World Health Organization
Regional Office for the Eastern Mediterranean

المجلة الصحية لشرق المتوسط

EMHJ

Eastern Mediterranean Health Journal

La Revue de Santé de la Méditerranée orientale

eHealth, the use of information and communication technologies for health, is a powerful development in the practice and provision of health care. The WHO strategy on eHealth in the Region aims to support Member States in developing and strengthening their capacity for eHealth and establishing effective eHealth-supported health services though provision of technical support on policy, quality, safety, access and use of eHealth applications and tools, and the development of norms, standards, guidelines, information and training materials.

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المجلة الصحية لشرق المتوسط

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

EASTERN MEDITERRANEAN HEALTH JOURNAL

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

LA REVUE DE SANTÉ DE LA MÉDITERRANÉE ORIENTALE

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

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Contents

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EMHJ

Editorial

eHealth is health care transformation, not "an IT project"

Salah Mandil, PhD[1]

Today, few would argue, and even fewer would be unaware, of the importance and growing impact of computing, networking and communications (CNC) on our everyday living – including wireless or mobile technologies and sensor technologies. Even though this is most evident in the commercial services sectors, it has also become evident in socioeconomic sectors such as health. The term "eHealth" (or sometimes "eHealth support") is used generically to mean "the uses of CNC support in medical and health care", and is frequently preferred over what are presently viewed as the limited terms of "health informatics" and "health telematics".

Throughout the world, in both the industrially developed and developing societies, we witness CNC experiences in hospitals, health centres, physician cabinets, educational institutions and ministries of health and through health care surveys. We see how CNC can be, and is being, used to handle all forms and types of data (numerical, textual, graphical, audio, visual and combinations thereof) and to conduct research to extract knowledge from the massive amount of health data accumulated over the decades. We witness how CNC has become a vital support to deliver medical care to the individual, the family and remote and otherwise under-served communities, to administer, monitor and evaluate one or a chain of hospitals, health centres, laboratories or pharmacies, and to manage local and national health care programmes.

Two core lessons have emerged from the practical experiences with eHealth of several countries. First, as the experiences of Singapore and Turkey have shown, eHealth support must not be tackled as an "information technology or IT project" but as a means for improving health care services. In other words, eHealth support must be conceived and managed as a means for health and clinical care transformation. Second, and as far as technology is concerned, the "solutions" must not be conceived as once-and-for-all, but must follow a judicious cost-effective approach of adopting and adapting the technologies and related procedures.

The challenge for a country is to have uniform, cost-effective and nationwide utilisation of eHealth throughout its health sector, not merely "pockets" of eHealth applications and excellence. This is achieved by conceiving eHealth support as an integral part of the national health programme and strategy, and by adopting and enforcing national standards for health data, information and procedures, and for the necessary CNC tools.

Most of the countries of the WHO Eastern Mediterranean Region (EMR) have numerous pockets of eHealth and technology applications, and some have areas of real eHealth excellence. That is, most countries have a few hospitals that are heavily supported by eHealth and technology when instead they should be aiming to uniformly equip ***all*** their hospitals with the ***essential*** eHealth support and thus enable better nationwide and timely analysis of the health care services. In fact, except for Oman, no EMR country has, and thus cultivates, truly nationwide eHealth support, which is quite feasible and necessary. Why, and what are the challenges in that?

In August 2012, the WHO Regional Office for the Eastern Mediterranean invited a group of eHealth experts to review the regional eHealth situation and provide recommendations for the member countries and the Regional Office. The group's main findings and recommendations included the challenges of health data, telemedicine, mobile health, management of health care, capacity-building, financial resources, lack of infrastructure and governance. The Regional Director sent the report to member countries for information and invited them to propose needed areas for collaboration with the Regional Office to build or enhance their use of eHealth support, including its core infrastructure. Half the member countries responded – all positively – and one requested support in enhancing its core infrastructure.

A key recommendation of the expert group, which I had the honour to chair, is for each country to build its essential infrastructure for eHealth support. In particular, countries should establish a national network dedicated to the health sector (in short, a "HealthNet") that is well protected, digitally secure and accessible to all its health-related institutions. Such an infrastructure does not require a ministry

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of health to lay its own network cables and wireless telecom towers, but to have a network laid over existing facilities. This is possible today for ***all*** EMR countries because the key elements of such an infrastructure already exist in all the countries. For example, all countries have existing dedicated network connections (e.g. for banks or airlines) and/or public data networks (e.g. for the Internet) and/or increasing Wi-Fi connections (e.g. for mobile phones) that are broadband and thus efficiently carry audio-visual materials. The uses of such services, as major building blocks for a HealthNet, are possible if technically sound and fair conditions are negotiated with the owners of these facilities. The Regional Office may be able to help in such negotiations.

Recognizing the economic differences between EMR countries, their start-up HealthNets would clearly differ in geographical coverage and performance. What is important, however, is that every member country needs and should have a national HealthNet, and should make that an immediate goal.

WhatsApp Messenger, the globally recognized and used smartphone application, provides services for sending and receiving text, video and audio messages. These are the same regular services that were developed and established over two decades ago and are today global and globally used routine services. Within 5 years, WhatsApp Messenger grew to support 700 million users, averaging 1.6 billion messages per day, within and between 170 countries. So, what are the secrets of WhatsApp's phenomenal success? The simple answer: apart from its very minimal charges, WhatsApp Messenger "provides the infrastructure" that enables services, without burdening the users/clients with technicalities or costs, by using the very same Internet plan and service used for email and browsing.

The WhatsApp Messenger lesson is quite simple: make the services available and they will be used, widely and effectively.

A start-up HealthNet does not have to be nationwide from the beginning but should be developed to be extensible geographically and functionally. Experience confirms that even when only a part of such a national network is operational and begins to connect some of the existing institutions, this motivates its own gradual nationwide development, users and uses.

In the interests of their national health care services, EMR countries could and should, at a Regional Committee meeting, seriously commit to eHealth and (a) acknowledge and emphasize that eHealth support was developed and is run as a health care transformation, not an IT project; (b) stress the importance of an adopt-and-adapt approach to the technological challenges; and (c) set as a target, over the following two years, that every EMR country will have a national HealthNet open to and supporting all its health-related institutions.

Seroprevalence of poliovirus antibodies among 7-month-old infants after 4 doses of oral polio vaccine in Sistan-va-Baluchestan, Islamic Republic of Iran

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الانتشار المصلي للأجسام المضادة لفيروس شلل الأطفال بين الرضّع في عمر سبعة أشهر بعد أربع جرعات من لقاح شلل الأطفال الفموي في سيستان وبلوشستان بجمهورية إيران الإسلامية

شاهرخ إيزدي، شهره شاه محمودي، سيد محسن زهرائي، فريبا درستكار، سيد رضا مجد زاده

الخلاصة: على الرغم من ارتفاع معدلات التغطية بلقاح شلل الأطفال في جمهورية إيران الإسلامية فإن معدلات الانقلاب السيرولوجي لدى الرضع قد تكون غير كافية. وقد قامت هذه الدراسة بقياس الانتشار المصلي للأجسام المضادة لفيروس شلل الأطفال من الأنماط المصلية1 إلى 3 (فيروس شلل الأطفال 1 وفيروس شلل الأطفال 2 وفيروس شلل الأطفال 3) لدى الرضع في عمر سبعة أشهر من الذين تلقوا ما لا يقل عن أربع جرعات من لقاح شلل الأطفال الفموي الثلاثي التكافؤ استناداً إلى برنامج التمنيع الوطني الإيراني. فتم إجراء مسح سيرولوجي في عام 2010 في المناطق الريفية لشاباهار بمحافظة سيستان وبلوشستان. وباستخدام أخذ العينات العنقودي تم فحص 72 رضيعاً من الرضع المؤهلين للكشف عن وجود أجسام مضادة للأنماط السيرولوجية الثلاثة لفيروس شلل الأطفال وفقاً للدلائل الإرشادية لمنظمة الصحة العالمية. وقد اعتُبرت عيارات الأجسام المضادة ≥ 10:1 إيجابية. وقد كانت معدلات إيجابية المصل للأجسام المضادة لفيروس شلل الأطفال1 و فيروس شلل الأطفال 2 وفيروس شلل الأطفال 3 84.7٪ و95.8٪ و70.8٪ على التوالي. وكان لدى 63.9٪ فقط من المشاركين إيجابية مصلية للأجسام المضادة لجميع الأنماط السيرولوجية الثلاثة لفيروس شلل الأطفال. وإذا استثنينا فيروس شلل الأطفال2 فإن الانتشار المصلي للأجسام المضادة للنمطَيْن السيرولوجيين الآخرين لفيروس شلل الأطفال - لاسيَّما فيروس شلل الأطفال3 - لم يكن مُرضيا.

