurances, while the AFIO schemes are compulsory. The universities of medical sciences in every province are responsible for monitoring all healthcare centres (public or not) in the province; in addition, the hospitals affiliated to MoHME in each province are under the direct supervision of the university (19). In the Islamic Republic of Iran, about 95% of deliveries occur in hospitals (20), with 557 hospitals affiliated to MoHME, 337 hospitals to the private sector, and 70 hospitals to SSO (19).

Iranian Health Transformation Plan

In the Islamic Republic of Iran a series of health reforms (under the title of Health Transformation Plan) were implemented over three phases that started in 2014. The first phase consisted of eight packages and came into force 5 May 2014 in all hospitals affiliated to MoHME (university hospitals) (21). The Natural Delivery Promotion Package encourages mothers to have a vaginal birth and natural childbirth in hospitals affiliated to MoHME is free of charge. In addition, during this phase to motivate obstetricians, gynaecologists and midwives to encourage vaginal delivery, the promotional tariff of 30K (K is the fee of a surgical operation which in 2013 was set at 88000 Rials for the public sector and social security (quasi-public) and 380000 Rials for the private sector) for natural childbirth (added to the tariff of natural delivery), was considered for all deliveries performed in hospitals affiliated to MoHME within a time interval from 5 May 2014 to 23 September 2014. In case of vaginal delivery under the supervision of a full-time gynaecologist and obstetrician, the incentive was shared as follows: 70% for

physicians, 10% for midwives 10% for staff, and 10% for the delivery unit.

However, during this period the C-section tariff did not change in hospitals and remained at 17K. In addition, with the implementation of the Natural Delivery Promotion Package in hospitals affiliated to MoHME, the private sector hospitals and social security hospitals were also required to reduce their C-section rate; accordingly, the reduction in the rate of C-section was considered as an important factor in their annual accreditation.

The second phase of the HTP was focused on screening chronic diseases and promoting health indicators in rural and marginalized areas and in the suburbs of large cities, and started in June 2014. The second phase is not related to the current study.

In the third phase of HTP, the new book of health services' valuation was issued and implemented in the health system from October 2014 to set tariffs for medical services and promote equality in various medical specialties. To implement the third phase, there was an increase in medical services tariffs in all sectors (public, private, and quasi-public). During this phase, the relative tariffs for vaginal delivery service and C-section service, respectively, were set at 50K and 40K (18,21).

Given the elimination of costs for natural childbirth in hospitals affiliated to MoHME, requiring hospitals to reduce the number of C-sections, and increasing the tariffs for normal delivery, it is expected to observe changes in the behaviour of mothers and health service providers in choosing natural delivery. In the current study, the immediate and long-term effects of HTP are investigated on the rate of C-section in hospitals affiliated to MoHME (university hospitals) and those not affiliated to MoHME (Social Security and private sector hospitals) in Kurdistan province. The results of this study can provide feedback to healthcare policy-makers to assess the success of HTP and revise health reforms in order to enhance them.

Methods

The HTP (intervention) was implemented in May 2014. We conducted an interrupted time series (ITS) study and analysed monthly C-section rate to assess immediate and long-term effects of HTP on C-section rate in all hospitals affiliated to MoHME and hospitals not affiliated to MoHME in Kurdistan province (Table 1). The study was approved by the Ethics Committee of Tehran University of Medical Sciences.

We detected abrupt drops or increases in the C-section rate and investigated gradual changes in trends during the interruption time. An interrupted time series study

Table 1 Characteristics of Kurdistan province, 2014 (30)

Variable	Number
Population	1524000 (approximately 2% of Iranian population)
Number of cities	10
Number of hospitals affiliated to MoHME	12
Number of hospitals not affiliated to MoHME	3 (2 hospitals affiliated to SSO and one to private sector)

does not require a concurrent “control group” to establish a causal link between an intervention and an outcome (22,23). ITS analysis is perhaps the strongest quasi-experimental research design and is particularly useful when a randomized trial is not feasible or unethical (23,24). Using hospitals’ health information systems we obtained the data on deliveries. We modeled data using segmented regressions to assess causal links between the intervention were and the outcome of interest. Our sample included 50 observations (i.e., one per month) starting 25 months before (March 2012 to April 2014) and 24 months after the HTP (June 2014 to May 2016).

Several diagnostic tests were conducted. The results of Dickey–Fuller test suggested the presence of stationary residuals. We estimated the Jarque–Berastatistic to check the normality of the residuals. The results suggested a normal residual distribution. We performed ITS analysis using Newey OLS regression-based approaches available in the official Stata package. The Newey estimates the coefficients by OLS regression, but in addition to possible heteroskedasticity, it presents Newey–West standard errors to handle autocorrelation (25). First, the model was estimated using Newey with lag (0). To ensure the estimation of a model that accounts for the correct autocorrelation structure, we used Actest, lag (6) to investigate autocorrelation. Based on the output table, there was an autocorrelation of error terms at lag 4 ($P = 0.039$) and lag 1 ($P = 0.016$) in C-section rate data in hospitals affiliated to MoHME and hospitals not affiliated to MoHME, respectively.

Thus, our initial model was adjusted with lag (4) and lag (1) to account for this autocorrelation. The standard ITSA regression model was formed as follows:

$$Y_t = \beta_0 + \beta_1 \text{time}_t + \beta_2 \text{intervention}_t + \beta_3 \text{time after intervention}_t \quad (1)$$

In equation 1, Y_t is C-section rate per month; time is a continuous variable indicating time in months at time t from the start of the observation period; intervention is an indicator for time t occurring before (intervention = 0) or after (intervention = 1) the HTP, which was implemented at the 26th month in the series, and time after intervention is counting the number of months after the HTP at time t ; β_0 represents the intercept, or starting level of the outcome variable; β_1 is the slope, or trajectory of the outcome variable until the introduction of the intervention. β_2 represents the change in the level of the outcome that occurs in the period immediately following the introduction of the intervention (compared to the counterfactual); β_3 represents the difference between pre- and post-intervention slopes of the outcome. The sum of β_1 and β_3 is the post-intervention slope. Thus, we look for significant P -values in β_2 to indicate an immediate treatment effect, or in β_3 to indicate a treatment effect over time (24,25). Analyses were conducted using STATA statistical software version 13.

Results

Table 2 reports the total number of deliveries and C-section rate in all hospitals from March 2012 to May 2016.

As shown in the regression table (Table 3), the starting level of C-section rate in the hospitals affiliated to MoHME was estimated to be 0.3716, and C-section rate appeared to significantly increase by 0.001 every month prior to May 2014 ($P < 0.05$). Right after the intervention (HTP) C-section rate (level) significantly decreased by 0.0629 ($P < 0.05$). However, we did not observe any significant decrease in the regression slope (Trend) ($P > 0.05$). In addition, after the introduction of HTP, post-trend of C-section rate decreased monthly, but the decrease was not significant ($P > 0.05$) (Table 3). The regression model for C-section rate in the hospitals affiliated to MoHME is shown in equation 2:

$$Y_t = 0.37159 + 0.00104 \text{time}_t - 0.06288 \text{intervention}_t - 0.00118 \text{time after intervention}_t \quad (2)$$

Figure 1 presents the visual display of these results.

As shown in the regression table, the starting level of C-section rate in the hospitals not affiliated to MoHME was 0.3783; the C-section rate significantly increased by 0.0013 before the intervention ($P < 0.05$). Moreover, we observed a significant decrease by 0.0311 in the intercept right after the initiation of the intervention ($P < 0.05$). However, we did not observe any significant change in the regression slope after the intervention ($P > 0.05$). The post-intervention slope of the C-section rate increased monthly, but this increase was not significant ($P > 0.05$). The regression model for C-section rate in the hospitals not affiliated to MoHME is shown in equation 3:

$$Y_t = 0.37831 + 0.0013 \text{time}_t - 0.0314 \text{intervention}_t - 0.0011 \text{time after intervention}_t \quad (3)$$

Figure 2 provides a visual display of these results.

Discussion

When a patient is receiving healthcare services delivered by healthcare providers, one of the important issues that cannot be neglected is the cost of the services. Altering the costs of different services and changing the reimbursement system can have an impact on healthcare providers’ policies and decision, and consequently the C-section rate may change in turn (16,17). Therefore, it is necessary to assess the reimbursement system and other factors that can alter the rate of caesarean delivery. In the current study, we evaluated the effects of the HTP on C-section rate in the Islamic Republic of Iran.

The implementation of HTP significantly decreased the level (immediate effect) of C-section rate in the hospitals affiliated to MoHME. The reduction observed in the hospitals affiliated to MoHME may be due to the elimination of costs of natural delivery (to encourage pregnant women to choose natural delivery), utilizing promotional tariffs for physicians to perform vaginal delivery (after the implementation of the first phase, a promotional tariff of 30K was added to the natural delivery tariff in hospitals affiliated to MoHME), and increasing the tariff of natural delivery within the new book of tariffs published in the third phase (the tariff of natural delivery was increased to 50K) (18). Despite the two years since the beginning of the HTP, the elimination

Table 2 Data for analysis of the impact of Health Transformation Plan on C-section rate in hospitals in Kurdistan province, March 2012–May 2016

Observation	Total number of deliveries in hospitals affiliated to MoHME	C-section rate in hospitals affiliated to MoHME	Total number of deliveries in hospitals not affiliated to MoHME	C-section rate in hospitals not affiliated to MoHME	Time (Month)	Intervention	Time after intervention
1	1947	0.370827	400	0.3875	1	0	0
2	1890	0.37037	401	0.40399	2	0	0
3	1962	0.365953	426	0.401408	3	0	0
4	2031	0.360414	378	0.383598	4	0	0
5	1994	0.361083	377	0.366048	5	0	0
6	2009	0.383275	395	0.36962	6	0	0
7	1769	0.384398	436	0.401376	7	0	0
8	1781	0.400898	396	0.40404	8	0	0
9	1694	0.401417	407	0.361179	9	0	0
10	1846	0.385699	417	0.364508	10	0	0
11	1889	0.390683	452	0.393805	11	0	0
12	1843	0.398264	390	0.364103	12	0	0
13	1979	0.376453	441	0.390023	13	0	0
14	1834	0.377317	469	0.415778	14	0	0
15	1956	0.380368	503	0.379722	15	0	0
16	1990	0.38794	519	0.400771	16	0	0
17	2013	0.398907	482	0.400415	17	0	0
18	1968	0.412602	505	0.415842	18	0	0
19	1711	0.374635	453	0.415011	19	0	0
20	1806	0.379845	485	0.416495	20	0	0
21	1909	0.387114	417	0.407674	21	0	0
22	2056	0.375486	441	0.414966	22	0	0
23	2017	0.392662	500	0.416	23	0	0
24	2061	0.402717	295	0.40339	24	0	0
25	2048	0.408691	336	0.401786	25	0	0
26	2070	0.384541	363	0.396694	26	1	1
27	2049	0.367496	458	0.40393	27	1	2
28	2155	0.342459	475	0.383158	28	1	3
29	2088	0.314176	474	0.405063	29	1	4
30	2126	0.326435	502	0.386454	30	1	5
31	1961	0.319225	384	0.372396	31	1	6
32	1941	0.308089	433	0.385681	32	1	7
33	1979	0.331481	385	0.366234	33	1	8
34	2044	0.327299	455	0.397802	34	1	9
35	2153	0.337204	479	0.363257	35	1	10
36	2044	0.34002	334	0.362275	36	1	11
37	2210	0.333937	341	0.360704	37	1	12
38	2399	0.300959	382	0.363874	38	1	13
39	2326	0.322872	452	0.360619	39	1	14
40	2336	0.318493	424	0.360849	40	1	15
41	2402	0.336803	413	0.377724	41	1	16
42	2282	0.339176	469	0.394456	42	1	17
43	2008	0.318227	426	0.396714	43	1	18
44	1916	0.336117	322	0.378882	44	1	19
45	1917	0.3229	383	0.391645	45	1	20
46	2094	0.346227	419	0.396181	46	1	21
47	2040	0.347059	435	0.393103	47	1	22
48	2072	0.343147	336	0.39881	48	1	23
49	2211	0.341927	358	0.396648	49	1	24
50	2069	0.343644	333	0.393393	50	1	25

Table 3 Estimated coefficients of segmented regression model for C-section rate in the hospitals affiliated to MoHME in Kurdistan province, March 2012–May 2016

Regression with Newey-West standard errors						
Maximum lag: 4	Number of observations =50		F (3,46) =45.29		Prob> F =0.0000	
Parameter	Coefficients	Newey-West Std. Err.	t	P-value	95% CI	
Intercept	0.37159	0.0066	56.44	0.000	0.3583	0.3849
Pre-intervention slope	0.00104	0.0004	2.67	0.010	0.0003	0.0018
Change in intercept	-0.06288	0.0126	-4.98	0.000	-0.0883	-0.0375
Change in slope	-0.00118	0.0010	-1.22	0.230	-0.0031	0.0008
Post-intervention Linear Trend	-0.00010	0.0008	-0.17	0.860	-0.0018	0.0011

of costs of natural childbirth for mothers, and increasing the tariffs of natural delivery for medical personnel, the rate of C-section in hospitals affiliated to MoHME in Kurdistan province still varies considerably with the standard rate recommended by WHO. There is no significant reduction in the slope of C-section in this group of hospitals.

The implementation of HTP significantly decreased the level (immediate effect) of C-section rate in non-university hospitals. The decrease in C-section observed in hospitals not affiliated to MoHME may be attributed to the fact that the hospitals were obliged (by Kurdistan University of Medical Sciences) to reduce their rates of C-section during the implementation of the HTP. As ordered by MoHME, non-university hospitals must decrease their rate of C-section by 10% annually, as compared with the baseline; the reduction will be considered as a factor in their annual accreditation (18).