ABSTRACT Despite high coverage rates of polio vaccine in the Islamic Republic of Iran, the seroconversion rates of infants may be inadequate. This study measured seroprevalence of antibodies against poliovirus serotypes 1 to 3 (PV1, PV2 and PV3) in 7-month-old infants who had received at least 4 doses of trivalent oral polio vaccine. A serosurvey was conducted in 2010 in rural areas of Chabahar, Sistan-va-Baluchestan province. Using cluster sampling, 72 eligible infants were tested for antibody against the 3 poliovirus serotypes according to WHO guidelines. Antibody titres ≥ 1:10 were considered positive. The seropositive rates for antibody against PV1, PV2 and PV3 were 84.7%, 95.8% and 70.8% respectively. Only 63.9% of participants were seropositive for antibodies against all 3 poliovirus serotypes. Except for PV2, the seroprevalence of antibody against the other 2 poliovirus serotypes, especially PV3, was unsatisfactory.

Séroprévalence des anticorps du poliovirus chez des nourrissons âgés de sept mois après quatre doses du vaccin antipoliomyélitique oral dans la province du Sistan-Baloutchistan (République islamique d'Iran)

RÉSUMÉ En dépit de taux de couverture élevés par le vaccin antipoliomyélitique en République islamique d'Iran, les taux de séroconversion des nourrissons peuvent être inadéquats. La présente étude a mesuré la séroprévalence des anticorps dirigés contre les sérotypes 1 à 3 de poliovirus (PV1, PV2 et PV3) chez des nourrissons de sept mois qui avaient reçu au moins quatre doses du vaccin antipoliomyélitique oral trivalent. En 2010, une enquête sérologique a été menée dans des zones rurales de Chabahar, dans la province du Sistan-Baloutchistan. À l'aide d'un échantillonnage en grappes, 72 nourrissons éligibles ont fait l'objet de tests de dépistage des anticorps contre les trois sérotypes de poliovirus conformément aux lignes directrices de l'Organisation mondiale de la Santé. Des titres d'anticorps supérieurs ou égaux à 1:10 étaient considérés comme positifs. Les taux de séropositivité pour les anticorps dirigés contre les sérotypes 1, 2 et 3 de poliovirus étaient de 84,7 %, 95,8 % et 70,8 % respectivement. Seuls 63,9 % des nourrissons participants étaient séropositifs pour les anticorps dirigés contre les trois sérotypes de poliovirus. À l'exception du sérotype 2 du poliovirus, la séroprévalence des anticorps dirigés contre les deux autres sérotypes, en particulier le sérotype 3, n'était pas satisfaisante.

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Introduction

The Islamic Republic of Iran joined the global campaign against polio in 1991 and the country was announced as polio-free in 2001. Since then the country has had no report of circulation of wild polioviruses throughout the country (*1*). Based on the Iranian national immunization schedule, by the 6th month of age, all infants should have received at least 4 doses of trivalent oral polio vaccine (OPV) (at birth and at 2, 4 and 6 months of age). All children should also receive another 2 doses at 18 months of age and before school entry (4–6 years of age). Added to these are the mopping-up activities of the national immunization days, which include all children aged less than 5 years and are implemented in January and February each year.

The main objective of these efforts is to establish and maintain an immunization coverage high enough to prevent recirculation of the wild polioviruses on probable re-introduction of the infection as has occurred several times within the last decade in the WHO Eastern Mediterranean Region and African Region and recently even in the Western Pacific Region (*2*). In fact the real protection level established by immunization activities depends on the proportion of the vaccinees who produce appropriate levels of anti-poliovirus antibodies in their blood.

Usually, however, there is a gap, small or large, between the immunization coverage rates and the seroconversion rates, i.e. not all those who receive vaccine always produce appropriate levels of antibody against the antigen. For example, in a study in the Islamic Republic of Iran on 20-month-old children who had received at least 5 doses of OPV, the seroconversion rates of poliovirus serotypes 1 to 3 (PV1, PV2 and PV3) were 94.1%, 96.7% and 78.3% respectively (*3*). Regardless of the quality of vaccination services it seems that the extent of this gap depends on the virus serotype and also to some extent the other nutritional and demographic characteristics, such as a history of exclusive breastfeeding during the first 6 months of life and the socioeconomic status of the household (*3,4*). The presence of such a gap will jeopardize the confidence of the country in its high OPV immunization coverage (*2,4–10*).

Sistan-va-Baluchestan province, located in the south-east of the Islamic Republic of Iran, has common borders with 2 of the 3 countries that still having circulation of wild poliovirus. In 2010, reintroduction of the virus from Pakistan to China produced a polio outbreak 11 years after elimination of polio in the Western Pacific Region (*2*). The same may occur in other countries, especially those which have common borders with these countries. Sistan-va-Baluchestan province has common borders and strong cultural and economic ties with Afghanistan and Pakistan. The Iranian Ministry of Health and Medical Education (MOH) is therefore concerned about the occurrence of similar outbreaks in Islamic Republic of Iran. The present study was performed in Sistan-va-Baluchestan province to assess the seroconversion rate in newborn infants who had received 4 doses of OPV within the framework of the national immunization schedule.

Methods

Study setting

Sistan-va-Baluchestan is one of the least developed parts of Islamic Republic of Iran. Chabahar district is a seaport in the coastal area of the south-east of the country, near the Pakistan border. About two-thirds of the Chabahar population live in rural areas (139 553 rural versus 77 128 urban) (*11*). The household economy in the rural areas is mostly based on subsistence agriculture, working on fishing boats and cross-border trading of fuel and other goods, and in the urban areas is mostly based on small businesses, shop-keeping and working in public and private institutions.

Sampling

Target population

The target population were 7-month-old infants (210- to 240-day-old infants, born from 25 April 2010 to 25 May 2010) living in the rural areas of Chabahar (i.e. people living outside the municipal territories of Chabahar). The criterion for entering the study was a recorded history of receiving 4 OPV doses scheduled at birth, 2, 4 and 6 months of age. Considering the birth date of the participants none of them had any opportunity for receiving vaccine during national immunization days or mopping-up activities.

Sample size

To calculate the sample size we used the following standard equation (*12*):

$$n = (z_{\alpha/2})^2(P)(1-P)/d^2$$

where n is the sample size; $\alpha = 0.05$, $z_{\alpha/2} = 1.98$ [for calculation of a confidence interval (CI) of 95%], $P = 0.85$ (based on findings in other studies, we estimated the seroconversion rate to be about 85%) (*13–16*); $1-P = 0.15$; $d = 1/10$ of $P = 0.085$ (*12*). The required sample size was 68.8.

Since we used the probability proportional to size cluster sampling method to compensate for clustering effects, the calculated n should be multiplied by the coefficient D for design effect (*17*):

$$D = 1 + (b-1)\rho$$

Where b = the average number of responses to the item per cluster (which was estimated to be at least 4); ρ is the rate of homogeneity (its value will be higher for those items whose value varies more between clusters). Since all the participants were from the rural areas of the same district, we considered $\rho = 0.1$; thus the design effect was calculated to be 1.3, which for caution we rounded up to 1.5. More explanations could

be found in statistical references (*17*). Using $n \times D$ = final sample size, then the sample required was 102, which we rounded up to 105.

Sampling method

In both urban and rural areas of Chalabar there are complete lists of the households booked into each health centre. The cluster size was defined as at least 5 children eligible for the serological part (i.e. 21 clusters) and in each cluster location we continued interviews and blood samplings until completion of blood sampling of the 5 children. Using the results of the latest national census performed in 2006–07, cluster locations were defined for urban and rural parts of each district (*11*). A cumulative list of the study population was produced and a systematic sample was selected from a random start. By dividing the total population of the communities by the number of communities to be selected (i.e. 21 communities) the sampling interval was obtained. A random number between 1 and the result of the division was then chosen. This was fitted into position in the list to identify the first community in the sample. Then by adding the sampling interval to the initial random number the remaining communities were selected. We considered the size of each community to be 200 people.

Data collection

From each selected community 5 households with infants in the required age range were randomly selected and the study questionnaire was filled during an interview with one of the parents (usually the mother) (*3*,*17*). If there were 2 eligible children in the same household, the interview was performed only for the younger one.

Research teams comprised a nurse well-trained in blood sampling of children, an interviewer fully adept in the local language and well-trained in using the study questionnaire, and a driver.

Questionnaire

The questionnaire contained questions about important demographic information such as child's sex, age and birth date; child's full vaccination history based on the records of the vaccination log book of the local health house; child's feeding history in the first 6 months of life (exclusive breastfeeding versus other options such as feeding on powdered milk); parents' educational level and occupation; number of people in household and number of rooms (or living spaces); and household economic status (ownership of a car, mobile-phone and refrigerator).

Laboratory methods

Serum samples were screened for neutralizing antibody against PV1, PV2 and PV3 by micro-neutralization assay, which was performed by an in-house procedure according to WHO guidelines. Briefly, sera were inactivated at 56 °C for 30 minutes before the test, diluted 2-fold from 1:10 to 1:1280, and then incubated for 2 hours at 36 °C with an equivalent volume of 100 TCID50 [50% tissue culture infectious dose] of PV1, PV2 or PV3. After the incubation period, 50 µL of L20B cell line (2×10^4 cells/0.1 mL) was added to all the microtitre plate wells (including control wells to monitor uninfected cell viability). Each test serum was investigated in triplicate. A back-titration of the 3 serotypes was included in each run as a control. After incubation for 5 days, the highest dilution of serum that prevented the development of virus induced cytopathogenic effects was recorded. A serum sample was considered positive if antibodies were present at a dilution 1: ≥ 10 of the serum specimen. To calculate the geometric mean titre seronegative reports (titres < 1:10) were considered as equal to 1:2 (*3*,*18*).