The results of a study by Kim et al. in the Republic

of Korea suggested that the type of the reimbursement system was associated with higher probability of C-section. To reduce the rate of caesarean delivery in the Republic of Korea, the payment method for caesarean delivery changed from Fee-For-Services (FFS) to Diagnostic Related Groups (DRG) and the tariff of natural delivery was increased by 50%. After taking these measures, the rate of C-section was significantly reduced (17). In line with the results of previous studies, the results of the current study indicated that women's decision to undergo C-section is affected by the related costs (10,26,27). However, some studies found no relationship between the costs of the procedure and women's decision to undergo C-section (28,29). For example, the results of a study by Lo in Taiwan (29) showed that the policy of fee equalization for vaginal and caesarean deliveries had no influence. Accordingly, as decided by the National Health Insurance (NHI) in Taiwan, the costs of vaginal birth and C-section were equalized. In an insurance

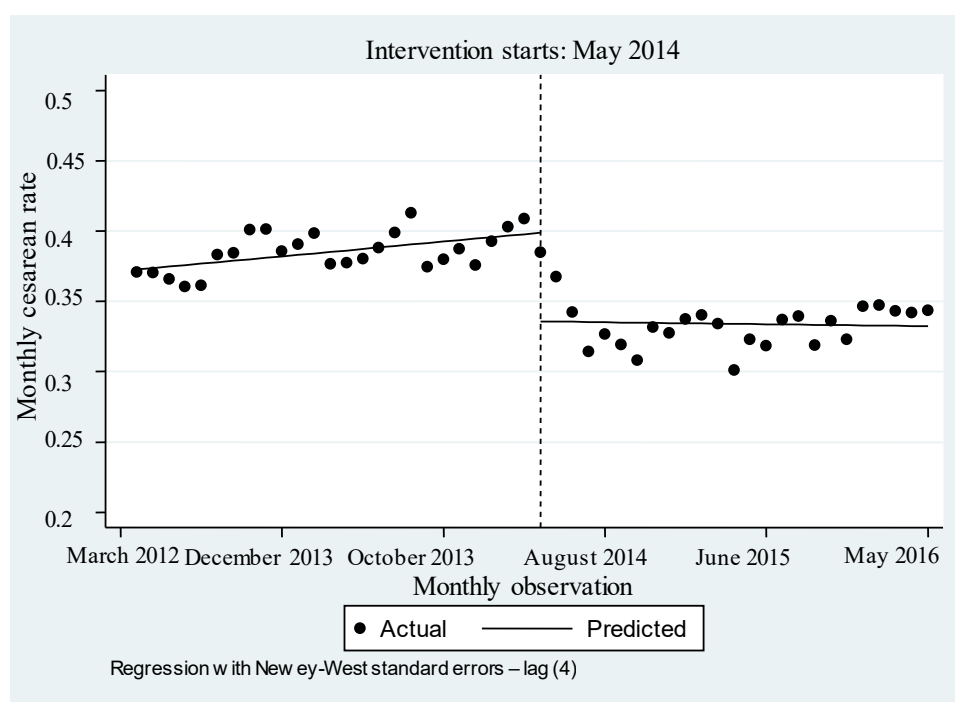
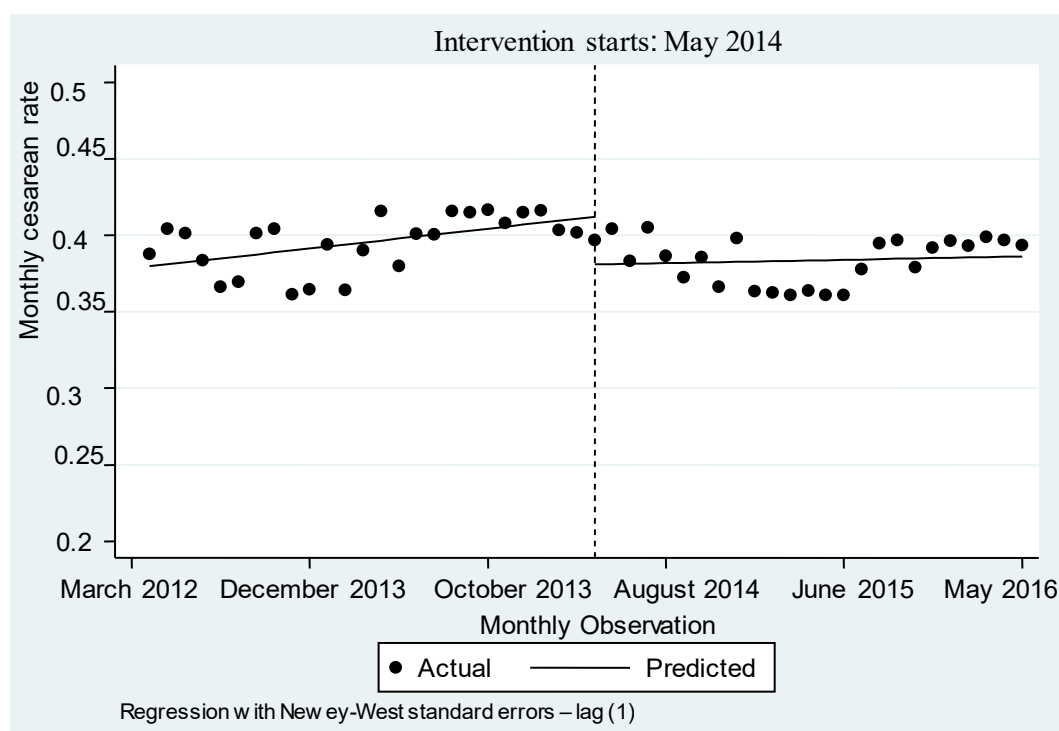
Figure 1 Segmented regression model showing C-section rate in the hospitals affiliated to MoHME in Kurdistan province, March 2012 to May 2016

Figure 2 Segmented regression model showing C-section rate in the hospitals not affiliated to MOHME, in Kurdistan province, March 2012 to May 2016



reform in California, United States, the costs of vaginal and caesarean deliveries had been equalized, as studied by Keeler and Fok (28). Based on the results of their study, after adjusting for case-mix, there was an insignificant reduction (0.7%) in C-section rate after the reform (28).

The current study aimed to assess the impact of HTP on the rate of C-section; however, it did not consider the effects of birth order and previous caesarean, and these two factors might have an impact on interventions utilized in HTP and on the rate of C-section. Studies have shown that most mothers who already had had a caesarean delivery are forced to undergo a caesarean again in subsequent pregnancies (29). According to the results of a study in Taiwan (29), the rate of C-section increased with the birth order, rising from 29% in the first birth to 37.4% in the second birth and 39.3% in the third birth. This observation was mainly attributed to the previous history of C-section, where the primary rates were 29%, 11.8%, and 12.1%, respectively. In that study the increasing fee for vaginal deliveries did not influence the C-section rate (29). However, based on our findings, cost has an impact on the choice made by physicians and patients for a specific medical procedure.

Limitations

This study was carried out in Kurdistan province in the west of the Islamic Republic of Iran; hence, the results may not represent a full picture of the impact of HTP on C-section rate across the whole country. Moreover, in this study we assessed the effects of HTP on C-section without taking into account the previous C-section and medical risk factors. Given the high rate of C-section in

the years before the implementation of HTP in the Islamic Republic of Iran and Kurdistan, it might have reduced (distorted) the real effect of the HTP on the rate of C-section. Thus, further studies are needed to more accurately study this issue at an individual level.

Conclusion

In general, based on the results of this study, after the implementation of HTP the rate of C-section was significantly reduced in Kurdistan province; however, the reduction observed was less than the expected level. The rate of C-section in Kurdistan province is still significantly higher than the standard rate recommended by WHO. Apparently, in order to further reduce the rate of C-section it is necessary not only to promote financial incentives for mothers and health service providers, but also focus on policies to change mothers' choice behaviours through awareness-raising programmes on natural childbirth and the negative consequences of C-section. However, our study has provided some evidences for policy-makers and suggests that health providers are under the influence of the existing reimbursement system. Accordingly, healthcare providers' decisions on the mode of delivery might be largely influenced by economic factors and advantages. As a result, it is necessary to design and adopt proper strategies for reimbursement in order to decrease the rate of superfluous procedures.

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Competing interests: None declared.

Effets du plan national de transformation du secteur de la santé sur le taux de césarienne en République islamique d'Iran : série chronologique interrompue

Résumé

Contexte : Au cours des dernières décennies, on a observé une augmentation du taux de césarienne en République islamique d'Iran. Une réforme du système de santé iranien – le plan national de transformation du secteur de la santé – a été lancée en 2014. L'un des objectifs de ce plan vise à réduire le taux de césarienne.

Objectifs : La présente étude vise à évaluer les effets du plan national de transformation du secteur de la santé sur le taux de césarienne en République islamique d'Iran.

Méthodes : La présente étude constitue une analyse d'une série chronologique interrompue basée sur une analyse de régression segmentée afin d'évaluer les effets immédiats et à long terme du plan de transformation du secteur de la santé sur le taux de césarienne dans deux groupes d'hôpitaux affiliés et non affiliés au ministère de la Santé et de l'Éducation médicale dans la province du Kurdistan. Les échantillons de l'étude ont été choisis en utilisant les données relatives au taux mensuel de césariennes, collectées sur une période de quatre ans.

Résultats : Nous avons observé une diminution sensible du taux de césarienne immédiatement après la mise en place du plan de transformation du secteur de la santé dans les deux groupes d'hôpitaux, s'élevant respectivement à 0,0629 et 0,0013, ($p < 0,05$). À long terme, nous n'avons observé aucune diminution importante de la pente de régression du taux de césarienne dans les deux groupes.

Conclusions : La mise en œuvre de ce plan de transformation du secteur de la santé a permis de diminuer le taux de césarienne. Cependant, cette réduction est en deçà des attentes.

آثار خطة التحوّل الصحي على معدل الجراحات القيصرية في جمهورية إيران الإسلامية: سلسلة زمنية متقطعة

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الخلاصة

الخلفية: في العقود الأخيرة، ارتفع معدل الجراحات القيصرية في جمهورية إيران الإسلامية. وبدأ إصلاح نظام الصحة الإيراني - خطة التحوّل الصحي - في عام ٢٠١٤، وكانت أحد أهداف الخطة تخفيض معدل الجراحات القيصرية.

الأهداف: هدفت هذه الدراسة إلى تقييم آثار خطة التحوّل الصحي على معدل الجراحات القيصرية في جمهورية إيران الإسلامية.

طرق البحث: استخدمت هذه الدراسة طريقة "تحليل سلسلة زمنية متقطعة"، حيث استخدم التحليل الانحداري المجرأ في تقييم الآثار الفورية وعلى المدى الطويل لخطة التحوّل الصحي على معدل الجراحات القيصرية في مجموعتين من المستشفيات التابعة لوزارة الصحة والتعليم الصحي في محافظة كردستان، ومستشفيات أخرى غير تابعة لها. وتم اختيار عينات الدراسة باستخدام البيانات المُجمّعة عن المعدل الشهري للجراحات القيصرية على مدار أربع سنوات.

النتائج: لاحظنا انخفاضات جوهرية فورية في معدل الجراحات القيصرية بعد تنفيذ خطة التحوّل الصحي في مجموعتي المستشفيات بمقدار ٠,٠٦٢٩ و ٠,٠٠١٣ على التوالي ($P > 0,05$). وعلى المدى البعيد، لاحظنا عدم وجود أي انخفاض جوهرية في ميل خط الانحدار لمعدل الجراحات القيصرية في كلا المجموعتين.

الاستنتاجات: أدى تنفيذ خطة التحوّل الصحي إلى تخفيض معدل الجراحات القيصرية. ومع ذلك، لم يتحقّق الانخفاض التوقعات المأمولة.

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Gender-based violence in New Delhi, India: forecast based on secondary data analysis

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Abstract

Background: Violence against women is a global phenomenon.

Aims: To estimate and forecast cognizable crime against women in New Delhi, India, from 2016 to 2020.

Methods: Reported cognizable crime against women in New Delhi for 2009–2015 was extracted for statistical analysis, synthesis and modelling. The cognizable crimes reported are rape, attempt to commit rape, kidnapping and abduction, dowry deaths, assault on women with intent to outrage her modesty, insult to modesty of women, cruelty by husband or his relative, importation of girls from foreign countries, abetment of suicide of women and indecent representation of women.

Results: The actual number of registered cases of crime against women ranged from 4251 (2009) to 17 104 (2015). The projected number of cases ranged between 18 991 [95% confidence interval (CI): 13 092–24 889] in 2016 to 28 663 (95% CI: 22 314–35 013) in 2020. A rising trend in crime against women was noticed in New Delhi, ranging from 204.6 (2016) to 308.8 (2020) per 100 000 women. After witnessing a substantive increase (116.2%) in reported crime against women in New Delhi in 2013, the subsequent actual and projected rise appears to be incremental in nature, with an annual percentage point change ranging between 9% and 18%.

Conclusion: Within limitations, it is concluded that the safety of women will continue to be a concern in the near future.

Keywords: crime, women's empowerment, gender training, police, time-series

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Introduction

Gender-based violence is defined as any act that results in, or is likely to result in, physical, sexual, economic or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life (1). Women across the world [North American region (7–32%); Latin America and the Caribbean (14–38%); Europe (13–46%); Africa (6–64%); Asia (6–67%); and Oceania (17–68%)], regardless of socioeconomic strata, are subjected to some form of violence (2).

One in 3 women has experienced physical/sexual violence at some point in their life. In a World Health Organization multicountry study, 23–56% of women reported experiencing physical or sexual violence from their partner (3). In most countries less than 40% of women who experienced violence sought help of any sort. In addition, studies have revealed that mental health and psychosomatic conditions reported among survivors of violence (especially among refugees) could also be a risk factor for poor reproductive health outcomes (4–8). The prevalence of female genital mutilation/cutting ranged between 1% (Uganda) and 98% (Somalia), including 74% in Ethiopia, 66% in Liberia, 44% in Chad, 26% in Senegal and 15% in Tanzania (9). However, recent evidence suggests a

decreasing trend across those countries with high rates and a target for the elimination of this practice by 2030 (10).

Women can face extreme discrimination due to a historical, orthodox, discriminatory mindset in society. The lower status of women increases and perpetuates gender-based violence, including female feticide, infanticide, gender discrimination (health care, nutrition, schooling, higher education, dress code, mobile phones and restriction of movement), early marriage, trafficking, rape, assault, insult to modesty, indecent representation of women, honour killing, etc. (11–13). These types of gender-based violence that are directed specifically against women are characterized as “crimes against women”.

The constitution of India provides equal rights to its citizens irrespective of cast, colour, creed, religion, socioeconomic status and gender. Various policies, legislation, interventions, schemes and welfare measures have been formulated specifically for the protection and safety of vulnerable populations, including women. Empowering women to live with dignity and contribute as equal partners in an environment free of violence and discrimination is of paramount importance for quality of life as well as the economic development of society.

Evaluation of past data can help to predict future rates, patterns, types, locations and/or times of crime. Therefore, a time-series analysis was undertaken to determine and forecast cognizable crime against women in New Delhi, India, for the period 2016–2020 using National Crime Record Bureau statistical data for the period 2009–2015. This information may specifically help policy-makers and administrative and law enforcement agencies towards better preparedness for prevention of crime against women.

Methods

Time-series analysis

A time-series analysis correlates a series of observations collected at regular time intervals (14,15). Typically, a time series comprises 4 components (variations) and traditionally 3 approaches (models) for forecasting future values (16). These variations are: trend variation (long-term change in the mean); seasonal variation (patterns that occur in a fixed and known period, e.g. quarter year, month, etc.); cyclic changes (pattern that exists when the data exhibit rises and falls that are not of a fixed or known period); and irregular component (any fluctuations that are observed excluding the above-mentioned variations from a time series). The statistical models used for predicting future events include regression-based methods, exponential smoothing methods and autoregressive integrated moving average (ARIMA) models (17).

Data source

Each year the government of India publishes statistical data on crime. The data for the current study were drawn from the National Crime Report Bureau (18). The cognizable crime as defined under the Indian penal court or local laws and registered by police stations is reflected in the annual report. The cognizable crimes against women are primarily: rape, attempted rape, kidnapping and abduction, dowry, assault with intent to defile her modesty, insult to modesty, cruelty by husband or relative, importation of girls from foreign countries, abetment of suicide, indecent representation of women, commission of *sati* (practice of immolation by a widow on the funeral pyre of her husband; now illegal), domestic violence and immoral traffic.

Cognizable crime data registered against women in New Delhi for the period 2009–2015 were extracted for statistical analysis, modelling and prediction using SPSS, version 16 (Table 1). Additional information was derived from the annual report 2015 to determine the pattern of cognizable crime committed against women in New Delhi in comparison to India as a whole in order to provide a comprehensive scenario.

Statistical analysis and modelling

The following steps were undertaken during modelling and forecast analysis (15,19).

Table 1. Total cognizable crime reported against women in New Delhi, India

Year	2009	2010	2011	2012	2013	2014	2015
No. registered cases	4251	4518	5234	5959	12 888	15 265	17 104

Source: National Crime Record Bureau, India.