All required OPV vaccines in Islamic Republic of Iran are produced by Razi Vaccine and Serum Research Institute, Tehran, and all children who took part in this study had been vaccinated by OPV produced by the Institute.

Data analysis

After entering the data into a computerized database, the data were analysed using *SPSS*, version 15 and *STATA*, version 9. The data were analysed using descriptive tables, chi-squared test and Fisher exact test, and odds ratios (OR) were calculated using both univariate and multivariate (logistic regression) analysis methods. In calculating standard errors (SE) and 95% CI, the cluster sampling design was taken into account and adjusted for (*17*).

Ethical considerations

The study protocol was reviewed and approved by the committee for medical research ethics of Zahedan University of Medical Sciences.

Results

A total of 125 children were visited. Their mean age was 7.6 months (standard deviation 0.5 months). Table 1 shows some of the important demographic characteristics of the participants.

Table 2 shows the vaccination coverage of the study children; 92 of them (73.6%, 95% CI: 64.9–81.0%) had completed their vaccination schedule based on the national immunization programme. The multivariate analysis of the association between participants' vaccination status (complete versus incomplete 4 doses OPV schedule) and selected characteristics showed no statistically significant associations between any of the studied variables and vaccination status (Table 3).

Blood samples were taken from only 72 of the eligible children with complete vaccination; sampling was not successful in the remaining 20 eligible children due to problems in drawing blood. Table 4 shows the distribution of antibody titres for the 3 poliovirus serotypes separately in

Table 1 Demographic characteristics and vaccination status of the study sample of 7-month-old children (*n* = 125)

Variable	Incomplete vaccination schedule		Complete vaccination schedule		*P*-value[b]
	No.	%	No.	%	
Sex					0.498
Male	19	27.1	51	72.9	
Female	14	25.5	41	74.5	
Father's education					0.271
Illiterate	12	22.6	41	77.4	
Educated	21	29.2	51	70.8	
Mother's education					0.185
Illiterate	25	29.4	60	70.6	
Educated	8	20.0	32	80.0	
No. of people in household					0.433
1–5	18	25.4	53	74.6	
> 5	15	28.3	38	71.7	
Household ownership of refrigerator					0.128
Yes	6	17.6	28	82.4	
No	27	29.7	64	70.3	
Household ownership of mobile phone					0.404
Yes	23	27.7	60	72.3	
No	10	23.8	32	76.2	
Household ownership of automobile					0.497
Yes	27	26.0	77	74.0	
No	6	28.6	15	71.4	
Method of feeding in first 6 months					0.293
Exclusive breastfeeding	18	24.0	57	76.0	
Other feeding[a]	15	30.0	35	70.0	

[a]*Including: breastfeeding by with feeding with powder milk; breastfeeding by with feeding with cow's milk; exclusive feeding with powder milk; exclusive feeding with cow's milk.*
[b]*1-sided Fisher exact test.*

these children. The seropositive rates of PV1, PV2 and PV3 were 84.7% (95% CI: 76.3–93.1%), 95.8% (95% CI: 91.4–100.0%) and 70.8% (95% CI: 58.7–82.9%) respectively. There were 46 infants (63.9%; 95% CI: 49.2–78.6%) who were positive for all 3 poliovirus serotypes and 1 child (1.4%; 95% CI: 0.0–4.1%) who was positive for none of the serotypes.

Table 5 shows the contingency tables for the distribution of seropositive and -negative children for each poliovirus serotype, according to 3 important variables: infant feeding, household crowding and father's education. There were no statistically significant associations or even noticeable differences in the distribution of these or other variables between seropositive and seronegative children.

Table 2 Estimation of the vaccination coverage of trivalent oral polio vaccine (OPV) of the study sample of 7-month-old children

No. of OPV doses received	No. of children	% of total (95% CI)	Cumulative %
4	92	73.6 (59.4–87.8)	73.6
3	23	18.4 (9.6–27.2)	92.0
2	6	4.8 (0.0–9.9)	96.8
1	4	3.2 (0.0–7.7)	100.0
Total	125	100	100.0

CI = confidence interval.

Table 3 Multivariate analysis of the association between vaccination status (complete versus incomplete 4 doses oral polio vaccine vaccination schedule) and selected characteristics of the 7-month-old children (*n* = 125)

Variable	OR (95% CI)	*P*-value
Exclusive breastfeeding	1.44 (0.63–3.28)	0.384
Sex	1.05 (0.46–2.41)	0.894
Father's education[a]	0.51 (0.21–1.27)	0.148
Mother's education[a]	2.30 (0.84–6.32)	0.104
Household car ownership	0.81 (0.28–2.39)	0.710
Household mobile phone ownership	1.28 (0.52–3.13)	0.470

[a]Illiterate = 0, capable of reading and writing = 1.
OR = odds ratio; CI = confidence interval.

Discussion

In interpreting these data it should be kept in mind that within the lifespan of these children no national immunization day or other kind of supplementary OPV vaccination had been performed (annual national immunization days are performed in January and February) and so what we observed was only the effect of the vaccines received based on the national immunization schedule. With regard to the sample size we could not reach the estimated number; however, we assume that it was reasonably large enough for estimating vaccination coverage. The fact that the sample did not include children of urban regions and that blood sampling was limited only to those children who had a complete vaccination profile are other limitations of the study design that decrease the external validity and generalizability of the findings. In multivariate analysis we could not find any statistically significant association between vaccination status and the characteristics of the participants, which is presumably due to lack of heterogeneity in the sample and possibly the small sample size.

The calculated vaccination coverage for the study sample was 92.0% for at least 3 doses of OPV and 73.6% for 4 OPV doses. Although the rates of coverage of the 4th dose of OPV in most parts of the Islamic Republic of Iran exceed 90% (*1*), based on our findings Chabahar has not reached this target. It might be speculated that a considerable proportion of infants and toddlers are not vaccinated on time because of a lack of appreciation of the seriousness of poliomyelitis and this is an issue that deserves the attention of the health authorities. It should be kept in mind that country-specific averages can be deceptive. For instance in Tajikistan, during the 2008 polio outbreak, the rate of uptake of polio vaccine was reported to be 87%, only slightly below the WHO recommended minimum of 90%; however, the immunization rates were well below target levels in some regions of the country (*5,6*).

The acceptable level of seroprevalence of antibodies to PV2 among the infants (95.8%; 95% CI: 91.4–100.0%) indicates that the cold-chain supply of the vaccination programme was good. However, perhaps the most important finding of this study was the low seroprevalence of antibodies against PV3. Nevertheless, if we take into account the characteristics of the study population (which is an underdeveloped poor community), the findings might be interpreted as not unexpected, i.e. low immunogenicity of trivalent OPV, especially for PV3 and to a lesser extent for PV1, might not be considered as a new finding. These finding are comparable with those of another study in the same region on 20-month-old children (*3*). Also, findings similar to ours have been reported since almost the first days of introduction of OPV. For example, during a mass vaccination campaign carried out in 1958 with the serotype 1 CHAT strain (developed by Koprowski) in the former Belgian Congo it was noted that the seroconversion rate was lower compared with that observed in large field studies with the same vaccine in Poland (*4,19*). Poorer immunogenicity of OPV in lower-income settings has since been confirmed in numerous studies (*4*). Although rates of seroconversion following administration of trivalent OPV approach 100% in industrialized countries, only 73% (range 36–99%) and 70% (range 40–99%) of children in developing countries had detectable antibody to PV1 and PV3 respectively after 3 doses (*7*).

In a review of 32 studies from lower-income countries 27% and 30% of

Table 4 Distribution of antibody titres in 7-month-old children who had received 4 trivalent oral polio vaccine doses and for whom blood samples were obtained (*n* = 72)

Poliovirus serotype	Minimum	Maximum	25th percentile	Median	75th percentile
PV1	< 1:10	1:1280	1:40	1:160	1:640
PV2	< 1:10	1:1280	1:40	1:640	1:1280
PV3	< 1:10	1:1280	< 1:10	1:80	1:1280

PV1 = poliovirus serotype 1; PV2 = poliovirus serotype 2; PV3 = poliovirus serotype 3.

children lacked detectable serum neutralizing antibodies to PV1 and PV3 respectively after 3 doses of trivalent OPV (*7*). In another study in a rural Mayan community, looking at factors affecting immunogenicity of the first 2 doses of OPV among unimmunized Mayan infants, seroresponses were 86% to Sabin serotype 1, 97% to Sabin type 2 and 61% to Sabin type 3 vaccines. Decreased OPV immunogenicity was primarily attributable to interference of Sabin type 3 by Sabin type 2 (*16*). In addition, a reduced immunogenicity of PV3 when compared to PV1 and PV2 has been shown for inactivated poliovirus vaccine (*20*) and, based on the above-mentioned evidence, presumably the same might be true for live attenuated OPV3.