- Time-series analysis was applied to determine presence of basic features such as trends, seasonal behaviour or both.
- Presences of any trend or seasonal components were eliminated either by differencing or by fitting appropriate models to the data. In our data set, only trend was present and was eliminated by using software command (Holt and auto ARIMA).
- Assessment of stationarity of data series was also checked. The autocorrelation function (ACF) and partial autocorrelation function (PACF) plots were used to determine the stationarity of the data and order of the model.
- In order to develop a forecasting model for the residuals, several models were chosen that could be representative for the available data. The optimal estimates for the coefficient of the chosen models were obtained at the identification stage. We used 20% of the dataset for “training” to find the parameters of the models, i.e. Holt Linear Model (HL) and ARIMA (20).
- In order to validate the performance of the models from the previous step, we used the remaining 80% of the data set for “testing”.
- A statistical tool, the Ljung–Box Q statistic, was used to determine independence of data series. The test statistic Q is represented as:

$$Q_m = n(n+2) \sum_{k=1}^m \left(\frac{r_2(e)}{n-k} \right) \sim \chi^2_{m-r}$$

where: $r_2(e)$ = the residual correlation at lag k ; m = the number of time lags included in the test; n = the number of residuals

- Forecast accuracy of the models was measured using mean absolute error (MAE), root mean square error (RMSE), mean absolute percentage error (MAPE) and Bayesian information criterion (BIC).
- The best model was selected on the basis of forecast accuracy measures obtained in the previous step and was used to predict future values of cognizable crime against women.

Holt's linear and the ARIMA models were found to be appropriate for the study dataset, and the best model was chosen based on the accuracy measures (21–23). Table 2 shows different model accuracy parameters. It was deduced that Holt's linear model was the best model for forecasting as it had the highest value of R^2 , suggesting that it explained 85% variability along with lower values

Table 2. Accuracy parameters of the model

Parameter	Model fit statistics					Ljung-Box Q-test	
	R ²	RMSE	MAPE	MAE	BIC	Statistic	P-value
Holt linear	0.858	2294.58	25.60	1688.88	16.03	4.04	0.257
ARIMA (1)	0.831	2960.03	25.99	1797.67	16.88	2.06	0.564
ARIMA (1,2)	0.848	3439.45	25.78	1775.02	17.48	2.09	0.554

RMSE = root mean square error.

MAPE = mean absolute percentage error.

MAE = mean absolute error.

BIC = Bayesian information criterion.

ARIMA = autoregressive integrated moving average.

of accuracy measures (RMSE, MAPE, MAE, BIC). The Ljung–Box test indicated that the model was statistically correct ($P = 0.257$ for Holt's linear model). There were no statistically significant differences between actual and predicted values by model.

Results

The available data indicated that the actual number of registered cases of crime against women ranged from 4251 (2009) to 17 104 (2015). The number of projected cases ranged between 18 991 (95% CI: 13 092–24 889) in 2016 and 28 663 (95% CI: 22 314–35 013) in 2020. A rising trend was noticed for crime against women with the rate ranging from 204.6 (2016) to 308.8 (2020) per 100 000 women in New Delhi. Table 3 and Figure 1 depict observed, fitted and forecast values along with the 95% confidence intervals.

The data showed that the population of women in New Delhi was 1.5% of that of India as a whole, while crime against women was slightly higher at 5.2% (Table 4). In regard to the pattern of crime against women, it was noticed that the number of cases registered under

Table 3. Projected cognizable crime against women in New Delhi, 2016–2020

Item	2016	2017	2018	2019	2020
No. of cases	18 991	21 409	23 827	26 245	28 663
UCL	24 889	27 423	29 955	32 485	35 013
LCL	13 092	15 395	17 699	20 005	22 314
Rate of total cognizable crime ^{a,b}	204.69	230.70	256.76	282.81	308.87

UCL = upper confidence level; LCL = lower confidence level.

^aRate = (reported cognizable crimes against women/female population) \times 100 000.

^bProjected female population (2015) in New Delhi used as base population (92.8 \times 100 000).

“outrage and insult to modesty” was much higher in New Delhi (40.4%) in comparison to the country as a whole (27.8%). However, cruelty by husband and in-laws (members of husband's family) was less common in New Delhi (20.5%) in comparison to the whole country (34.6%) (Table 5). Similarly, kidnapping and abduction cases registered were also higher in New Delhi (25.0%) in comparison to the country (18.1%).

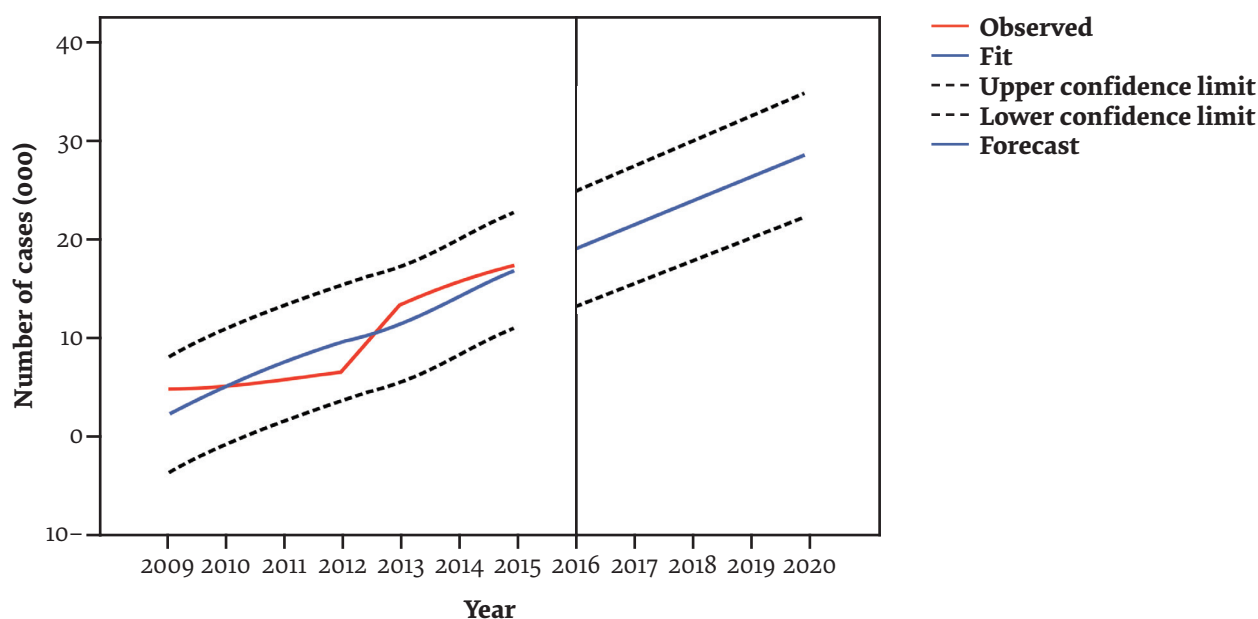
**Figure 1. Historical (2009–2015; source: National Crime Record Bureau, India) and forecast (2016–2020) cognizable crime against women in New Delhi**

Table 4. Selected parameters relating to women, New Delhi, 2015

Parameter	New Delhi (a)	India (b)	Proportion (a/b) (%)
Total projected mid-year population (100 000)	208.8	12 591.1	1.6
Female population (100 000)	92.8	6 070.8	1.5
Total registered cognizable crime (including crime against women) (No.)	191 377	2 949 400	6.5
Crime against women (registered cases) (No.)	17 104	327 394	5.2
Proportion of crime against women to total crime (%)	8.9	11.1	—

Source: National Crime Record Bureau, India.

Discussion

A time-series analysis was undertaken to determine and forecast crime against women in New Delhi, as defined under Indian legislation, for the period 2016–2020. There was a 40% increase in reported cases in New Delhi from 2009 to 2012 while the rise was 33% from 2013 to 2015. It was projected that if the current situation remains unchanged, there will be a 25% increase in crime against women.

Our findings need to be considered in view of a number of limitations: firstly, the rate of increment of crime against women should be the same with some fluctuation in the future comparing with current levels; secondly, the social makeup should be considered as the current scenario, and finally distribution of crime has a variation in respect to age but our study includes total crime against women irrespective of age.

India, the second most populated country and the largest democracy in the world, is undergoing an epidemiological, demographical, cultural, social, nutritional and economic transition and witnessing the double burden of disease (communicable and noncommunicable) with widespread ramifications for mortality. In recent years, societal awareness, the system of accountability and enforcement of existing legislation have improved in the country following the brutal gang rape and death of a victim in Delhi in 2012 (24). This was considered to be a watershed year, which attracted global media attention, discussion, debate and protest and candle-lit marches in the streets of the capital, resulting in an enhanced political commitment and the announcement of additional safety measures for women. Following this event, a sudden rise in the reporting of crime against women was noticed (116.2%) in New Delhi during 2013 as reflected in Table 1. The subsequent actual and projected rise appears to be incremental in nature, with an annual percentage point change varying between 9% and 18%. The prevailing high crime rate in Delhi is suggestive either that such cases were not registered by

Table 5. Pattern of cognizable crime committed against women, India and New Delhi, 2015

Crime	India (%)	New Delhi (%)
Outrage and insult to modesty	27.8	40.4
Kidnapping and abduction	18.1	25.0
Cruelty by husband and relatives	34.6	25.5
Rape and attempted rape	11.9	13.0
Dowry	5.4	0.3
Miscellaneous	2.2	0.8
Total	100	100

Source: National Crime Record Bureau, India.

the police in the past or that women have become more assertive and/or the scope of cognizable crime against women has broadened under various legislative sections and local laws and/or sensitivity has increased since a large number of female personnel have been inducted into the police force.

The national capital region constitutes a mix of urban, slum and urbanized rural population of 20 million residing in 11 revenue districts, with an 86% literacy rate along with one of the highest per capita income rates in India, but with a skewed sex ratio (number of females per 1000 males) 868 compared with 940 for the whole country in 2011 (25). The cosmopolitan environment constitutes diverse economic, cultural, dietary, language and religious practices. The porous boundaries of planned and unplanned urban development in the region is expanding and encroaching on neighbouring states. Such increasing urbanization, material aspirations and migration are leading to challenging pressures on space and basic utility services, increased pollution and mushrooming of slum clusters. Meanwhile, there is also increasing access to the Internet, social media, mobile phones and other tools of technology with concomitant misuse leading to an increase in impersonation, defamation and public insult of women. Additionally, the proportion of cases registered as “cruelty by husband and relatives” was 20.5%, which appears to correlate with a slightly higher population-based prevalence of spousal violence (26.8%) experienced by women in New Delhi (26).

In neighbouring Pakistan spousal abuse is also considered to be widespread (27). The World Economic Forum's Global Gender Gap report revealed that Pakistan is the second lowest performing country globally in terms of gender equality (28). Tazeen et al. found that almost all forms of spousal abuse (81.8%, psychological; 56.3%, physical and 53.4% sexual) were prevalent in urban areas of Karachi (29). In Saudi Arabia, spousal physical violence was reported by 45.5% of women (30). It is pertinent to mention that the WHO South-East Asia Region has one of the highest (37.7%) prevalence rates for partner violence globally; this compares with the Eastern Mediterranean Region (37.0%), African Region (36.6%), the Americas Region (29.8%), European Region (25.4%) and Western Pacific Region (24.6%) (5).

Conclusion

From the findings of the current study it is clear that safety of women will remain a concern and will require a multipronged preventive strategy. A comprehensive approach (individual, family, community and societal) including efforts to improve women's access to resources (e.g. credit, training, inheritance and land rights), hostels for working women and access to them (e.g. through anti-discrimination and gender-based violence legislation, gender-aware justice systems, and government mechanisms to improve gender equality) may improve the situation (31). Other measures such as sustained political commitment, increasing system accountability, social

consciousness, digital awareness, removing online child pornography, restricting migration, socioeconomic improvement, safe transport, gender sensitization training, counselling, surveillance and increased crime control policing may lead to lower crime rates against women in society. On a positive note, some of the recent legislative, policy and development measures initiated by the present government of India will transform society and strengthen transparency, including financial transactions, and as a secondary outcome may possibly bring down crime rates.

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Violence sexiste à l'encontre des femmes à New Delhi (Inde) : projections basées sur une analyse des données secondaires

Résumé

Contexte : La violence à l'encontre des femmes est un phénomène mondial qui nécessite une attention constante.

Objectifs : Évaluer les délits caractérisés à l'encontre des femmes à New Delhi (Inde) entre 2016 et 2020 et établir des projections à cet égard.

Méthodes : Les délits caractérisés à l'encontre des femmes, rapportés à la police, à New Delhi pour la période allant de 2009 à 2015 ont servi de base à un travail d'analyse statistique, de synthèse et de modélisation. Les délits caractérisés à l'encontre des femmes ayant fait l'objet d'un dépôt de plainte sont : le viol, la tentative de viol, l'enlèvement et le détournement de femmes, les meurtres liés à la question de la dot, les agressions sur les femmes avec intention d'attenter à leur pudeur, l'outrage à la pudeur, les actes de cruauté de la part du mari ou d'un parent, la traite de jeunes filles originaires de pays étrangers, l'incitation au suicide des femmes, la représentation obscène de la femme.

Résultats : Les données disponibles indiquent que le nombre véritable de délits enregistrés à l'encontre de femmes était compris entre 4251 (2009) et 17 104 (2015). Selon les projections, le nombre de cas varie entre 18 991 (IC à 95 % : 13 092–24 889) en 2016 et 28 663 (IC à 95 % : 22 314–35 013) en 2020. On a observé une tendance à la hausse des délits perpétrés contre des femmes, le taux allant de 204,6 (2016) à 308,8 (2020) pour 100 000 femmes à New Delhi. En outre, on a constaté qu'après avoir enregistré une augmentation importante (116,2 %) des délits à l'encontre des femmes à New Delhi en 2013, ayant fait l'objet d'un dépôt de plainte, la hausse réelle et prospective semble être progressive par nature, l'évolution en points de pourcentage allant de 9 à 18 %.

Conclusion : Dans certaines limites, l'étude conclut que la sécurité des femmes restera une préoccupation sérieuse dans un avenir proche, exigeant une attention accrue à la fois au niveau politique et au sein de la communauté.

العنف القائم على الجنس في نيودلهي، الهند: التوقعات القائمة على تحليل البيانات الثانوية

نيدي دوفيدي، سانديب ساشديفا

الخلاصة

الخلفية: تُعدّ الجرائم المرتكبة ضد النساء ظاهرة عالمية تحتاج إلى معالجة مستمرة.

الأهداف: تم تقدير نسبة الجرائم التي يعترف بها القانون المرتكبة ضد النساء وتوقعها في نيودلهي، الهند، بداية من عام ٢٠١٦ حتى عام ٢٠٢٠.

طرق البحث: استُخرجت نسبة الجرائم التي يعترف بها القانون المرتكبة ضد النساء في نيودلهي للفترة بين عامي ٢٠٠٩ و٢٠١٥ من أجل تحليلها إحصائياً وتجميعها ونمذجتها. وشملت الجرائم التي يعترف بها القانون والمُبلغ عنها المرتكبة ضد النساء: الاغتصاب، ومحاولة الاغتصاب، والاختطاف والأسر، وحالات الوفاة بسبب المهر، والاعتداء على النساء بنية خدش حياتهن، وخدش حياة المرأة، والتعرض للقسوة على يد الزوج أو أحد أقاربه، وجلب الفتيات من البلدان الأجنبية، والتحرّض على انتحار النساء، والتصوير غير اللائق للمرأة.