The threat of infiltration of wild poliovirus into these areas and occurrence of outbreaks such the 2011 outbreak in China (*2*) or the 2008 outbreak in Tajikistan (*21*), is real and there should be measures to tackle this problem. Use of bivalent (containing serotypes 1 and 3 vaccine) and monovalent (containing only serotype 1 or 3) formulations might be the best solution for this. Bivalent OPV was first used in December 2009 in Afghanistan and was swiftly adopted more widely (*4*). In India it was first used in January 2010, and a year later, elimination of the remaining wild PV1 and PV3 was achieved, and in 2012 India was declared polio-free (*4,22*). Without doubt, the final decision is with health experts of the Iranian Ministry of Health and we hope that our findings will be useful in this regard.

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Table 5 Distribution of seropositive and seronegative children (n = 72) to the 3 poliovirus serotypes by infant feeding, household crowding and father's education

Poliovirus type and seropositivity	Infant feeding					Household crowding					Father's education				
	Exclusive breastfeeding		Other feeding		*P*-value[a]	1–3 people/ room		> 3 people/ room		*P*-value[a]	Father illiterate		Father literate		*P*-value[a]
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
PV1															
Seropositive	41	89.1	20	76.9	0.188	44	89.8	5	10.2	0.156	26	83.9	35	85.4	1.000
Seronegative	5	10.9	6	23.1		17	73.9	6	26.1		5	16.1	6	14.6	
PV2															
Seropositive	44	95.7	25	96.2	1.000	48	98.0	21	91.3	0.238	30	96.8	39	95.1	1.000
Seronegative	2	4.3	1	3.8		1	2.0	2	8.7		1	3.2	2	4.9	
PV3															
Seropositive	33	71.7	18	69.2	1.000	38	77.6	11	22.4	0.095	18	58.1	33	80.5	0.065
Seronegative	13	28.3	8	30.8		13	56.5	10	43.5		13	41.9	8	19.5	

[a] *2-sided Fisher exact test.*
PV1 = poliovirus serotype 1; PV2 = poliovirus serotype 2; PV3 = poliovirus serotype 3.

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Value and impact of international hospital accreditation: a case study from Jordan

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قيمة وتأثير الاعتماد الدولي للمستشفيات: دراسة حالة من الأردن

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الخلاصة: قام الباحثون بتقييم الأثر الاقتصادي لاعتماد اللجنة الدولية المشتركة للمستشفيات على خمسة مقاييس لأداء المستشفيات تتعلق بالبنى والنتائج في الأردن. فأجروا دراسة استعادية لمدة أربع سنوات تقارن بين مجموعتين من المستشفيات الخاصة المعتمدة المعنية بالأمراض الحادة العامة وبين مستشفيات غير معتمدة مطابقة لها، مستخدمين الاختلاف في الفوارق وتحليلات التباين المشترك المعدَّلة لاختبار تأثير وقيمة الاعتماد على مقاييس أداء المستشفى. وقد أظهرت ثلاثة من المقاييس الخمسة المختارة تأثيرات ذات دلائل إحصائية (كلها تحسينات) مرتبطة بالاعتماد هي: انخفاض معدل العودة إلى وحدة العناية المركزة خلال 24 ساعة من الخروج من الوحدة، وانخفاض معدل تبديل الموظفين، واستكمال السجلات الطبية. وكان الأثر النهائي للاعتماد انخفاض عدد المرضى الذين يعودون إلى وحدة العناية المركزة بمقدار 1.2٪، وانخفاض التبديل السنوي للموظفين بمقدار 12.8٪، وتحسن استكمال السجلات الطبية بمقدار 20.0٪. وبالجمع بين نتائج كلا المستشفيين على مدى ثلاث سنوات، تُرجمت هذه التحسينات إلى توفير إجمالي قدره 593 000 دولار أمريكي في نظام الرعاية الصحية الأردني.

ABSTRACT We assessed the economic impact of Joint Commission International hospital accreditation on 5 structural and outcome hospital performance measures in Jordan. We conducted a 4-year retrospective study comparing 2 private accredited acute general hospitals with matched non-accredited hospitals, using difference-in-differences and adjusted covariance analyses to test the impact and value of accreditation on hospital performance measures. Of the 5 selected measures, 3 showed statistically significant effects (all improvements) associated with accreditation: reduction in return to intensive care unit (ICU) within 24 hours of ICU discharge; reduction in staff turnover; and completeness of medical records. The net impact of accreditation was a 1.2 percentage point reduction in patients who returned to the ICU, 12.8% reduction in annual staff turnover and 20.0% improvement in the completeness of medical records. Pooling both hospitals over 3 years, these improvements translated into total savings of US$ 593 000 in Jordan's health-care system.

Valeur et impact d'une accréditation internationale des hôpitaux : étude de cas en Jordanie

RÉSUMÉ Nous avons évalué l'impact économique d'une accréditation internationale des hôpitaux attribuée par une commission conjointe sur cinq mesures de la performance des hôpitaux en termes de structure et de résultats en Jordanie. Nous avons mené une étude rétrospective sur quatre ans, comparant deux hôpitaux généraux de soins aigus privés et accrédités avec des hôpitaux appariés sans accréditation. Nous avons utilisé des analyses de la covariance ajustée et de l'écart des différences pour évaluer l'impact et la valeur d'une accréditation sur les mesures de la performance des hôpitaux. Sur les cinq mesures sélectionnées, trois ont eu des effets positifs statistiquement significatifs associés à l'accréditation : la réduction des retours en service de soins intensifs dans les 24 heures suivant la sortie du patient de ce service ; la réduction de la rotation du personnel ; et l'exhaustivité des dossiers médicaux. L'impact net de l'accréditation était une réduction de 1,2 point de pourcentage du retour des patients en soins intensifs, une baisse de 12,8 % de la rotation annuelle du personnel et une amélioration de 20 % de l'exhaustivité des dossiers médicaux. Le cumul sur trois ans des améliorations dans ces deux hôpitaux s'est traduit par des économies totales s'élevant à USD 593 000 pour le système de soins de santé jordanien.

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Introduction

Hospital accreditation aims to improve patient safety and strengthen the quality of health care. Quality of care reflects the degree to which health services are consistent with current professional knowledge, meet users' expectations and increase the likelihood of achieving desired health outcomes (*1*). Improvement in quality is believed to result in fewer mistakes, shorter delays, improvements in productivity, increased market share and lower costs (*1*). Hospital accreditation—a self-assessment and external quality review mechanism that checks a hospital's conformity with established standards (*2*)—is perceived as a strategic tool to promote quality and patient safety (*3*). Joint Commission International (JCI) is the largest international accreditation organization, with 718 accredited or certified organizations and programmes in 63 countries as of December 2014. Hospitals seek accreditation as a voluntary or self-regulated step towards improving their quality of health care, maintaining high standards in healthcare delivery, gaining recognition for excellence and signalling their competitiveness. To achieve these objectives, accreditation aims to change the organizational culture of a health institution and to improve its strategies and tactics towards a continuous improvement in organizational systems and processes (*4*).

The available literature on the impact of hospital accreditation programmes on hospitals' performance shows mixed results (*5*). In the United States (US), accredited hospitals have generally shown modest improvements in performance compared with non-accredited hospitals; for example, accredited hospitals provided better emergency response planning (*6,7*), training (*8*) and patient safety system initiation and implementation (*9*), and performed better in care of acute myocardial infarction, heart failure and pneumonia (*6,7,10*). Other studies, however, have found no such relationships (*11–13*). The literature on the economics of accreditation consist of studies concerning the explicit costs of seeking accreditation (*14*) and the design of a planned controlled study (*15*).

The process of accreditation can be profound (*16,17*) but daunting (*18*) for health-care providers and its high cost to hospitals might be a barrier to seeking accreditation (*14*). Understanding the impact of accreditation on health outputs and outcomes, and the cost savings associated with accreditation, is helpful for policy-makers as well as hospitals facing the decision to commit potentially limited resources to the accreditation process. This paper is the first, to our knowledge, to examine the economic impact of JCI hospital accreditation standards on selected structural and outcome of care measures of hospital performance.

Methods

Study design

This study aimed to quantify the impact of implementing JCI standards on 5 selected structural and outcome hospital performance measures, and the monetary value associated with the expected improvement. Our retrospective study compared 2 matched groups of general acute hospitals in Jordan. We used difference-in-differences and adjusted covariance analyses to test the impact of accreditation on the selected hospital performance measures. For each selected measure (Y_{it}), treated as a dependent variable, we estimated a random-effect regression model to measure the impact of accreditation on the changes observed in that measure, if any. This difference-in-differences approach, widely used in observational studies over time, controls for possible baseline differences among the hospitals and does not require that the accredited and control hospitals match perfectly (*19*). This approach assumes that underlying changes in Jordan's health system affect accredited and non-accredited hospitals similarly. The absence of any major initiatives for private hospitals over the study period supports the validity of this assumption.