النتائج: أشارت البيانات المتاحة إلى أن العدد الفعلي للحالات المسجلة للجرائم المرتكبة ضد النساء تراوحت بين ٤٢٥١ (٢٠٠٩)، و١٧ ١٠٤ (٢٠١٥). وتتراوح عدد الحالات المتوقعة بين ١٨ ٩٩١ (٩٥٪ CI: ١٣ ٠٩٢–٢٤ ٨٨٩) في ٢٠١٦ إلى ٢٨ ٦٦٣ (٩٥٪ CI: ٢٢ ٣١٤–٣٥ ٠١٣) في عام ٢٠٢٠. ولوحظ تصاعد وتيرة الجرائم ضد النساء، حيث تراوح معدل الجرائم المرتكبة ضد النساء بين ٢٠٤ (٢٠١٦) و٣٠٨ (٢٠٢٠) لكل ١٠٠ ألف امرأة من سكان نيودلهي. بالإضافة إلى ذلك، لوحظ أنه بعد ملاحظة زيادة جوهرية (١١٦، ٢٪) في الجرائم المُبلغ عنها ضد النساء في نيودلهي في عام ٢٠١٣، بدا أن الارتفاع اللاحق الفعلي والمتوقع ذو طبيعة تزايدية حيث يتراوح التغير بالنقاط المئوية السنوية بين ٩٪ و١٨٪.

الاستنتاجات: تم استنتاج أن سلامة النساء ستظل مصدر قلق بالغ في المستقبل القريب، وأنه يجب إعطاء مزيد من الاهتمام لهذه القضية على المستوى السياسي وفي المجتمع.

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Communicable diseases management in disasters: an analysis of improvement measures since 2005, Islamic Republic of Iran

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Abstract

Background: Due to the importance of managing communicable diseases in disaster situations, the Centre for Communicable Diseases Management (CCDM) within the Iranian Ministry of Health and Medical Education has taken measures to improve routine communicable diseases management systems in normal and emergency situations.

Aims: This study aimed to explore the improvement measures since 2005.

Methods: A qualitative document analysis method was used to analyse all documents related to communicable diseases management from March 2003 to the end of 2014 in the CCDM and on official websites of related organizations.

Results: Seventy-two documents addressing communicable diseases management in disasters were included in the final analysis. The findings were summarized in 4 phases of the disaster management cycle corresponding to 5 core and support functions of the surveillance system.

Conclusions: The findings highlighted improvements in communicable diseases management in disasters, including interorganizational collaboration, information flow and use of new technologies such as web-based or mobile phone-based systems.

Keywords: disasters, communicable disease management, surveillance, outbreaks, Iran

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Introduction

Generally, any kind of man-made or natural disasters result in humanitarian emergencies (1). The consequences of such disasters, including displacement of a large number of people; disruption of basic infrastructure and lifelines; overcrowding; increased exposure to disease vectors; food insecurity; and shortages of safe water, sanitation and basic health services facilitate communicable disease epidemics with particularly high morbidity and mortality (2). Death rates have been reported to increase by a factor of 10 among displaced populations compared with baseline rates, with communicable diseases being responsible for the majority of deaths (3). The Islamic Republic of Iran is affected by a number of man-made and natural disasters, placing it among the areas with a high prevalence of disasters (4) and the probability of epidemic communicable diseases.

The *International Health Regulations (2005)* and the subsequent guidelines and scientific documents have emphasized the importance of communicable disease control (5). In addition, the new approach has affirmed the importance of surveillance core and support functions in all 4 phases of the disaster management cycle. This approach has highlighted case detection, reporting, investigation/confirmation, analysis/interpretation and actions (control/response, policy and feedback) as core

functions, and the setting of standards, training and supervision, setting up laboratory support, setting up communications and resource management as support functions (6).

Communicable diseases control programmes started more than 70 years ago in the Islamic Republic of Iran and, in accord with international developments, have gone through many revisions. Before the release of the *International Health Regulations (2005)* (5), the Bam earthquake of 2003 was the focal point of the new approach for the country's communicable diseases management in disasters. On 27 December 2003, the ancient city of Bam experienced one of the worst natural disasters since the previous century (7). The first communicable diseases control programme in disasters was launched in the earthquake-stricken areas with the emphasis on communicable diseases control, yet routine surveillance had some shortcomings (8). It should be noted that a pre-disaster surveillance system already existed in the country but it was not properly prepared for disaster situations. In fact, current health systems in disaster-affected areas show that the pre-existing surveillance system was quite inefficient (9). Therefore, communicable diseases surveillance contingency plans for disasters are a necessity (10).

The Centre for Communicable Diseases Management (CCDM) in the Ministry of Health and Medical

Education is the ultimate decision-making and planning authority in the area, and has issued many guidelines and regulations with the assistance and cooperation of other health authorities to improve and empower the existing disaster surveillance system. The present study aims to explore how the country's communicable diseases management has improved since its inception.

Methods

The qualitative document analysis method (11) was used for analysing the existing documents in the CCDM. All types of hard copy or electronic documents, including books, guidelines, reports (conference papers, training, exercises, operational reports), interviews, correspondence, government documents, laws or regulations, newspaper articles and films or broadcasts in Farsi or English that were related to communicable diseases control and management in disasters from March 2003 to the end of 2014 were reviewed. Additionally, the official websites of the Iranian Islamic Parliament, the Ministry of Health and Medical Education and the Iranian Red Crescent Society were searched for relevant documents. The key terms for searching websites were “communicable disease” or “infection” and “surveillance” or “control” and “emergencies” or “disaster”. For those documents that were not directly retrievable from websites the researchers referred to the secretariat and the archive centres of the related organizations or ministries to obtain the required materials. The inclusion criteria were: produced in English or Farsi from March 2003 to the end of 2014, relevance to communicable diseases control, management or surveillance and disaster.

All data extracted from the included documents were put into analysis sheets (Table 1), which were then evaluated and confirmed by the research team epidemiologist using the content validity assessment method (12). The analysis sheet consisted of 11 items using data compiled from the documents. We recorded the frequency of each item in relation to year and place of document in the disaster management cycle across all content.

Documents were analysed regarding the inclusion of surveillance definition and communicable diseases control in the 4 phases of disaster management. Subsequently, the information in the document analysis sheets was grouped using the content analysis method in *Maxqda*, version 12, and analysed using *SPSS*, version 14. “Enhancing transparency in reporting the synthesis of qualitative research” (ENTREQ) was used for presenting strategy guidelines (13).

Results

Documents

In total, 2256 pages of 131 documents were reviewed. Initially, 93 documents were included. However, 21 documents did not address the research topic and were excluded (Figure 1). All the 72 remaining documents addressed, either directly or indirectly, the surveillance and

communicable diseases management during the 4 phases of the disaster management cycle. The study findings were summarized in the 4 phases (mitigation–prevention, preparedness, response and recovery) according to 5 core (case detection, reporting, investigation and confirmation, analysis and interpretation, and action) and support (setting of standards, training and supervision, setting up laboratory support, setting up communications and resource management) functions of the surveillance system (Table 2).

The number of documents generated relating to the management of communicable diseases in the years under study has grown more or less progressively from 1 in 2003 and 2007 to a maximum of 24 in 2013.

Although content such as guidelines for all phases of the disaster management cycle in primary years and field reports from the response phase in subsequent years were more prominent, there were documents covering all phases of the cycle.

There were both weaknesses and strengths in communicable diseases management in disasters; these are detailed in Table 3. The situation was partly resolved by establishing a national disaster risk reduction plan as well as by developing regulations and related guidelines and planning for the provision of resources.

The changes and improvements in communicable diseases management over the 10 years of the study, based on the 4 phases of the disaster management cycle are detailed below.

Mitigation–prevention, preparedness

Case definition

The main diseases with the potential to produce epidemics include cholera, measles, meningococcal meningitis, shigellosis, cutaneous and visceral leishmaniasis, viral haemorrhagic fever, plague, influenza, malaria, typhus, relapsing fever (*Borrelia recurrentis*), hepatitis A and E, typhoid and yellow fever and were therefore included in routine surveillance systems. In accordance with the limitation of case-specific definition and detection, especially in disasters and emergencies, a syndromic surveillance system with definitions for 14 syndromes was confirmed. Definitions for: severe acute respiratory illness, chronic cough syndrome, fever with bleeding syndrome, fever with skin rash syndrome, acute watery diarrhoea syndrome, bloody diarrhoea syndrome, fever with meningeal symptoms, undifferentiated fever, food intoxication, acute flaccid paralysis, shock syndrome, icter syndrome, influenza-like syndrome, and sudden or unexpected death were established and distributed for rapid detection, early notification and early intervention. These definitions were integrated into primary health care services and family physician reference materials. Zero reporting is also mandatory.

Table 1. Document analysis sheet

Document No.:.....

Type

☐ Newspaper ☐ Map ☐ Advertisement ☐ Mail ☐ Telegraph
☐ Seminar report ☐ Invent register ☐ Press ☐ Note ☐ Report ☐ Other

The unique physical characteristics of the document

☐ Interesting header ☐ Annotation ☐ Handwritten ☐ Received (postal) stamp
☐ Typed ☐ Sealed ☐ Other :

3- Date:

4- Author (originator) of document:

5- Subject:

6- Position (job or academic title):

7- The document was written for whom?

8- If you have access to electronic resources, write address:

9- Document description(A-E):

(A) Key things that you think the writer has mentioned:

(B) Why do you think this document was written?

(C) What reason guided you to the aim of the document? (Quote from the document):

(D) Important things that matter to you at the time of writing the document:

(E) Comments for author of document regarding unanswered questions:

10- Strength of document:

11- Weakness of document:

Setting of standards

Standard definitions; training and exercise protocols; standard educational materials; documentation for laboratory, supplies and necessary equipment standards; organized reporting with mandatory zero reporting; standard communication devices; and evaluation standards were prepared and released as the emergency response plan, i.e. the National Public Health Emergency Operation Plan (also known as the Emergency Operation Plan), in the middle of the study period. Risk assessment and a risk map of health facilities were produced as reference maps in all universities.

Training, exercise and drills

In line with the Emergency Operation Plan, training sessions, exercises and drills were performed in universities and at national level to improve the coordination

and skills of team members and to identify and address weak and strong points. Exercises were performed with the participation of all members of the health work group to improve inter-agency coordination.

Policy-making

In accordance with the *International Health Regulations (2005)* and the World Health Organization, legislation and regulations were adopted in the health sector at national, provincial and university levels. The National Disaster Management Organization also published regulations to improve coordination in action by governmental and nongovernmental organizations. For this purpose, the Emergency Operation Centre was set up in universities and the Ministry of Health and Medical Education as local and national authorities of the health sector.

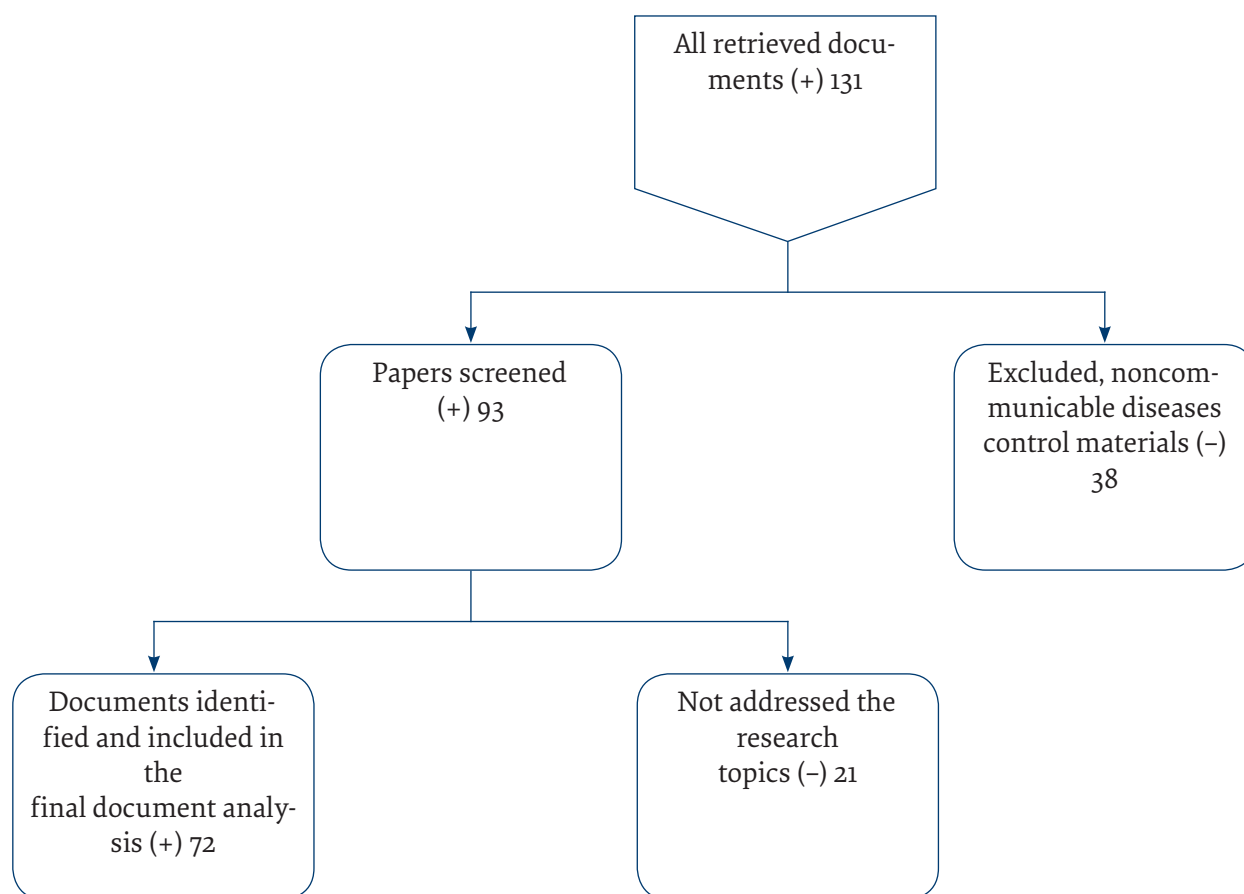


Figure 1. Document analysis process

Response

Investigation and confirmation

Outbreak investigations or rapid health assessments were carried out within 2–3 days of a disaster by a standard team comprising specialists in the related sectors (general physicians, obstetricians/nurses, environmental health and disease control technicians/specialists) with rapid laboratory kits, primary equipment and sample collection tools in accordance with the Emergency Operation Plan. The communicable diseases surveillance system was designed to detect and monitor diseases/syndromes in the affected areas.

Analysis, interpretation, report and feedback

Having information about the prevalence of diseases over the same period in previous months or years is very helpful in determining epidemic thresholds (the number of cases that can produce an outbreak) in a disaster-affected population. The first step in interpretation and confirmation of an outbreak of unknown origin is assessment of the available clinical and epidemiological information. Endemic disease status and information on previous seasonal epidemics are available in the CCDM. Communications and reports were 2-sided, meaning that the data were collected from field health teams and inter-

preted and analysed in the regional health centres and then sent to the Emergency Operations Centre and the health centre of the provincial university. Finally, information was sent to the end point for information collection, the CCDM in the Ministry of Health and Medical Education. Feedback is provided at each stage during this process, and continues to be given on a daily basis. The Emergency Operation Plan forms were used to record data and distribute information.

Control

It may not always be possible to determine the exact cause in the early stages of an outbreak in the aftermath of natural disasters. In such a situation using syndromic surveillance, general control measures based on the probable cause of the outbreak were carried out for primary control. In later stages, when the causative agents become clear, specific measures may be carried out. Four main actions can be performed: preventing exposure (by eliminating the possible source of the disease), preventing infection (protecting sensitive groups, including immunization and primary hygiene services), preventing disease (chemoprophylaxis early treatment) and preventing death.

Table 2. Findings of document analysis, 2003–2014 (continued)

No.	Author, designation, institution	Subject	Year	Audience	Place in the disaster management cycle
1	CCDM in cooperation with Kermanshah University of Medical Sciences and Health Services	Guide to disease surveillance systems in disaster	2003	Universities and relevant ministerial departments and responsible partner organizations	All phases
2	Secretariat Task Force on health in disaster with collaboration of Kermanshah University of Medical Sciences and Health Services	General health threats in disaster	2005	Universities and relevant ministerial departments and responsible partner organizations	All phases
3	MA Connolly Farsi Translation: MM Gouya, M Soroush, A Omidvarinia, M Hemmati, et al Centre for Communicable Disease Management, Ministry of Health and Medical Education	Communicable diseases control in emergencies: a field manual	2005	Universities and relevant ministerial departments and responsible partner organizations	All phases
4	Islamic Parliament Research Centre, Parliament of Islamic Republic of Iran	Disaster Management Act	2007	All country and regional role playing organizations	All phases
5	SH Emami Razavi, Deputy of Health, Ministry of Health and Medical Education	Mandatory Reporting to Emergency Operation Centre of Ministry of Health and Medical Education	2008	Universities and relevant ministerial departments and responsible partner organizations	All phases
6	SM Alavian, Health Deputy, Iran Ministry of Health and Medical Education	Lessons learned from Cyclone Gonu	2008	All country and regional directors	All phases
7	GR Haghighi Deputy of Health, Zahedan University of Medical Sciences	performance report on Bampour flood disaster	2008	Iran CCDM	Response
8	GR Haghighi, Deputy of Health, Zahedan University of Medical Sciences	Report measures taken in the wake of heavy rainfall and flooding in Sistan and Baluchestan	2008	Iran CCDM	Response
9	GR Haghighi, Deputy of Health, Zahedan University of Medical Sciences	Health Measures Instructions During Floods	2008	Administrator of all health networks, Sistan and Baluchestan Province	Response
10	Iran CCDM	Report the latest flood situation in Sistan and Baluchestan with Summarizing Report of Province the Emergency Operation Centre	2008	Deputy of Health, Ministry of Health and Medical Education	Response
11	F Bidarpour, Deputy of Health, Kurdistan University of Medical Sciences	The Report of First Health Exercise	2008	Deputy of Health, Ministry of Health and Medical Education	All phases
12	H Jafarzadeh, Deputy of Health, Ardabil University of Medical Sciences	Reporting zero case in the Khalkhal Hashtjin earthquake area	2008	Deputy of Health, Ministry of Health and Medical Education	Response
13	SH Emami Razavi, Deputy of Health, Ministry of Health and Medical Education	Mandatory Reporting to Emergency Operation Centre of Ministry of Health and Medical Education	2008	Iran CCDM	All phases
14	N Nikparast, Deputy of Health, Mashad University of Medical Sciences	Report of measures taken in city flood of Bojnoord	2008	Iran CCDM	Response

Table 2. Findings of document analysis, 2003–2014 (continued)

No.	Author, designation, institution	Subject	Year	Audience	Place in the disaster management cycle
15	A Hasani, Head of Centre for Disaster Management and Medical Emergencies, Ministry of Health and Medical Education	The third session report of the workshop on national project guidelines for service package for disaster preparedness	2008	Deputies and managers of the Ministry of Health and Medical Education	All phases
16	M Soroush, Head Surveillance Bureau, Iran CCDCM, Ministry of Health and Medical Education	Health rapid response teams configuration and tasks in heterogeneous wars and disaster	2008	Participants in health in heterogeneous wars and disaster conference	Response
17	SH Emami Razavi, Deputy of Health, Ministry of Health and Medical Education	The activities of the Centre for Disease Control in 4 response levels: National, Pole, Provincial and County	2009	Iran CCDCM	All phases
18	M Soroush, Head Surveillance Bureau, Iran CCDCM, Ministry of Health and Medical Education	Duties of the Ministry of Interior in communicable diseases control	2009	Presentations session in Ministry of Interior	All phases
19	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Pakistan flood risks	2010	Deputy of Health, Ministry of Health and Medical Education	Preparedness and mitigation
20	Deputy of Health, Kerman University of Medical Sciences	Necessary measures in earthquake-stricken areas	2010	Head of health network, Reagan city	Preparedness and mitigation, Response
21	MM Gouya, M Soroush, A Omidvarinia, M Zahraei, A Raeisi, A Sedaghat Centre for Communicable Disease Management, Ministry of Health and Medical Education	National Communicable Diseases Operation Plan in Disaster and Emergencies	2011	Universities and relevant ministerial departments and responsible partner organizations	All phases
22	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Report of visit the earthquake region of Mamasani city in Fars province	2011	Deputy of Health, Ministry of Health and Medical Education	Response and Recovery
23	M Aghazadeh, M Mafi, Centre for Communicable Disease Management, Emergency Headquartered of Environment and Labour Health Centre, Ministry of Health and Medical Education	Report from the Flood affected areas of Kelardasht in Mazandaran Province	2011	Deputy of Health, Ministry of Health and Medical Education	Response
24	A Ardalan, MJ Moradian, MM Gouya, K Naddafi, ME Motlagh, Z Abdollahi, et al Disaster Management and Risk Reduction Unit, Department for Public Health, Disaster Public Health Committee, Task force of Health in Disaster and Emergencies, Ministry of Health and Medical education	National Public Health Disaster and Emergency Operation Plan	2011	Universities and relevant ministerial departments and responsible partner organizations	All phases
25	A Reisi, M Zahraei, M Soroush, M Shirzadi, A Sedaghat, H Masoumi Asl, et al CCDCM, Ministry of Health and Medical Education	A Comprehensive Guide for communicable diseases surveillance system for family physicians	2012	Universities and relevant ministerial departments and responsible partner organizations	All phases
26	S Eayar, Deputy of Health, Ilam University of Medical Sciences	Report on Measures in Earthquake affected areas in Abadan	2012	Iran CCDCM	Response
27	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Syndromic surveillance system of national and international needed in the implementation of the International Health Regulations	2012	Universities and relevant ministerial departments and responsible partner organizations representatives in meeting	All phases

Table 2. Findings of document analysis, 2003–2014 (continued)

No.	Author, designation, institution	Subject	Year	Audience	Place in the disaster management cycle
28	AR Mesdaghinia, Deputy of Health, Ministry of Health and Medical Education	The necessary measures in Eastern Azerbaijan earthquake	2012	A Ardalan, Health Deputy Counsellor and Head of Disaster Risk Management Unit	Response
29	M Soroush, Head Surveillance Bureau, Iran CCMD, Ministry of Health and Medical Education	Analysis of earthquake affected situation in east Azarbaijan Quoted from Young Journalist club reported by Astrian News Agency	2012	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Response
30	Javad Nouaallah, Deputy of Health, Ilam University of Medical Sciences	Environmental health emergency vigilance performance report	2012	Deputy of Health, Ministry of Health and Medical Education	Preparedness
31	A Hasani, Head of Centre for Disaster Management and Medical Emergencies, Ministry of Health and Medical Education	Announce some issues related to emergency and passive defence	2012	Public awareness through Iranian Students News Agency	Preparedness
32	SM Dastour, Head of Veterinary Organization	Report on veterinary services and activities in the Eastern Azerbaijan earthquake	2012	Minister of Agriculture	Response
33	SM Dastour, Head of Veterinary Organization	The report of subsequent measures taken in East Azerbaijan earthquake	2012	Minister of Agriculture	Response
34	M Mirzaei, Deputy of Health, Mazandaran University of Medical Sciences	Briefings the measures taken following flood of Noshahr and Chaloos	2012	Centre for Communicable Disease Management, and Environment and Labour Health Centre, Ministry of Health and Medical Education	Response
35	National Disaster management Organization. In: National Disaster management Organization, Ministry of Interior 2012	Tasks of health sector specialized working group in unexpected events and disaster	2012	Ministry of Health and other member organizations in health disaster working group	All phases
36	M Soroush, Head of Surveillance Bureau, Iran CCMD, Ministry of Health and Medical Education	Report on earthquake-stricken areas of Eastern Azerbaijan	2012	CCDM	Response
37	A Reisi, M Zahraei, M Soroush, M Shirzadi, A Sedaghat, H Masoumi Asl, et al. CCMD, Ministry of Health and Medical Education	A Comprehensive Guide for communicable diseases surveillance system for family physicians, 1st ed.	2012	All general practitioners	All phases
38	K Mehdizadeh, Deputy of Health, Birjand University of Medical Sciences	Field visit report of flood-hit areas covered by the Sarbishe health network	2013	CCDM	Response
39	A Khajeh Nian, Deputy of health, Bushehr University of Medical Sciences	Report on activities carried out in Bushehr earthquake	2013	Deputy of Health, Ministry of Health and Medical Education	Response
40	Specialized group of disease response and prevention, Deputy of Health, Qazvin University of Medical Sciences	Report of rapid response teams' exercise	2013	CCDM	Preparedness
41	Manager of Disaster and Medical Emergencies of Bam city, Bam University of Medical Sciences	Report of damage after the flood in Tilek-Asfykan of Bam city	2013	Emergency Operations Centre of Tehran Emergency Centre	Response
42	Seyedi. Manager of Disaster and medical emergencies, Jiroft University of Medical Sciences	Report of the flood and waterlogging in city of Jiroft	2013	Centre for Disaster Management and Medical Emergencies	Response
43	Manager of Centre for Disaster Management and Medical Emergencies, Kerman University of Medical Sciences	A report of recent floods and rainfall in Kerman province	2013	Centre for Disaster Management and Medical Emergencies	Response

Table 2. Findings of document analysis, 2003–2014 (continued)

No.	Author, designation, institution	Subject	Year	Audience	Place in the disaster management cycle
44	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Bam and Jiroft flooding	2013	Deputy of Health, Bam and Jiroft University of Medical Sciences	Response
45	F Rakhshani, Health Deputy, Zahedan University of Medical Sciences	Flooding in Sistan and Baluchestan province	2013	Governor of Sistan and Baluchestan province	Prevention, response
46	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences	A report of primary measures to control flood disaster	2013	Centre for Communicable Disease Management, and Environment and Labour Health Centre, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
47	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences	A report of subsequent measures to control flood disaster	2013	Centre for Communicable Disease Management, and Environment and Labour Health Centre, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
48	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences	A report of measures to control flood disaster consequences	2013	Centre for Communicable Disease Management, and Environment and Labour Health Centre, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
49	SM Tabatabaei, Deputy of Health, Zahedan University of Medical Sciences	A report of measures taken in flood disaster	2013	Centre for Communicable Disease Management, and Environment and Labour Health Centre, Ministry of Health and Medical Education. Iran National Disaster Management Organization	Response
50	F Rakhshani, Deputy of Health, Ministry of Health and Medical Education	The implementation of disaster risk assessment programme in health networks	2013	Health Deputy of all medical universities in the Islamic Republic of Iran	Mitigation and prevention
51	MT Talebian, Head of Disaster Management and Medical Emergencies Centre, Ministry of Health and Medical Education	Report of problems caused by the outbreak of water-borne and food-borne diseases in Yazd province	2013	Preparedness and response deputy, Iran National Disaster Management Organization	Response
52	K Naddafi, Head of Environment and Labour Health Centre, Ministry of Health and Medical Education	A report of the assessment team dispatched from the Ministry of Health to Yazd	2013	Deputy of Health, Yazd University of Medical Sciences	Response
53	K Naddafi, Head of Environment and Labour Health Centre, Ministry of Health and Medical Education	Proceedings of outbreak investigation in Yazd province	2013	Director and Chairman of the Board of Water and Wastewater Engineering Company	Response
54	AR Moraveji, Deputy of Health, Kashan University of Medical Sciences	Report on water and food-borne outbreaks in Abu Zeid Abad of Aran and Bidgol county	2013	Centre for Communicable Disease Management, Ministry of Health and Medical Education	Response
55	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Eltor report	2013	Deputy of Health, Ministry of Health and Medical Education	Response
56	Deputy of Health, Zahedan University of Medical Sciences	A report of cholera control activities	2013	CCDM Ministry of Health and Medical Education	Response
57	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Report of cholera control team activities in the Sistan and Baluchestan	2013	Deputy of Health, Ministry of Health and Medical Education	Response

Table 2. Findings of document analysis, 2003–2014 (concluded)

No.	Author, designation, institution	Subject	Year	Audience	Place in the disaster management cycle
58	A Ardalan, Deputy of Health Counsellor and Head of Disaster Risk Management Unit, Ministry of Health and Medical Education	A report of natural hazards occurrence in Iran	2013	Deputy of Health, Ministry of Health and Medical Education	Preparedness
59	AA Rezaei, General Directorate of Animal Health and Disease Management, Ministry of Agriculture	Necessary measures in the earthquake affected areas of Borazjan	2013	General Director of Veterinary Medicine, Bushehr Province	Response
60	AM Khajeheian, Deputy of Health, Bousehr University of Medical Sciences	Description of the current situation, the initial assessment and health measures in the affected area of Dashtestan	2013	Deputy of Health, Ministry of Health and Medical Education	Response
61	K Naddafi, Head of Environment and Labour Health Centre, Ministry of Health and Medical Education	A brief report of the review mission on respiratory disease in Ahvaz	2013	Deputy of Health, Ministry of Health and Medical Education	Response
62	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	Rapid assessment of the earthquake affected area in the county of Bastak	2014	Deputy of Health, Ministry of Health and Medical Education	Response
63	A Vahidi, Deputy of Health, Kerman University of Medical Sciences	Instructions of response to flood	2014	Administrator of all health networks in Kerman province	Response
64	SH Hashemi, Minister of Health and Medical Education	Warning about Eltor	2014	Minister of Interior	Preparedness and response
65	M Araabi, Deputy of Health, Mazandaran University of Medical Sciences	Request of equipment and funding for responding to cold wave disaster	2014	CCDM, Ministry of Health and Medical Education	Response
66	AA Sayyari, Deputy of Health, Ministry of Health and Medical Education	Recalling things to apply in cold wave disaster management	2014	Health Deputy of Mazandaran and Gilan universities of medical sciences	Preparedness and response
67	K Naddafi, Head of Environment and Labour Health Centre, Ministry of Health and Medical Education	Intensify supervision on water facilities and food storage and distribution centres	2014	Deputy of Health of all universities of medical sciences in Islamic Republic of Iran	Prevention
68	M Araabi, Deputy of Health, Mazandaran University of Medical Sciences	A report of measures taken in cold wave disaster	2014	Deputy of Health, Ministry of Health and Medical Education Chancellor of Mazandaran University of Medical Sciences	Response
69	A Ardalan, Deputy of Health Counsellor and Head of Disaster Risk Management Unit, Ministry of Health and Medical Education	General recommendations related to the snowfall disaster	2014	Deputy of Health of all universities of medical sciences in Islamic Republic of Iran	Preparedness and response
70	K Mehdizadeh, Health Deputy, Birjand University of Medical Sciences	A report of most important actions taken in Tabasyn flood, Nehbandan county	2014	Centre for Communicable Disease Management, Ministry of Health and Medical Education	Response
71	K Mehdizadeh, Deputy of Health, Birjand University of Medical Sciences	Daily report of number of patients affected by the disaster in the Tabasyn flooded area, Nehbandan county	2014	CCDM, Ministry of Health and Medical Education	Response
72	MM Gouya, Director of Centre for Communicable Diseases Management, Ministry of Health and Medical Education	The initial assessment of the disaster-affected area of Musian	2014	Head of Environment and Labour Health Centre, Ministry of Health and Medical Education	Response

CCDM = Iranian Centre for Communicable Diseases Management.