We used the intervention period, the hospital's accreditation status and the interaction term between these factors as the independent variables. We had 2 observations for each hospital: the first in the pre-intervention period and the second in the intervention period. The model is presented in the equation:

$$Y_{it} = (\beta_0 + \beta_1 \text{Period}_t + \beta_2 \text{Accreditation} + \beta_3 \text{Period}_t) \times \text{Accreditation}_{it}$$

where: Period is a dummy variable equal to 1 if the observations came from the interventions years; β_1 captures aggregate factors that cause changes in the dependent variable(s) during the intervention period; Accreditation is a dummy variable equal to 1 if the observation comes from the accredited hospitals; β_2 captures possible differences between accredited and control hospitals. The coefficient β_3 of the interaction term is the key difference–indifference estimator.

We performed sensitivity analyses to examine the impact of accreditation separately by year. We did this by adding dummy variables (*d*2007, *d*2008 and *d*2009) to the model; these are equal to 1 if the observation came in the corresponding intervention year (2007, 2008 or 2009) and zero otherwise. The pre-intervention year (2006) served as the reference. With this specification, we estimated individual intervention year effects $(\gamma)t$, as shown in the following equation:

$$Y_{it} = (\beta_0 + \beta_1 \text{Accreditation} + \beta_2 \text{Period}) \times (\text{Accreditation} + \gamma_1 \text{d2007} + \gamma_2 \text{d2008} + \gamma_3 \text{d2009})$$

Standards and measures

We used JCI standards as principles to define 9 related structural and outcome hospital performance measures for potential use (*20*). Four measures addressed structure of care: rate of completeness of medical records; percentage of repeated X-rays; percentage of scheduled surgeries cancelled; and rate of staff turnover. The other 5 outcome measures were: rate of readmission within 30 days of discharge; rate of return to surgery within 24 hours of the previous surgery; rate of readmission to the intensive care unit (ICU) within 24 hours of discharge from ICU; and proportion of foreign (i.e. non-citizen) patients admitted (a measure of the hospital's international reputation and distinction) (*1*). We examined these potential measures and found that 5 were feasible to use based on the frequency, reliability, objectivity and availability of data to quantify them: rate of completeness of medical records, rate of staff turnover, rate of readmission within 30 days of discharge, rate of return to surgery within 24 hours, and rate of readmission to ICU within 24 hours of discharge. Table 1 describes the rationale for selecting these measures and their relationship to JCI hospital accreditation standards.

Additionally, we computed a quality improvement index to address the random variation in the rates of events which could be attributed to small numbers and to changing incentives over the years around the period of accreditation. The index converted each available measure to a ratio of its value in each year divided by the value in the pre-accreditation year. We took the inverse of the ratio for return to ICU, return to surgery, readmissions, and staff turnover to make sure all indices corresponded to better achievements. We then computed the geometric mean of those ratios and compared the 2 hospital groups. We estimated a random-effects regression to predict the change in the quality improvement

Table 1 Description of study measures selected for the study and their relationship to Joint Commission International (JCI) standards and quality of care

Measure (type)	JCI standard	Definition of measure	Relationship to quality of care
Rate of completeness of medical records (S)	MOI.12	Average percentage of requirements completed in a systematically selected sample of records (n = 400) in selected hospital in specified study year	Medical record is a source of communication between health-care workers, supports continuity of care and detects possible adverse events
Rate of readmission within 30 days of discharge (O)	ACC.4	Number of patients readmitted to study hospital within 30 days of discharge in specified study year divided by total number of admissions to selected hospital in specified study year	Unplanned readmission within 30 days of discharge increases hospital days per capita and may lead to waste of resources, medical complications and patient dissatisfaction
Rate of return to surgery within 24 hours (O)	ASC.7	Number of surgery cases returning within 24 hours to study hospital in specified study year divided by number of surgeries conducted in study hospital in specified study year	Unplanned return to surgery within 24 hours can be due to complications related to inadequate treatment or medical error, and may increase length of stay, waste of resources, medical complications and patient dissatisfaction
Rate of readmissions to ICU within 24 hours of discharge (O)	AOP.2	Number of patients readmitted to ICU within 24 hours of discharge in study hospital in specified study year divided by number of admissions to ICU in study hospital in specified study year	Unplanned return to ICU within 24 hours of discharge may be due to a complication related to inadequate treatment or medical errors, and may increase length of stay, waste of resources and patient dissatisfaction
Rate of staff turnover (S)	GLD.5 & GLD.11	Number of employees who resigned or were laid off during a specified year divided by number of staff employed at study hospital at midpoint of specified study year	Accreditation is a recognition of high quality of care, adds lustre to an institution's image and may be a source of professional pride for employees; it may also routinize staff procedures, thereby increasing staff morale
Quality improvement index (I)	n/a	Average ratio of improvement in quality	Individual quality measures may be unstable due to random variations in rates of events due to small numbers and changing incentives over the years around accreditation. Combining these measures in one index creates a more stable measure for estimating the improvement in quality of care associated with accreditation.

S = structural; O = outcome; I = index; n/a = not applicable.

index as a function of year and accreditation status. The 12 observations were for each of the 4 participating hospitals (i) during each of the 3 post-accreditation years (t). The model is shown in the equation:

$$\text{Quality index (change)}_{it} = \beta_0 + \beta_1 \text{Year}_t + \beta_2 \text{Accredited}_i + \alpha_{it}$$

Where the coefficient β_2 estimates the change associated with accreditation status.

Hospital characteristics

The 2 general acute care hospitals that received JCI accreditation in 2008 participated in this study and were closely matched to control hospitals by type (general acute hospitals); location (the capital, Amman); sector (private, for-profit); and capacity (bed size). Of the 4 eligible control hospitals, 2 agreed to participate. The average bed sizes were 133 for the 2 accredited hospitals and 115 for the 2 control hospitals. The average bed size of the control hospitals was close to the average bed size (109 beds) of 2 other non-accredited hospitals that declined to participate.

Study period

Health providers have been shown to perceive improvements in quality of care during and after the accreditation process (*16,17*). Therefore, we hypothesized that each hospital's preparation for and participation in the process of accreditation led to enhanced and accelerated adherence to quality standards compared with what would have occurred otherwise. Therefore, we based our study design on a 4-year period from 2006 to 2009. The pre-intervention period was the first year in our study period (2006). The intervention period (2007–09) is based on the assumption that quality of care improves during the year preparing for accreditation (*16,17*), with the improvements continuing through and after accreditation. Thus, the intervention period spans 3 years: the year preparing for accreditation, the year of accreditation, and the year following accreditation.

Cost

To estimate cost savings associated with improvements in the selected hospitals' outcome performance measures, we first approximated the cost of the medical services. The cost of a normal delivery, which is a frequent and brief (2–3 days) reason for hospitalization, was used to estimate the cost of a recurrent admission. An ICU admission for a respiratory infection was used to estimate the cost of return to ICU. A general surgery admission represented the cost of return to surgery. We obtained the cost of these proxy services by randomly choosing 240 admissions (20 instances of each of 3 services in 4 hospitals).

To estimate the cost savings from a possible reduction in staff turnover, we obtained the average salary of employees at each of the participating hospitals. Based on common practice, we estimated that on average, the hospital would save 3 months of salary (the customary probationary period and estimated time needed for new staff orientation). Since hospital charges were obtained in 2008, we adjusted these costs to the year 2013 using the projected consumer price inflation index for Jordan.

Ethical considerations

Hospitals agreed to participate after an in-depth discussion of the importance and methodology of this study and the expected impact of its results. Each hospital's general director signed the consent form. Due to the retrospective nature of this study, it was not possible to obtain patients' consent to review their medical records. However, during the sample selection process the medical department in each hospital concealed patients' identities before they provided the needed data to study investigators. The Brandeis Committee for Protection of Human Subjects in Research reviewed and approved the research protocol (IRB number: 11056).

Results

Baseline data

Comparing measures in the pre-intervention year for all participating hospitals showed that, on average, the rate of staff turnover was higher for the to-be-accredited hospitals (36.1%) compared with the control hospitals (24.7%). Similarly, at baseline, to-be-accredited hospitals performed better compared with control hospitals in the rate of readmission within 30 days of discharge (5.1% versus 7.2% respectively); rate of return to surgery within 24 hours (0.2% versus 0.6% respectively) and completeness of medical records (62.0% versus 53.0% respectively). Control hospitals performed better, however, compared with to-be-accredited hospitals in the rate of readmission to ICU within 24 hours of discharge from ICU (1.3% versus 1.4% respectively). However, none of these baseline differences was statistically significant and the mixed pattern suggests no large differences between the control and intervention hospitals.

Impact of accreditation

Of the 5 measures, 3 showed statistically significant changes due to accreditation: the rate of return to ICU within 24 hours; the rate of completeness of medical records; and the rate of staff turnover. As presented in Table 2, all of these 3 measures favoured the intervention group.

Figure 1 displays the rate of return to ICU within 24 hours for both accredited and control hospitals. The absolute changes in these rates were –0.37% in the JCI accredited hospitals (from an average rate of 1.44% in 2006 to an average rate of 1.06% over the 3 intervention years 2007–09) compared with +0.82% in the control hospitals (from 1.33% to 2.15%).

Table 2 Net impact of Joint Commission International (JCI) hospital accreditation on the 2 accreditation and 2 control hospitals in Jordan, 2006–09

Variable	Accredited hospitals[a] (%)	Control hospitals (trend)[a] (%)	Net impact of accreditation[b] (%)	*P*-value	Monetary savings per hospital per year in 2013 (US$)[c]
Readmission to hospital within 30 days	0.56	0.43	0.13	0.857	–
Return to ICU within 24 hours	–0.37	0.82	–1.20	< 0.001	56 595
Return to surgery within 24 hours	–0.07	–0.21	0.14	0.731	–
Staff turnover per year	–4.97	7.83	–12.8	0.005	42 290
Completeness of medical records	19.8	–0.2	20.0	0.002	–
All indicators	–	–	–	–	98 885

[a]Changes from pre-intervention year (2006) compared with average of 3 intervention years (2007–09).
[b]Net impact is the differences in differences associated with the accreditation status.
[c]Savings were calculated only for indicators for which results could be valued in monetary terms and the difference between accredited and control hospitals was statistically significant. Results converted at July 2013 exchange rate of US $1 = 0.707 Jordanian dinars.
ICU = intensive care unit.

The difference between these changes yielded a 1.20% net impact due to JCI accreditation ($P < 0.001$). The monetary saving per hospital per year was US$ 56 595.

Figure 2 shows the rates of staff turnover for both accredited and control hospitals. The absolute changes in these rates were –5.0% in the JCI accredited hospitals (from an average rate of 36.1% in 2006 to an average rate of 31.2% over the 3 intervention years 2007–09) compared with +7.8% in the control hospitals (from 24.7% to 32.6%). The difference gives a 12.8% net impact due to JCI accreditation ($P = 0.005$). The monetary saving per hospital per year was US$ 42 290.

Figure 3 shows the rates of completeness of medical records for both accredited and control hospitals. The absolute changes in these rates were +19.8% in the JCI accredited hospitals (from an average rate of 62.0% in

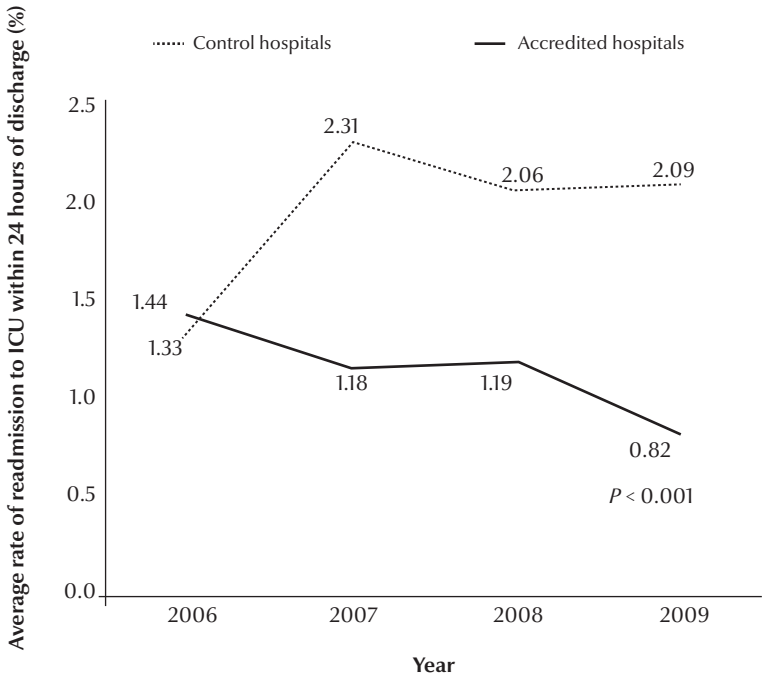

Figure 1 Average rate of return to the intensive care unit (ICU) within 24 hours of discharge for accredited and control hospitals by year, 2006–2009

2006 to an average rate of 81.8% over the 3 intervention years 2007–2009) compared with –0.19% in the control hospitals (from 53.0% to 52.8%). The difference gave a 20.0% net impact due to JCI accreditation (P = 0.002). As this item is a structural measure rather than an outcome, we could not attribute any monetary savings to it.

Two measures were not statistically significant: the rate of readmission to hospital within 30 days (P = 0.857), and the rate of return to surgery within 24 hours (P = 0.731).

The total saving from combining the 2 measures (reduction in return to ICU within 24 hours of discharge and reduction in staff turnover) was US$ 98 885 per accredited hospital per year. This amount aggregates to US$ 296 655 per hospital over the 3-year period, with an aggregate saving of US$ 593 310 for the health system in Jordan for the 2 accredited hospitals.

Figure 4 shows the quality improvement index for accredited and control hospitals in the intervention period compared with the pre-intervention period. A quality index of 0 indicates no difference in the index relative to the base year 2006, while a positive number represents improved quality. For example, the average value of 37.5% for accredited hospitals in the year 2007 indicates an improvement of nearly 38% in the quality index compared with the baseline year (2006). Accreditation status was associated with a 119.3% improvement in the quality index compared with the baseline year 2006 (P < 0.001). With a root mean square deviation of 29.5%, the improvement in quality corresponded to a large effect size of 1.74.

Sensitivity analyses

Sensitivity analyses using the post-intervention year effect showed a 20.0% net impact on the completeness of medical records (P = 0.027) and –13.0% net impact on staff turnover (P = 0.027), illustrating a favourable impact due to JCI accreditation. However, the impact on the 3 other measures were not statistically significant: return to ICU within 24 hours of discharge (impact = –1.0%, P = 0.19), return to surgery (impact = 0.0%, P = 1.00) or readmission within 30 days of discharge (impact = 0.2%, P = 0.87).

Discussion

Donabedian conceptualized quality of care as a combination of structure, process and outcomes, whereby good structure increases the likelihood of good process and good process increases the likelihood of good outcome (*21*). Structural factors describe the environment and staff characteristics. Process describes the contents or course of services and outcomes examine the results of service. Our findings are consistent with Donabedian's theory. The quality improvement index showed that, in general, being accredited showed a consistent improvement in the structural and outcome measures in the intervention period compared with the pre-intervention period. This result supports our hypothesis that

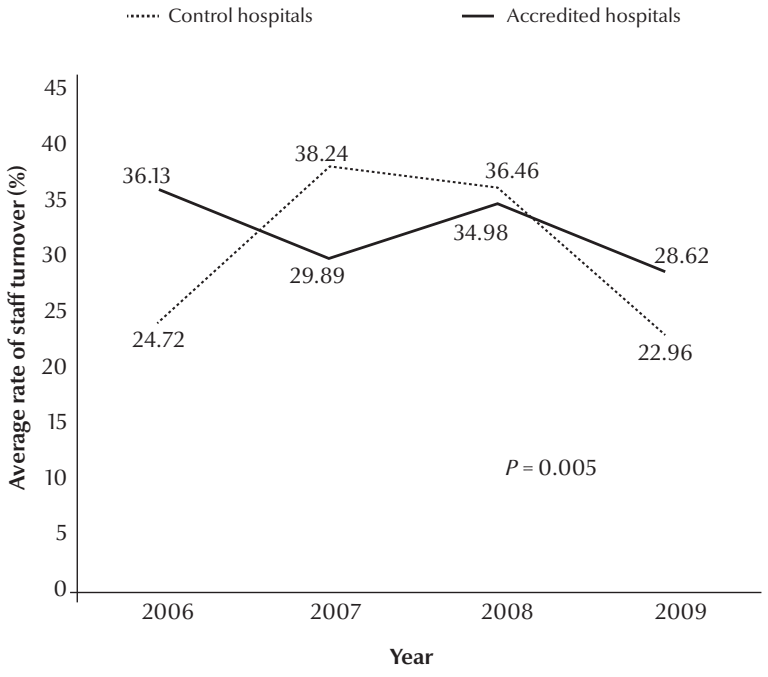

Figure 2 Average rate of staff turnover for accredited and control hospitals by year, 2006–2009