Table 3. Weaknesses and strengths of communicable diseases management in disasters

Weaknesses/problems	Strengths
<ul style="list-style-type: none"> • Safety and security of staff and health facilities • Health facility vulnerability • Basic requirements and tools scarce • Interacting with the media • Access to affected areas • Span of control in operation area • Reporting weakness (communication) • Information management and documentation • correct indicators (lack of denominator) • Inter organizational coordination • Evaluation and performance assessment • Equipment and diagnostic facilities • Job description or transparency in duties (inter-organizational) • Nonparticipation of staff 	<ul style="list-style-type: none"> • Operation plan • Training and exercise • Monitoring and vertical supervision • Logistics • Active and continuous surveillance system • Vector control programme • Contingency planning • Information management system • Intra organizational coordination

Setting up laboratory support

Confirmation of probable case/syndrome to define the disease agent needs laboratory services. According to the Emergency Operation Plan, essential laboratory services are deployed on-site with the support of advance laboratory services at the provincial and national level. Rapid diagnostic kits have been used in recent years for outbreak investigation.

Setting up communications

Stable and appropriate communications are an important component of a communicable diseases surveillance system in disasters. With the mobile networks distributed in recent years, information is transferred in a timely manner, but back-up communication is essential.

Coordination

In keeping with laws and regulations announced by the National Disaster Management Organization to improve coordination in action, coordination among the organizations involved has improved but is still not satisfactory.

Resource management

Since communicable diseases management is an ongoing and enduring process, providing sustainable resources is one of the main concerns. Collaboration and sharing of resources among all responsible organizations is critical to a sustainable supply chain. The issue has been the subject of laws and regulations promulgated by the National Disaster Management Organization to relevant authorities, and by the Ministry of Health and Medical Education to universities and local and national health organizations.

Recovery

In accordance with the Emergency Operation Plan, the final point of response and the instigation of recovery is shifting from emergency surveillance systems to routine surveillance systems, reconstruction of health facilities and re-implementation of routine health services.

Discussion

The aim of this study was to review the Islamic Republic of Iran's communicable diseases management specification and improvement in disaster management from documents published during 2003–2014. The main issues included the identification of partners; policy planning for health management in disasters; early warning of hazards; training and simulation; cooperation with the media; safety and security of health facilities and staff; transparency in describing tasks; search and evacuation capacity; safe water and sanitation; rescue and relief; health preparedness; health response planning; policy support; efficiency and sustainability of the supply chain; risk assessment and vulnerability analysis; defects in cooperation and coordination; outbreak management; resource mobilization; information management and documentation. These were addressed in primary documents from 2003, and indicated a need for improved communicable diseases management.

In line with changes enacted internationally, and using existing guidance from the World Health Organization, measures have also been made towards improving communicable diseases management in the Islamic Republic of Iran. One of the most important points of the system development was the change in case definition to syndrome. Simple learning of the syndromic surveillance for health staff, rapid implementation with minimum facilities and there being no need for extra cost are advantages of the establishment of syndromic surveillance. Another advantage is its adaptation to the routine surveillance system in the country, and familiarity with syndromic surveillance helped inspire health staff to act more skilfully and efficiently. Nevertheless, there were weaknesses in syndromic surveillance, for example a non-estimated denominator, lack of participation of the private sector and general hospitals, nonparticipation of staff, poor intersectoral collaboration and inconsistency of data collection tools. These findings were similar to another study of the East Azerbaijan earthquake to examine strengths and weaknesses of the communicable diseases surveillance system in disaster-affected areas (14).

Another major problem of implementing the surveillance system was lack of agreement on case definitions for monitoring diseases among physicians, especially in the private sector. Although there are some problems in the establishment of syndromic surveillance, its success and effectiveness is confirmed in many disaster-affected areas within different contexts (14,15,16). Routine surveillance systems that are supposed to be involved in patient care at the start of syndromic surveillance in disaster-stricken areas should have the use of advanced technology but these are extremely vulnerable to the effects of disasters. Considering this problem, the introduction of simple disease surveillance, such as syndromic surveillance, following a disaster can be useful. After a disaster has occurred, syndromic surveillance should be initiated and tailored to the local setting (17).

Another problem in the current situation was documentation and registration systems. Data were collected, registered and reported manually, which could introduce human error (18). Although advanced technology such as web-based registration has some advantages, e.g. increased coverage, accuracy and timeliness of data collection and instant feedback, the disruption of telecommunications infrastructure and failing computers creates too high a risk (19). According to advanced mobile networks in the Islamic Republic of Iran, mobile-based surveillance systems for sending data and monitoring communicable diseases, which has seen success in other countries (20,21,22) using a geographical information system to identify disease distribution, could be useful (23).

Intra-organizational collaboration with the implementation of the Public Health Emergency Operation Plan showed little improvement. Despite notification of the comprehensive Rescue and Relief Act that was approved by the Iranian Council of Ministers (Article 44 of the Third Economic, Social, and Cultural Act of the Islamic Republic of Iran, approved in 2000 and regulated by the National Disaster Management Organization), interorganizational cooperation issues still remain. These communication and coordination problems between role player organizations are similar to those experienced in other countries (24,25). Perhaps a helpful action to resolve this problem would be legal penalties for noncooperating organizations. This requires the establishment of a performance assessment system to determine the failure of partner organizations as developed by Babaie et al. in recent research in CCDM (26). This is a very important step since successful control and management of communicable diseases requires the cooperation and support of all organizations involved in health (safe water and food, vector control, security at the scene, lifelines, basic supplies, etc.).

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Laboratory support for communicable disease surveillance is usually severely limited in disasters and the existence of a mobile laboratory with proper facilities at the time of disasters in the affected area has long been a problem (27). Although rapid diagnostic kits have been used in recent years for outbreak investigation in the Islamic Republic of Iran for many infectious agents, access to advanced laboratory services on-site remains an issue. Transferring samples to provincial and national referral laboratories and receiving feedback has an adverse effect on the management of communicable diseases through time wasting.

In the field of resource management, a speedy response to health-related needs immediately after natural disasters through efficient emergency logistics distribution and resource management is vital for the alleviation of disaster impact in the affected areas. Although the National Disaster Management Organization emphasized this issue, measures taken have been inadequate. A hybrid clustering–optimization approach to the operation of emergency logistics distribution might be a solution (28).

Conclusion

The established communicable diseases management functioned well in controlling communicable diseases in disasters in the Islamic Republic of Iran, and could be usable for other low- and middle-income countries. Many problems have been resolved, including preparing guidelines, training materials, training courses, exercises and coordination of units in the Ministry of Health and Medical Education. However, there were some weaknesses in current communicable diseases management in intra-organizational cooperation in the Ministry of Health and Medical Education and interorganizational cooperation at the national and provincial level and this needs further development. Lack of coordination among external organizations, comprehensive support systems, external monitoring and evaluation, reliable communications, and timely action of all responsible organizations are the main issues. Inter-agency coordination could be improved to some extent by changing the current disaster management legislation to a service-based approach (29), i.e. an organization-centred approach.

Considering the Islamic Republic is among the top 10 countries vulnerable to natural hazards, designing an information and communication system for recording and collecting data is essential at the time of any disaster. For better coordination and general improvement, continual retraining and exercises for intra-organizational staff in the Ministry of Health and Medical Education, universities and other organization are suggested.

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Prise en charge des maladies transmissibles en situation de catastrophe : analyse en République islamique d'Iran

Résumé

Contexte : En raison de l'importance de la prise en charge des maladies transmissibles dans les situations de catastrophe, le Centre de prise en charge des maladies transmissibles du ministère de la Santé et de l'Enseignement médical de la République islamique d'Iran a pris des mesures afin d'améliorer les systèmes de prise en charge systématique des maladies transmissibles dans les situations normales et d'urgence.

Objectifs : La présente étude a pour objet d'analyser les mesures d'amélioration prises depuis 2005.

Méthodes : Une méthode d'analyse qualitative a été utilisée pour examiner l'ensemble des documents existants ayant trait à la prise en charge des maladies transmissibles, entre le mois de mars 2003 et la fin de l'année 2014. Ces documents sont disponibles auprès du Centre de prise en charge des maladies transmissibles et via les sites Web officiels des organisations apparentées.

Résultats : Soixante-douze documents relatifs à la prise en charge des maladies transmissibles en situation de catastrophe ont été intégrés dans l'analyse finale. Les conclusions de l'étude ont été résumées en tenant compte des quatre phases du cycle de gestion des catastrophes et des cinq fonctions essentielles et d'appui du système de surveillance.

Conclusions : L'examen des documents a montré des améliorations dans la prise en charge des maladies transmissibles en situations de catastrophe, notamment en termes de collaboration interorganisations et d'utilisation des nouvelles technologies telles que les systèmes basés sur le Web et sur téléphone portable.

علاج الأمراض السارية في حالات الكوارث: دراسة تحليلية في جمهورية إيران الإسلامية

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الخلاصة

الخلفية: نظرًا لأهمية علاج الأمراض السارية في حالات الكوارث، اتخذ مركز علاج الأمراض السارية التابع لوزارة الصحة والتعليم الطبي في جمهورية إيران الإسلامية التدابير اللازمة لتحسين نظم العلاج الروتيني للأمراض السارية في الظروف العادية وحالات الطوارئ.

الأهداف: هدفت هذه الدراسة إلى استعراض تدابير التحسين التي تم اتخاذها منذ عام ٢٠٠٥.

طرق البحث: استخدم أسلوب التحليل النوعي للمستندات في تحليل جميع الوثائق المتعلقة بعلاج الأمراض السارية منذ مارس/آذار ٢٠٠٣ حتى نهاية عام ٢٠١٤، والمتاحة في مركز علاج الأمراض السارية والمواقع الإلكترونية الرسمية للمنظمات ذات الصلة بالموضوع.

النتائج: أدرجت اثنين وسبعين وثيقة تناولت علاج الأمراض السارية في حالات الكوارث في الدراسة التحليلية النهائية. ولخصت نتائج البحث في أربع مراحل لدورة إدارة الكوارث وفقًا للوظائف الأساسية والداعمة الخمسة لنظام الترصد.

الاستنتاجات: أشارت الوثائق التي تم مراجعتها إلى التحسينات المُدخلة في علاج الأمراض السارية في حالات الكوارث، بما في ذلك التعاون بين المنظمات، وتدفق المعلومات، واستخدام التقنيات الجديدة مثل النظم القائمة على شبكة الإنترنت أو الهواتف المحمولة.

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Fasting and post-prandial plasma glucose screening for gestational diabetes mellitus

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Abstract

Background: Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance with onset during the second or third trimester of pregnancy.

Aims: The purpose of this study was to investigate the prevalence of pregnant women who were not screened for gestational diabetes mellitus and compare the maternal and fetal outcomes of women who had undergone GDM screening.

Methods: Women who refused to attend the gestational diabetes screening test ($n = 162$) at a maternity hospital in Ankara, Turkey, between October 2014 and January 2015 were included in this prospective cohort study. The control group (matched for age and body mass index) was recruited from women who agreed to have the gestational diabetes screening test ($n = 194$).

Results: Just 12% of pregnant women did not attend gestational diabetes screening test; these women were at higher risk for idiopathic polyhydramnios ($P = 0.026$). Prevalence of GDM was 8.8% ($n = 17$) in the control group and 30.9% ($n = 50$) in those who refused GDM screening. The maternal and fetal outcomes of GDM patients were similar in both groups. Women who did not attend GDM screening test had increased risk for mild idiopathic polyhydramnios in late gestation.

Conclusions: Fasting and postprandial plasma glucose screening can replace gestational diabetes mellitus screening in women who refuse to have the glucose load test.

Keywords: idiopathic polyhydramnios, gestational diabetes screening, plasma glucose test, glucose tolerance test

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Introduction

Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance with onset during the second or third trimester of pregnancy (1). The prevalence of GDM is as high as 9.2%, according to a 2014 analysis (2). Risk factors for GDM include advanced maternal age (> 25 years), multiparity, multiple pregnancy, family history of diabetes, pregnancy loss at second or third trimester, history of fetal macrosomia childbirth, history of GDM in a previous pregnancy, and overweight and obesity (3).

Pregnancies with complicated GDM are faced with abortion, large for gestational age, intrauterine growth restriction, polyhydramnios, intrauterine fetal death, pre-eclampsia, and delivery complications including caesarean section, birth trauma, neonatal hypoglycaemia, hyperbilirubinaemia, polycythaemia, and requirement for admission to the neonatal intensive care unit. Therefore, early diagnosis and treatment of GDM may reduce fetal exposure to maternal hyperglycaemia and decrease maternal and fetal complications (4,5).

Screening for GDM is recommended as a single or 2-stage oral glucose tolerance test (OGTT) between 24 and 28 weeks of pregnancy (6). In this study, we aimed to determine the prevalence of pregnant women who

refused to attend a gestational diabetes screening test and compared their maternal and fetal outcomes with those who accepted a gestational diabetes screening test. Our second aim was to investigate whether fasting and postprandial plasma glucose screening could replace gestational diabetes mellitus screening in women who refuse glucose load.

Methods

This prospective cohort study was conducted among 1450 patients admitted for routine antenatal follow-up between 24 and 28 weeks of gestation at a maternity hospital in Ankara, Turkey, between October 2014 and January 2015. The hospital is a maternity care hospital and a tertiary referral centre that has 18 000 births annually. This study was conducted according to the Declaration of Helsinki (7). The institutional review board of the University of Health Sciences, Zekai Tahir Burak Woman's Health, Education and Research Hospital (# 18/2014) approved the study. Exclusion criteria included multiple gestation, clinical evidence or historical pregestational of diabetes, fasting plasma glucose exceeding 126 mg/dL or the 2-hour postprandial or glucose challenge test (GCT) value exceeding 200 mg/dL, history of a positive glucose tolerance test in the first trimester, and women

with known diseases of the kidney, liver or thyroid gland. Maternal age, gravidity, parity, body mass index, family history of diabetes, history of gestational diabetes and macrosomia (> 4000 g) in their previous pregnancy were recorded. All patients were informed about gestational diabetes mellitus and screening of GDM. Women who refused to attend the gestational diabetes screening test were followed with fasting and postprandial 2nd hour plasma glucose levels, initially at screening time and at 32 weeks of gestational age. Abnormal glucose test was defined as fasting venous plasma glucose level > 92 mg/dL and/or postprandial 2-hour venous plasma glucose level > 120 mg/dL.

The control group was selected by a simple random sampling method and 194 age-parity matched women who had agreed to have the gestational diabetes screening test were recruited in the study. Women in the control group underwent a 2-stage GCT. A positive 50-g GCT is defined as glucose level 1 hour after glucose challenge of at least 140 mg/dL. Women who had a positive 50-g GCT were advised to follow a normal diet 3 days before the 100-g OGTT. The standard protocol for the OGTT was used; after an 8-hour overnight fast, venous plasma samples were collected when fasting 1, 2 and 3 hours after the receipt of the 100-g oral glucose load. Women who had a positive OGTT test according to the criteria identified by Carpenter and Coustan were labelled as having GDM; GDM was diagnosed if the 2 diagnostic criteria were found (8).