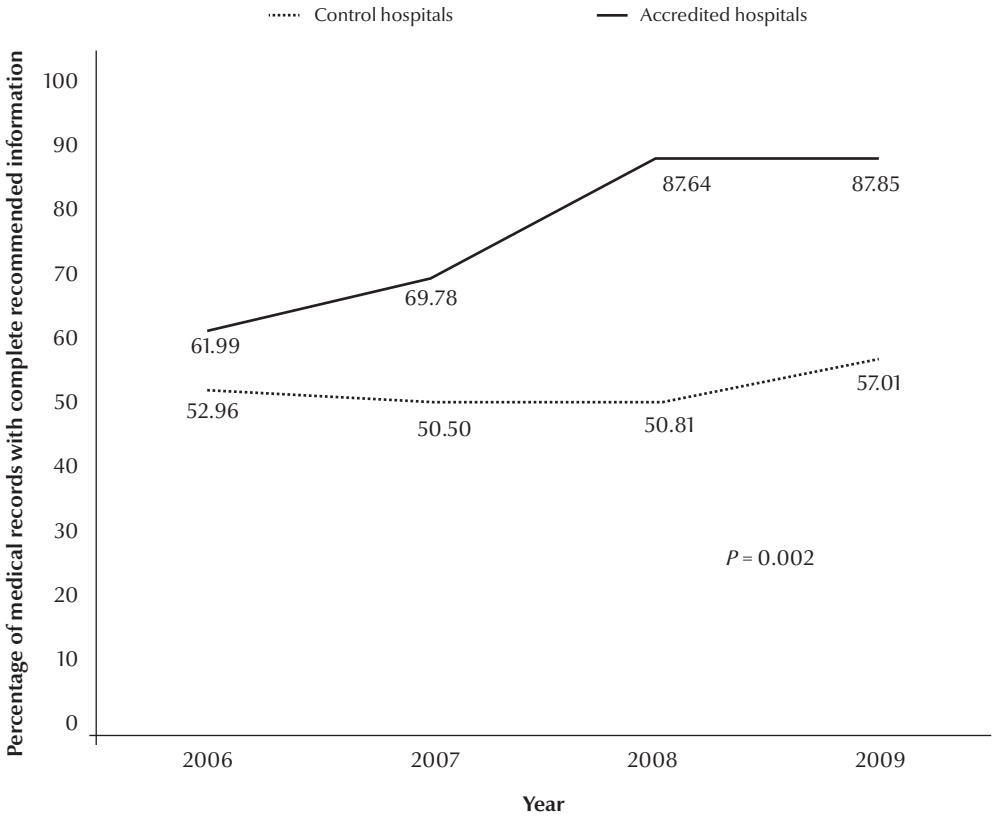

Figure 3 **Average rate of completeness of medical records for accredited and control hospitals by year, 2006–2009**

preparation for and participation in the process of accreditation enhances and accelerates adherence to quality standards.

Because this study had a small number of hospitals, we computed the average rate of the measures by hospital group in the intervention years and compared these averages with the rates in the pre-intervention year. Our results show that engagement in the accreditation process is positively associated with reductions in the rate of patients readmitted to ICU within 24 hours of discharge from ICU and in the rate of staff turnover. The results of the core analyses and the sensitivity analyses for completeness of medical records and staff turnover support our hypothesis of a positive association between organizational structure and process. The results demonstrate that accredited hospitals achieved substantial improvement in the completeness of medical records compared with the control hospitals. Both control and accredited hospitals started with a moderate level of completeness. However, over the intervention years the level of completeness of medical records in the accredited hospitals improved noticeably (81.8%) compared with the non-accredited hospitals (52.8%).

The results of the sensitivity analyses agreed with the results of our core analyses in terms of similar estimated impacts. The classification between significant or not significant impacts of accreditation did not change for 4 outcomes, but did change for one. The outcome for which significance changed (return to ICU within 24 hours of discharge) likely resulted from substantial random variation for individual years in this relatively rare event compared with more stable findings when years were pooled. The 2 lowest individual years had 0 and 3 patients returning to ICU in one hospital, whereas when years were pooled, the 2 lowest observations were 31 and 33 patients. For this rare event, the attempt to examine individual years introduced too much random variation to obtain statistical significance. Our core analysis avoided this artefact.

Our results suggest that the hospitals' engagement in the accreditation process was associated with higher improvement in their quality of care (Figure 4). We noted that after obtaining accreditation, these hospitals possibly relaxed their monitoring and implementation of JCI indicators. However, the slight reduction in the relative quality index (0.75% per year compared with the base year of 2006) was not statistically significant ($P = 0.74$).

The evolution of accreditation standards over time might create difficulties in evaluating their impact. We believe our study design successfully addressed this challenge. First, most of

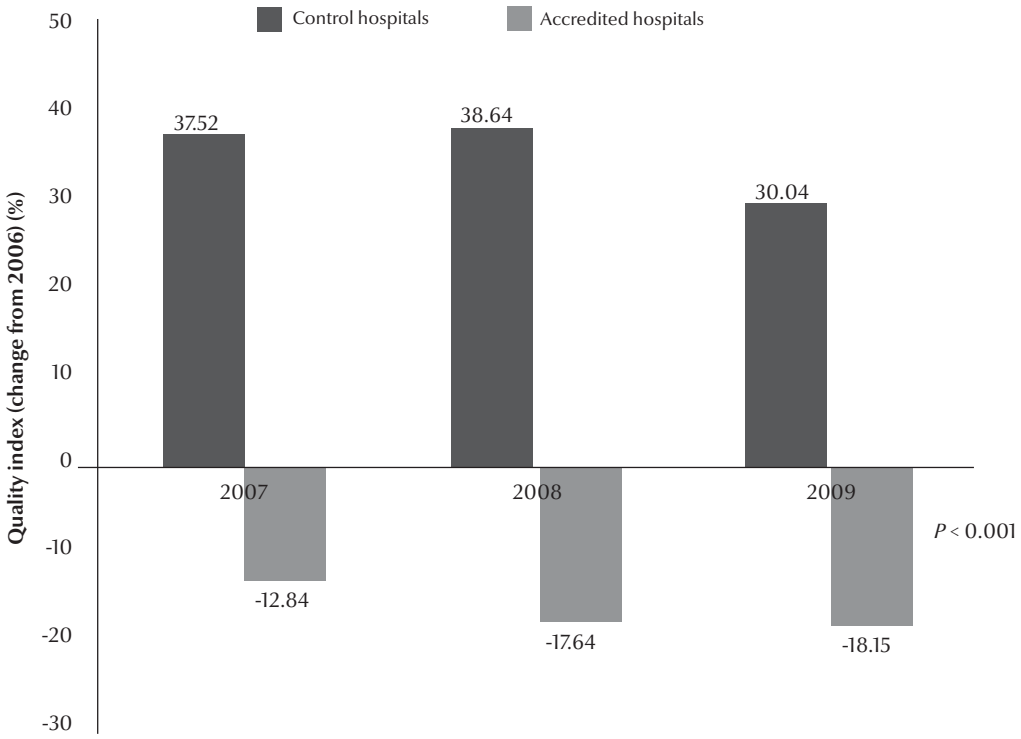

Figure 4 **Quality improvement index for accredited and control hospitals by year, 2007–2009**

our measures were outcome measures, so even if the specifications of JCI indicators changed over time, the overall impact of JCI accreditation would still be measurable and give a clear picture of a hospital's performance. Secondly, we used longitudinal comparisons and tracked results over 4 years, including pre- and post-intervention periods in both accredited and control hospitals. Thirdly, the selected measures were available retrospectively in both accredited and control hospitals for the duration of the study period; we were therefore able to use the difference-in-differences analysis to control for external factors that might have influenced hospitals' performance measures.

Of the US$ 98 885 average savings per accredited hospital per year, 57% was from preventing adverse events that led to returning to the ICU within 24 hours of discharge, thus benefitting governments, health insurers and households. Savings from lower staff turnover (43% of total savings per year) benefits hospitals through reductions in their operating budget. The hospitals' operating costs were not available for the study period. Assuming hospitals in Jordan are following international patterns (*22*), we project that a hospital's annual operating budget averages US$ 4 million, so the annual savings were about 2% of the annual operating budget. Although we were unable to ascertain the actual cost of an accreditation, a US study found it represented about 1% of a hospital's annual budget (*23*). If this result were applied in Jordan, it suggests that accreditation would pay off financially in just 6 months, or a return of 200% per year.

Our study had several limitations. First, the sampling method may have resulted in a selection bias among control hospitals; of the 4 control hospitals matched to the accredited hospitals, only 2 agreed to participate. However, the characteristics of these 2 non-participating hospitals were similar to those of the 2 control hospitals that agreed to participate in this study. Secondly, our sample, although covering all accredited acute general hospitals in Jordan during the study period, was relatively small and therefore may be subject to sample variation. Thirdly, the primary reasons for recording information in patients' medical records are to support the delivery of good care, clinical decision-making and communication between health-care workers, and to ensure continuity of care. A medical record is also a resource for detecting adverse events, which, if addressed, can improve the quality of care in the hospital. The cost of these adverse events was estimated at 6.5 times the cost of an admission with no adverse events (*24*). Unfortunately, we were able to assess only the completeness of the medical records, not the improvement in the content of patient clinical records. Therefore, we were not able to estimate any cost saving associated with improvement in this measure. Fourthly, we were not able to adjust for risk factors due to lack of an algorithm to do the adjustment specifically for Jordan, and the unavailability of the

historical diagnostic or comorbidity data needed to perform the risk adjustment. However, using the difference-in-differences approach means that each hospital served as its own control. Furthermore, no major changes occurred in the health system in Jordan during the study period, as evidenced by only minor changes in key trends in hospital statistics. For example, from 2006 through 2009, bed capacity per capita fell by 1.2% per year, while admissions per capita rose by 1.8% per year (25). These national statistics give us the confidence that no major changes occurred during the study period that would make risk adjustment a necessity. Finally, it should be noted that the study was limited in scope by the available data and it therefore covered only a few hospital performance measures.