Diagnosis for polyhydramnios was made measuring either amnion fluid index (AFI) and/or single deepest pocket (SDP) (9,10). Polyhydramnios was defined and categorized into 3 groups according to severity: mild polyhydramnios (AFI 24.0–30.0 cm and/or SDP 8.0–11.9 cm), moderate polyhydramnios (AFI 30.1–35.0 cm and/or SDP 12.0–15.9 cm) and severe polyhydramnios (≥ 35.0 cm and/or SDP ≥ 16.0 cm) (10). Macrosomia was defined as fetal birth weight exceeding 4000 g. Deliveries occurring prior to 37 weeks of gestation were recorded as preterm.

Patients with abnormal plasma glucose level (FPG > 92 mg/dL and or PPG > 120 mg/dL) or positive OGTT were followed by a qualified dietitian and initially received an 1800–2200 calorie diet with the meal composition of 40–45% carbohydrates, 20% protein, and 40% fat, individualized to pre-pregnancy weight, activity level, dietary intake, and weight gain. The FPG and PPG tests were performed 10 days after nutritional counselling and 2 hours after a standard breakfast. Treatment targets to maintain maternal capillary glucose concentration were at < 92 mg/dL in the fasting state and < 120 mg/dL 2 hours after starting the meal. If levels were still above these objectives despite repeated FPG and PPG measurements, the patient was treated with insulin as necessary.

Clinical patient characteristics such as age, gravidity, body mass index, gestational age, socioeconomic and education level, family history of diabetes, previous pregnancy GDM and macrosomia history were evaluated. Weight gain, labour, delivery, birth outcome, obstetric

complications (including hypertension, diabetes, oligohydramnios, polyhydramnios, premature rupture of membrane), and neonatal outcomes (including first and fifth minute Apgar scores, birth weight, fetal sex, and neonatal intensive care unit admission) were obtained from medical records. Lower socioeconomic level was defined as unemployed or without regular income or with income lower than the minimum wage.

An enzymatic method using Roche automated clinical chemistry analyser (Hitachi 912 analyser, Roche Diagnostics GmbH, Germany) was used for quantitative determinations of blood glucose. Glucose was measured using a commercial glucose oxidase kit (Glucose GOD-PAP, Roche Diagnostics GmbH, Germany). Detection range was 2–450 mg/dL (0.11–25 mmol/L) and intra- and inter-assay coefficient of variation values was 0.9 and 1.8%, respectively.

Distribution of the data was analysed with Kolmogorov-Smirnov and Shapiro-Wilks tests. The data were presented as mean and standard deviation (SD) or median and range for continuous variables, and as number and percentage for categorical variables. The Mann-Whitney U-test was used to analyse non-normally distributed data. An independent sample t-test was used to compare the continuous variables with normal distribution. The Chi-squared and Fisher exact tests were used to compare categorical variables. Data were evaluated using SPSS, version 23.0. The significance boundary was given as 0.05.

For the power calculation, we assumed a GDM prevalence of 5–10% and an effect size of 0.3 (11–13). The sample size calculation for the entire study population of 1450 women involved a 2-sample comparison with a 5% level of significance (alpha) and power of 0.95 and gave a study population of 220 patients in each group. This sample size was able to detect a 0.5 SD difference in continuous variables given the same power and significance level. However, during the study period only 162 patient refused to be screened by 50 g-GCT and the actual power of this study was therefore 0.91, with both alpha and beta error probabilities of 0.09. Sample size calculations were performed using *G*Power*, version 3.1.5, general power analysis program (11).

Results

Between October 2014 and January 2015, 1450 pregnant women attended the hospital for routine follow-up at 24–28 weeks; 62 women were excluded from this study due to their quitting antenatal follow-up or having a chronic disease before pregnancy; 5 had a fasting plasma glucose exceeding 126 mg/dL or the 2-hour postprandial value exceeding 200 mg/dL and were referred to an endocrinology specialist. Among the 1388 remaining women, 162 (12%) refused to attend the screening test and 1226 (88%) accepted the gestational diabetes screening test. The control group comprised 194 age-parity matched women from those who had accepted to have the screening test.

Mean maternal age of all women included in this study was 27 (range 17–43) years (Table 1) and median

Table 1 Demographic characteristics of two groups of pregnant women undergoing screening for gestational diabetes mellitus, Ankara, 2014–2015

Characteristic	FPG and PPG screening (n = 162)	2-step OGTT screening (n = 194)	P-value
	Median (min–max)	Median (min–max)	
Age, mean (range) (years)	26 (17–43)	28 (17–42)	0.914
Maternal BMI (kg/m ²)	27.6 (18–40)	26.9 (18–38)	0.072
Gestational age (wks)	25.9 (24–28)	25.8 (24–28)	0.207
	No. (%)	No. (%)	
Multiparous (parity ≥ 1)	99 (61)	127 (65)	
Lower socioeconomic level	138 (85.0)	170 (8.0)	0.834
Education level			0.956
1 (0–8 years)	126 (78.1)	152 (78.3)	
2 (> 8 years)	36 (21.9)	42 (21.7)	
History of GDM	3 (1.9)	8 (4.1)	0.282
Positive family history of GDM	17 (10.5)	29 (14.9)	0.125
History of macrosomic delivery	8 (4.9)	7 (3.6)	0.575

FPG = fasting plasma glucose

PPG = postprandial plasma glucose.

OGTT = oral glucose tolerance test.

BMI = body mass index.

GDM = gestational diabetes mellitus.

parity was 1 (range 0–6). In the study group, median FPG was 81 (range 61–124) mg/dL, postprandial plasma glucose (PPPG) was 102 (range 74–198) mg/dL; 50 women (30.8%) had abnormal glucose levels, 23 (14%) had FPG ≥ 92 mg/dL and 5 had complicated polyhydramnios and macrosomia; 37 women (10.4%) had PPPG ≥ 120 mg/dL and 5 had complicated polyhydramnios and macrosomia.

At least 1 risk factor for GDM was indicated in 147 patients (90.7%) who refused to attend the GDM screening test and in 177 patients (91.2%) in the control group. Prevalence of GDM in the control group was 8.8% (n = 17/194) whereas it was 30.9% (n = 50/162) in the GCT refusing group. There were no statistically significant differences between groups in terms of maternal age, gravidity, parity, body mass index, socioeconomic level, education level, family history of diabetes, history of gestational diabetes in their previous pregnancy, whether they delivered a macrosomic baby (> 4000 g), or number of risk factors for gestational diabetes ($P > 0.05$). The demographic characteristics of the patients are shown in Table 1.

All the patients recruited in the study had only dietary treatment. No insulin or oral antidiabetic drugs were needed. Pregnant women who refused to attend the gestational diabetes screening test had higher rates of polyhydramnios compared to control group ($P = 0.026$). All of polyhydramnios cases were mild. There were no significant differences between control and study group for neonatal outcomes. Obstetric complications and neonatal outcomes in the 2 groups are shown in Tables 2 and 3. There were 3 cases of neonatal hypoglycaemia and hyperbilirubinaemia in the study population but these were not statistically significant ($P = 0.093$). When the 2 groups were re-analysed according to gestational

diabetes diagnosis, the maternal and fetal outcomes were similar in women those with and without a diagnosis of diabetes (Tables 4,5).

Discussion

We evaluated the prevalence of pregnant women who refused to attend gestational diabetes screening, and compared their maternal and fetal outcomes with the women screened using 2-step GCT. The prevalence of women who refused to attend GDM screening was 12%. We also found that the prevalence of idiopathic polyhydramnios was higher in women who refused to attend the GDM screening test compared with the control group. To the best of our knowledge, this is the first study determining the prevalence of pregnant women who refused to attend gestational diabetes screening test and evaluating maternal and neonatal outcomes in the Turkish population'

Although the current evidence is controversial and insufficient to interpret the benefits and harm of GDM screening, there are studies showing that treating GDM allows for a significant reduction in macrosomia, neonatal fat mass, shoulder dystocia, pre-eclampsia, and caesarean section (5,12). Therefore, the American Diabetes Association recommended that all pregnant women should undergo risk assessment for GDM at the first antenatal visit and if necessary undergo glucose testing as soon as possible (1). Women with abnormal glucose levels in the first trimester should be classified as type 2 diabetes (1). Patients not known to have prior diabetes or normal glucose values at the initial screening should go for repeat testing at 24–28 weeks gestation (1). In addition, the American College of Obstetricians and Gynecologists suggested that all pregnant women should be tested at 24–28 weeks gestation (13). The Hyperglycaemia and

Table 2 Obstetric outcomes for two groups of pregnant women undergoing screening for gestational diabetes mellitus, Ankara, 2014–2015

Outcome	FPG and PPG screening (n = 162) No. (%)	2-step OGTT screening (n = 194) No. (%)	P-value
Gestational age at delivery (wks) ^a	38.7 (24–42)	38.8 (29–42)	0.846
Maternal weight gain (kg) ^a	11.1 (5–18)	12.5 (3–30)	0.628
Delivery by caesarean-section	72 (44.4)	90 (46.4)	0.822
Preterm delivery (< 37 wks)	14 (8.6)	17 (8.8)	1.000
Macrosomia (birthweight > 4000 g)	10 (6.2)	9 (4.6)	0.970
Pre-eclampsia	6 (3.7)	4 (2.1)	0.522
Polyhydramnios	7 (4.3)	1 (0.5)	0.026
Oligohydramnios	6 (3.7)	5 (2.6)	0.556
SGA (< 10th percentile)	19 (11.7)	23 (11.9)	1.000

^aMedian (min–max).

FPG = fasting plasma glucose.

PPG = post prandial glucose.

OGTT = oral glucose tolerance test.

SGA = small for gestational age.

Adverse Pregnancy Outcome (HAPO) study found that there were also associations between increased maternal hyperglycaemia and preterm delivery, shoulder dystocia, pre-eclampsia, and hyperbilirubinemia (14). Adverse obstetrics outcomes and perinatal mortality rates decrease with better glycaemic control (15).

However, although the debate is ongoing in regard to the cut-off value in the screening, the GCT can be performed as a 100-g 3-hour test and a 75-g 2-hour test (16–18). Although the 100-g 3-hour GTT is generally applied as the second stage of the 2-stage approach while the 75-g 2-hour test is applied as the only test in the 1-stage approach, this is optional. For example, the Canadian Diabetes Association clinical guidelines suggest the 75-g 2-hour GTT (18). Even if carbohydrate loading is recommended for 3 days before the screening test, it is not necessary in patients who do not want to follow a low-carbohydrate diet (19,20).

The prevalence of GDM has been steadily increasing with the rise in obesity and type 2 diabetes. Worldwide reports range from 1–14% (16). For our control group,

the prevalence of GDM was estimated at 8.8%. This is somewhat lower than the rate reported by Yeral et al. (11.2%) using the 2-step method in the Turkish population (17). The majority of women (90%) in our study population had ≥ 1 risk factors of GDM.

Glucose solutions used for oral glucose tolerance test (OGTT) and GTT have a hyperosmolar content at high concentration and can cause gastric irritation, delayed emptying, and gastrointestinal osmotic imbalance, leading to nausea and, in a small percentage of women, vomiting (21). Therefore, some pregnant women did not succeed in completing the OGTT because of refusing to undergo the test, vomiting, eating during the test, etc. For this reason, some alternatives to the oral screening and GTTs have been described these and are better tolerated. These methods include offering the hyperosmolar glucose drink on ice, using candy, a predefined meal, or commercial soft drinks instead of a standard glucose monomer or polymer solution, and intravenous GGT. But these options seem to be less sensitive and have not been affirmed in prospective randomized studies (22–27). None

Table 3 Neonatal characteristics for two groups of pregnant women undergoing screening for gestational diabetes mellitus, Ankara, 2014–2015

Characteristic	FPG and PPG screening (n = 162)	2-step OGTT screening (n = 194)	P-value
Birthweight (g) ^a	3232 (751–5150)	3211 (1000–4700)	0.876
Apgara			
1st min	7 (4–8)	7 (4–8)	0.956
5th min	9 (6–10)	9 (6–10)	0.956
NICU (No. %)	9 (5.6)	7 (3.6)	0.446

^aMedian (min–max).

FPG = fasting plasma glucose.

PPG = postprandial plasma glucose.

OGTT = oral glucose tolerance test.

NICU = requirement for neonatal intensive care unit.

Table 4 Obstetric and neonatal outcomes of pregnant women who did not have gestational diabetes mellitus among the 2 groups undergoing screening, Ankara, 2014–2015

Outcome	FPG and PPG screening (n = 112) No. (%)	2-step OGTT screening (n = 177) No. (%)	P-value
Delivery by caesarean-section	49 (43.8)	81 (45.8)	0.945
Preterm delivery (< 37 wks)	9 (8)	14 (8)	1.000
Macrosomia (birthweight > 4000 g)	4 (3.6)	7 (4)	1.000
Pre-eclampsia	4 (3.6)	3 (1.7)	0.436
Polyhydramnios	1 (0.9)	1 (0.6)	1.000
Oligohydramnios	6 (5.4)	5 (2.8)	0.347
SGA (< 10th percentile)	10 (8.9)	21 (11.9)	0.559
NICU	7 (6.3)	4 (2.3)	0.114

FPG = fasting plasma glucose.

PPG = post prandial glucose.

OGTT = oral glucose tolerance test.

SGA = small for gestational age.

NICU = requirement for neonatal intensive care unit.

of them have been confirmed by the American Diabetes Association or the American College of Obstetricians and Gynecologists. Agarwal et al. reported that 5% (n = 242) of 4844 women who underwent the OGTT at 24–28 weeks of gestation were not able to complete this test (28).

Some research has focused on the association between fasting plasma glucose (FPG) and adverse perinatal outcomes. The HAPO study demonstrated that FPG \geq 95 mg/dL was correlated with fetal macrosomia in the second half of pregnancy at the time of screening at 24–28 weeks (14). A review of FPG as a screening test for GDM demonstrated that, with the American Diabetes Association criteria for 75 g or 100 g OGTT, it appears to be a good test for the screening of GDM. Using the WHO criteria (FPG > 109 mg/dL) could limit the usefulness of FPG as a screening test for GDM due to poor specificity and high false positive rates (29). Tam et al. recommended that the FPG with a threshold of 88 mg/dL (4.9 mmol/L)

is a better test rather than using GCT or postprandial glucose for universal screening (30).

Previous studies have focused on postprandial 2-hour glucose screening (30–35), mostly with accompanying FPG for the diagnosis of GDM (36–39). Battacharya et al. and Rust et al. reported against the use of PPPG, but Bhattacharya determined FPG cut-off value as 105 mg/dL (higher than the conventional threshold of 92 mg/dL) and Rust et al. did not evaluate FPG (34,35). While Senanayake et al. found FPG superior to PPPG when screening for GDM (33), Huddleston et al. reported that if FPG is normal, then a 2-hour postprandial glucose test is not needed (31). Agarwal et al. (32) pointed to the high false positive rates of FPG and PPPG testing; we found that GDM prevalence was 31% with FPG and PPPG screening compared with 9% using the regular 50 g GCT.

Polyhydramnios is a condition associated with an excess volume of amniotic fluid. The incidence of

Table 5 Obstetric and neonatal outcomes ifor pregnant women who had gestational diabetes mellitus among the two groups undergoing screening, Ankara, 2014–2015

Outcome	FPG and PPG screening n = 50 No. (%)	2-step OGTT screening n = 17 No. (%)	P-value
Delivery by caesarean section	23 (46.0)	9 (52.9)	0.326
Preterm delivery (< 37 wks)	5 (10.0)	1 (5.9)	1.000
Macrosomia (birthweight > 4000g)	6 (12.0)	2 (11.8)	1.000
Pre-eclampsia	2 (4.0)	1 (5.9)	1.000
Polyhydramnios	6 (12.0)	0 (0.0)	0.325
Oligohydramnios	0 (0.0)	0 (0.0)	1.000
SGA (< 10th percentile)	9 (18.0)	2 (11.8)	0.716
NICU	2 (4.0)	1 (5.9)	1.000

FPG = fasting plasma glucose.

PPG = post prandial glucose.

OGTT = oral glucose tolerance test.

SGA = small for gestational age.

NICU = requirement for neonatal intensive care unit.

polyhydramnios ranges from 1–2% in general obstetric practice and most cases display mild severity. The most common causes of mild polyhydramnios are maternal diabetes, multiple gestation, fetal infection, fetal structural anomalies and idiopathic factors (40). In our study, only idiopathic polyhydramnios was found to be higher in women who did not attend the GDM screening test compared with those in the control group [$n = 7$ (4.3%) vs $n = 1$ (0.5%)]. All cases were of mild severity and were diagnosed in the third trimester. Six out of the 7 patients were correlated with high levels of plasma glucose.

There were some limitations to the present study. Initially HbA_{1c} levels were not evaluated, however, screening for HbA_{1c} is not routinely performed or recommended (36). The study population was lower than we had predicted. Lastly, all the patients recruited in

the study had only dietary treatment: no insulin or oral antidiabetic drugs were needed, which indicates that all the cases were mild.

Conclusion

As GDM is linked to many serious fetal and maternal complications, screening, diagnosis, treatment and follow-up of GDM are recommended for all pregnant women. Although pregnant women were screened by FPG and PPPG in the second trimester, 40% of fetal macrosomia and 28.6% polyhydramnios were missed. Therefore fasting and post-prandial plasma glucose screening could be a beneficial individual screening for gestational diabetes mellitus in women who refuse the glucose load test.

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Competing interests: None declared.

Dépistage du diabète gestationnel à l'aide de la mesure de la glycémie plasmatique à jeun et postprandiale

Résumé

Contexte : Le diabète gestationnel se définit comme une intolérance au glucose qui apparaît au cours du deuxième ou troisième trimestre de la grossesse.

Objectifs : La présente étude a pour objectif d'analyser la prévalence de femmes enceintes n'ayant pas bénéficié d'un dépistage du diabète gestationnel et de comparer l'issue de la grossesse pour la mère et le fœtus.

Méthodes : Les femmes ayant refusé de participer au test de dépistage du diabète gestationnel ($n = 162$) dans une maternité d'Ankara (Turquie) entre le mois d'octobre 2014 et de janvier 2015 ont été incluses dans cette étude de cohorte prospective. Le groupe témoin était constitué de femmes appartenant à la même tranche d'âge et présentant un indice de masse corporelle similaire qui ont accepté le test de dépistage du diabète gestationnel ($n = 194$).

Résultats : La prévalence de femmes enceintes qui n'avaient pas participé au test de dépistage du diabète gestationnel était de 12 %. Les femmes n'ayant pas participé au test de dépistage du diabète gestationnel présentaient un risque plus élevé d'hydramnios idiopathique ($p = 0,026$). La prévalence du diabète gestationnel était respectivement de 8,8 % ($n = 17$) et de 30,9 % ($n = 50$). L'issue de la grossesse pour les mères présentant un diabète gestationnel et leur fœtus était similaire dans les deux groupes. Les femmes n'ayant pas participé au test de dépistage du diabète gestationnel présentaient un risque accru d'hydramnios idiopathique léger en fin de grossesse.

Conclusions : La mesure de la glycémie plasmatique à jeun et postprandiale peut remplacer le dépistage du diabète gestationnel chez les femmes qui refusent l'administration d'une charge de glucose.

فحص مستوى الجلوكوز في البلازما عند الصيام وبعد الأكل للتحقق من الإصابة بداء السكري الحُملي

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الخلاصة

الخلفية: يُعرّف داء السكري الحُملي بضعف تحمل الجلوكوز الذي تبدأ أعراضه في الثلث الثاني أو الثالث من الحمل.

الأهداف: هدفت هذه الدراسة إلى استقصاء معدل انتشار عدم خضوع الحوامل لفحص السكري الحُملي، ومقارنة المخرجات الصحية لدى الأم والجنين.

طرق البحث: أدرجت النساء اللاتي رفضن الخضوع لفحص داء السكري الحُملي ($n = 162$) في أحد مستشفيات الولادة في أنقرة، بتركيا، في الفترة بين أكتوبر/ تشرين الأول ٢٠١٤ ويناير/ كانون الثاني ٢٠١٥، في هذه الدراسة الأترابية الاستباقية. وتمت الاستعانة بمجموعة مرجعية من النساء المتماثلات في السن ومنسب كتلة الجسم واللاتي قبلن الخضوع لفحص داء السكري الحُملي ($n = 194$).

النتائج: بلغ معدل انتشار عدم خضوع الحوامل لفحص السكري الحُملي ١٢٪. والنساء اللاتي لم يخضعن لفحص السكري الحُملي كن معروضات أكثر لخطر الإصابة بمَوَه السَّلي مجهول العلة ($p = 0,026$). وكان معدل انتشار داء السكري الحُملي ٨,٨٪ ($n = 17$) و ٣٠,٩٪ ($n = 50$) على التوالي.

وكانت المخرجات الصحية لدى الحوامل المصابات بداء السكري الحملي متشابهة بالنسبة للأمهات والأجنة في كلا المجموعتين. والنساء اللاتي لم يخضعن لفحص السكري الحملي كن معرضات بشكل أكبر لخطر الإصابة بمَوَه السَّلَى مجهول العلة الخفيف في آخر الحمل.

الاستنتاجات: يمكن أن يحل فحص مستوى الجلوكوز في البلازما عند الصيام وبعد الأكل محل فحص داء السكري الحملي لدى النساء اللاتي يرفضن قياس حمل الجلوكوز.

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Response to:**Population and mortality profile in the Islamic Republic of Iran, 2006–2035**

Aghamohamadi S; Hajinabi K; Jahangiri K; Masoudi Asl I; Dehnavieh R. Population and mortality profile in the Islamic Republic of Iran, 2006–2035. *East Mediterr Health J.* 2018;24(5):469–476. <https://doi.org/10.26719/2018.24.5.469>

Methodological issue on population and mortality profile in the Islamic Republic of Iran

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Sir,

We were interested to read the paper by Aghamohamadi et al. published in the July 2018 issue of the *Eastern Mediterranean Health Journal* (1). Their purpose was to calculate the population and mortality in the Islamic Republic of Iran from 2006 to 2035 in two phases: first, the age and sex structure of the population was predicted in three steps. Second, the value of the general groups for cause of death in the country was assessed and predicted during the indicated years. The crude and causal death rates were calculated and their 20 year trend was predicted using the Lee–Carter model. Authors reported that in 2035, the age group 60 years and over will reach 17.6% of the total population. Endocrine, nutritional and metabolic diseases will be the biggest causes of an increase in the rate of death in the general population; also the largest decline in cause of death is for unintentional injuries (1).

It should be noted that the Lee–Carter method expresses the death report in age groups of 5 years. It also expresses only the prediction of death in the form of a time series and is not able to predict the causes of death; this process not mentioned in this article (2). Another point is that this method is not able to predict death for a group under the age of 5 years, and more precise methods are available (2). In addition, in terms of the number of deaths expected by 2035, the debate on the progress of

science and technology has not been considered, and is one of the weaknesses of the Lee–Carter method. Also, regarding the coding of the causes of death in the Islamic Republic of Iran – despite significant progress – it is incorrect to use the codes of Group I, which is also mentioned in Khosravi's study (3). The Ministry of Health is faced with a low estimate of the number of deaths recorded, especially for females, which is also evident in this article. The article states that deaths from cardiovascular disease, especially in women, and deaths due to unintentional incidents, are declining; however, according to the World Health Organization report, since 2006 these rates have been rising (4), which indicates the inability of this method to predict the cause of death.

Authors concluded that noncommunicable diseases will increase as the aging population grows. Identification of their primary causal and risk factors can, therefore, contribute to prevention and control.

Methods to predict the causes of death and the expected number of deaths, such as the Murray method that can predict the causes and number of deaths expected for each community based on hospital deaths (5). However, the use of this method as expressed in this article can be somewhat misleading, especially if the results are taken into account in health decisions.

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Response by Dr Hajinabi:

In this study after calculating the amount of crude and cause-specific deaths in 5-year age groups, the 20-year trend was predicted using the Lee–Carter model. It should be noted that using this model for predicting the causes' trend, a value must exist for all 5-year age groups, and forecasts in main groups of cause of death was based on the International Classification of Diseases. Of the total 21 primary disease groups in this classification, the diseases that cannot be considered as the causes of death – as well as the diseases of the skin and subcutaneous tissue, diseases of the musculoskeletal system and connective tissue, pregnancy, childbirth and puerperium and conditions originating in the perinatal period with negligible or zero value in age and gender groups – were excluded from the study because their trend was not predictable by this model. Finally, forecast for 13 major groups of causes of death was performed. Also in this study we calculated 5-year age groups but not all data was specifically mentioned in the article.

In this paper, Lee–Carter's method is used since it is a combination of a sophisticated demographic model (with least parameters) and time series methods. It also predicts the age group under 5 years old and a large portion of changes in the mortality rates are covered by this model (1,2). The causes of death are also mortality rates that can be calculated with this model.

The Lee–Carter model calculates the death rate and not the number. Although in this method, similar to other methods of extrapolation, information about the

effects of medical, social and behavioural advances is not exerted on the mortality rate, but its usage is superior to other methods of extrapolation for the following reasons: first, a large proportion of changes in the mortality rate of the total population in developed countries is covered by this model; second, the parameters of this model can be easily interpreted; and third, this method in addition to predicting mortality rates in a specific period of time, is able to provide the corresponding confidence interval as well. In the demographic texts, this method is regarded as an “outstanding statistical model to predict long-term mortality rate of the total population (2).

The Coding of causes of death in the Islamic Republic of Iran over the past 10 years has improved significantly, which has been confirmed by the World Health Organization (3).

In this study, the data were also amended in terms of low registration. Low registrations were amended by scaling up of causes of death. For this purpose, the number of deaths reported (current registration) by the organization for civil registration (4) in each of the years 2006 to 2015 was considered as the basis for incremental coefficient of that year and the multiplier of all deaths in certain age groups and gender, as well as the number of deaths caused by various diseases with respect to the multiplier and were re-calculated.

It should be noted that some of the above sections were omitted from the article because of the article word limit in accordance with the EMHJ submission guidelines.

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Rheumatic heart disease in the Eastern Mediterranean Region¹

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Introduction

To support implementation of resolution WHA71/14 of the Seventy-first World Health Assembly (1) on rheumatic fever and rheumatic heart disease (2), passed in May 2018, the WHO Regional Office for the Eastern Mediterranean held a technical consultative meeting on rheumatic heart disease, in partnership with the World Heart Federation, in Cairo, Egypt, 21–22 January, 2019 (3). The meeting provided an opportunity to discuss a draft regional framework for action to address rheumatic fever and rheumatic heart disease in endemic countries of the Eastern Mediterranean Region. The proposed regional framework seeks to operationalize the World Health Assembly resolution, guiding countries in developing/adapting comprehensive national programmes.

The objectives of the meeting were to:

- assess the national capacity, health systems barriers, and needs of Member States of the WHO Eastern Mediterranean Region in relation to the prevention and control of rheumatic fever and rheumatic heart disease;
- review a draft regional framework for action for rheumatic heart disease prevention and control;
- discuss the terms of reference for a regional rheumatic fever/rheumatic heart disease expert network; and
- share information and best practices on rheumatic heart disease prevention and control in the Region, including site visits to Egyptian rheumatic heart disease clinics.

The meeting was attended by representatives from ministries of health, global and regional experts, representatives from Reach and the World Heart Federation, and staff from the WHO Regional Office for the Eastern Mediterranean.

Dr Asmus Hammerich, Director, Noncommunicable Diseases and Mental Health, and Dr Slim Slama, Regional Advisor, Noncommunicable Diseases Prevention, WHO Regional Office for the Eastern Mediterranean, welcomed participants and outlined the current global momentum to address rheumatic fever and rheumatic heart disease, following the passing of the World Health Assembly resolution, along with the background to WHO's engagement in this area of work and the objectives of the meeting.

Summary of discussions

There was discussion on the inclusion of the social determinants of health as a strategic approach, given the limited scope of the health sector to influence broader policy issues. While recognizing that capacity to influence may be limited, it was agreed that social determinants of health would be retained as one of the framework's strategic approaches.

It was proposed that the strategic approach of “community education”, be renamed “community awareness”. In addition, with regard to the strategic approach of “community and primary health care workforce”, it was proposed that the title be changed to avoid ambiguity and potential misinterpretation that the domain relates not to the health workforce, but to the broader community/general population.

In relation to the strategic approach of “surveillance and research”, there was discussion on the expectation and requirement that countries should develop or implement a priority research agenda. It was concluded that this would be an option for countries, but should not be considered a requirement. A change in the title of this domain was proposed to “surveillance and monitoring”, while retaining a mention of research as a progress indicator. Likewise, the issue of whether countries should be required to make rheumatic fever a notifiable condition was discussed. It was agreed that this should not be a requirement, but rather identified in the framework as an option for countries to consider, according to national needs.

Regarding primary and secondary prevention, it was agreed that the wording should make more explicit the need to achieve integration.

Reproductive health was noted as an important area that should be explicitly mentioned, and highlighted as an opportunity for integration with existing service delivery platforms.

Benzathine penicillin G (BPG) quality testing was raised as an important issue for countries to consider, given the concerns in many countries regarding adverse events and quality control. It was agreed that this should be mentioned as an issue that countries should give consideration to in regard to the measures that can reasonably be taken to assure quality.

The draft regional framework for action on rheumatic heart disease prevention and control will be presented at

¹ This report is extracted from the Summary report on the Consultative meeting on rheumatic disease in the Eastern Mediterranean Region, Cairo, Egypt, 21–22 January 2019 (http://applications.emro.who.int/docs/IC_Meet_Rep_2019_23550_en.pdf?ua=1).

the next session of the Regional Committee for the WHO Eastern Mediterranean, to be held in Tehran, Islamic Republic of Iran, during October 2019.

Next steps

- Refine the situational analysis by integrating input from country focal points/representatives, and devel-

op a regional synopsis identifying key priorities and opportunities.

- Disseminate the regional synopsis to Member States.
- A draft agenda will be created for the first rheumatic fever/rheumatic heart disease expert network meeting.

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The State of Kuwait Prize for the Control of Cancer, Cardiovascular Diseases and Diabetes Foundation, in the Eastern Mediterranean Region is one of the several foundation prizes, administered by the World Health Organization, created to acknowledge the work of well-known scientists, researchers or simply dedicated people who have made an outstanding contribution in prevention, control and research in one or more of the following disease groups:

Cancer, Cardiovascular Disease and Diabetes in the Eastern Mediterranean Region.

The prize consists of a certificate of award, a bronze medal and a sum of USD 5,000 to be presented during the applicable session of the World Health Organization Regional Committee for the Eastern Mediterranean by its Chairman.

For more information about the eligibility and the online application form please visit the following link: <http://kuwait-prize.emro.who.int/>

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