With increasing interest in healthcare accreditation, this study's methodology and results are useful for researchers who might wish to replicate the study in other types of healthcare facilities and in other countries. In conclusion, our results showed that accredited hospitals improved 2 structural and 1 outcome measures compared with the control hospitals. These measures fall under the direct supervision of hospital management. The 2 outcome measures that did not improve (return to surgery and readmission within 30 days of discharge) are primarily under the control of individual physicians, who are independent practitioners who may admit patients to multiple hospitals, both accredited and unaccredited. Their indirect relationship to the hospital and possible crossover substantially reduces the possibility that accreditation would impact these measures. Finally, the quality improvement index, a composite of all 5 indicators, showed a significantly greater improvement in the performance of accredited hospitals compared with the control hospitals. These significant improvements in 3 measures were associated with direct cost savings that would benefit both hospitals and the overall health-care system.

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Use of clinical guidelines: perspectives from clinicians in paediatric and maternity hospitals in Kabul, Afghanistan

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استخدام الدلائل الإرشادية السريرية: وجهات نظر من أطباء سريريين في مستشفيات طب الأطفال والولادة في كابول بأفغانستان

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الخلاصة: استكشفت هذه الدراسة القيمة المتصوَّرة للدلائل الإرشادية السريرية ودورها واستخدامها المبلغ عنه من قبل الأطباء السريريين في أوساط مستشفيات طب الأطفال والولادة في المناطق الحضرية، وتأثير استراتيجيات التنفيذ الحالية على اتجاهات الأطباء السريريين ومعارفهم وسلوكهم. وقد شارك ما مجموعه 63 طبيباً سريرياً من 7 مستشفيات لطب الأطفال والولادة في كابول بأفغانستان في مجموعات بؤرية منظَّمة، وتم استخدام منهجيات تحليل المحتوى لتحديد وتحليل المواضيع الرئيسية. وتم تحديد سبع مجموعات من الدلائل الإرشادية أو البروتوكولات أو المعايير (بما في ذلك 5 دلائل إرشادية مقرَّة من قبل منظمة الصحة العالمية). ومع ذلك، فإن معظمها فشل في تحقيق مستويات استخدام عالية. ومن العوامل المرتبطة باستخدام الدلائل الإرشادية: مشاركة الأطباء السريريين في وضع الدلائل الإرشادية، والتدريب المتعدد الاختصاصات، والنتائج الملموسة، واتجاهات الأطباء السريريين الإيجابية بخصوص جودة الدلائل الإرشادية ومدى ملاءمتها للسياق. ويرى الباحثون أنه يتعين على أنشطة التنفيذ تحقيق ثلاثة أهداف رئيسية: تعزيز التوعية بالدلائل الإرشادية وتشجيع الحصول عليها، وتحفيز الدافع لدى مستخدمي الدلائل الإرشادية السريرية، وتسهيل الالتزام بالدلائل الإرشادية بشكل فعال.

ABSTRACT This study explored the perceived value, role and reported use of clinical guidelines by clinicians in urban paediatric and maternity hospital settings, and the effect of current implementation strategies on clinician attitudes, knowledge and behaviour. A total of 63 clinicians from 7 paediatric and maternity hospitals in Kabul, Afghanistan participated in structured focus groups; content analysis methodology was used for identification and analysis of key themes. Seven sets of guidelines, protocols or standards were identified (including 5 WHO-endorsed guidelines). However, most are failing to achieve high levels of use. Factors associated with guideline use included: clinician involvement in guideline development; multidisciplinary training; demonstrable results; and positive clinician perceptions regarding guideline quality and contextual appropriateness. Implementation activities should fulfil 3 major objectives: promote guideline awareness and access; stimulate motivation among clinical guideline users; and actively facilitate adherence to guidelines.

Application des lignes directrices cliniques : points de vue des cliniciens dans des hôpitaux pédiatriques et des maternités à Kaboul (Afghanistan)

RÉSUMÉ La présente étude a analysé l'application des lignes directrices cliniques ainsi que la valeur et le rôle qui leur sont attribués par des cliniciens exerçant dans des hôpitaux pédiatriques et des maternités en milieu urbain. L'effet des stratégies de mise en œuvre actuelles sur les attitudes, les comportements et les connaissances des cliniciens a également été étudié. Au total, 63 cliniciens exerçant dans sept hôpitaux pédiatriques et maternités de Kaboul (Afghanistan) ont participé à des groupes de discussion thématique structurés. Une méthodologie d'analyse de contenu a été utilisée pour identifier et analyser les thèmes clés. Sept ensembles de lignes directrices, protocoles ou normes ont été identifiés (y compris cinq lignes directrices approuvées par l'OMS). Toutefois, la plupart de ceux-ci n'atteignent pas de hauts niveaux d'application. Les facteurs associés à l'application des lignes directrices sont les suivants : l'implication du clinicien dans l'élaboration des lignes directrices ; une formation pluridisciplinaire ; des résultats démontrables ; des perceptions cliniques positives de la qualité des lignes directrices, mais aussi leur adéquation par rapport au contexte. Les activités de mise en œuvre devraient atteindre les trois principaux objectifs suivants : faire mieux connaître les lignes directrices et promouvoir leur accès ; accentuer la motivation des utilisateurs des lignes directrices cliniques ; et faciliter activement le respect des lignes directrices.

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Introduction

Clinical guidelines are systematically developed statements that seek to distil and present the best available evidence in a clear and practical way for clinicians and the community (*1*). The World Health Organization (WHO) has embraced guideline development as one of its core functions, recognizing their important role in translating evidence into practice and thereby improving health outcomes (*2*). This is particularly well appreciated in maternal and child health where guidelines are seen as instrumental in filling the implementation gap between evidence of quality, cost-effective health interventions and their full implementation (*3,4*). However, despite strong evidence of their potential benefits many guidelines fail, either because of deficits in the quality of their evidence base or due to failures in implementation (*5,6*). And while there is emerging consensus regarding the development of quality guidelines, there is significant debate over the best implementation strategies (*7–11*).

Evidence from a variety of settings suggest that clinical guideline implementation can be impeded by barriers or aided by facilitators at the level of the guideline itself, the individual patient and clinician, the work environment and the broader organizational and structural environment (*12*). However, specific factors vary greatly between guidelines and settings, underlining the importance of a context-specific approach to guideline development and implementation (*7,13*).

Clinical guidelines in Afghanistan

Questions regarding how to best implement clinical guidelines are particularly relevant in low-resource settings where resource allocation for implementation strategies is most limited (*14,15*). Afghanistan has invested substantially in guideline development over the past decade, while facing the challenges of war and resource scarcity. Afghanistan ranks 175th (out of 185 countries) on human development index (HDI) rankings, with one of the highest child and maternal mortality rates globally (under-5 mortality 64 per 1000 live births; maternal mortality ratio 327 per 100 000 live births) (*16*). Health workforce capacity is at one-third of WHO recommendations (7.26 doctors/nurses/midwives per 100 000 population) (*17,18*) and poor quality of care is impairing progress in maternal and child health (*19,20*). Professional and pharmaceutical regulation is weak, research capacity and access to evidence is severely limited, and large gaps remain in health service management, broader social support systems and infrastructure (*17*).

Within this context, the presence of clinical guidelines has been shown to be a major predictor of clinical care and overall hospital performance, with hospitals in Kabul identified as particularly deficient (*18,21,22*). Multiple international partners have been involved in guideline development and the Ministry of Public Health (MoPH) has made "enhancing evidence-based decision making" one of its 10 strategic objectives and begun creation of a clinical guidelines unit (*23,24*).

This is an exploratory study into guideline use in Afghan paediatric and maternity hospitals and addresses: which clinical guidelines are reported to be available; how these guidelines are perceived and used by clinicians; what factors facilitate or impede implementation of these guidelines; and what can be learned from these data about clinical guideline implementation in other low-resource settings.

Methods

Study design

A qualitative study design was chosen, using focus group discussions to collect data and a content analysis approach to objectively identify key themes. This was accompanied by site visits to record objective evidence of guideline use and supplementary meetings with relevant MoPH officials (directors of child health, maternal health and quality improvement sections). The study protocol was developed in consultation with clinicians in Afghanistan and structured around 4 themes: clinical decision-making resources; guideline availability and use; guideline value and role; and factors influencing guideline implementation. To encourage free and open discussion we chose peer interaction among clinician groups (e.g. trainee paediatric doctors), and for consistency the same 2 investigators (H.G., M.T.) moderated all focus groups. The research was approved by the institutional review boards of Johns Hopkins University and the MoPH Afghanistan.

Participants and recruitment

Hospitals were identified in collaboration with the MoPH and selected to represent a spectrum of urban obstetric and paediatric hospitals, including those which are regarded as particularly influential through their clinical, academic and health policy activities. These included Afghanistan's 2 largest paediatric referral and teaching hospitals, 2 largest obstetric referral and teaching hospitals, 2 district-level urban hospitals and 1 private hospital. Participants were selected purposively through contact with hospital directors to represent clinician groups with different levels of experience. To facilitate participant comfort and openness focus groups were conducted in a private area of the participants' hospital (with one additional focus group of midwives conducted at the Afghan Midwifery Association). No monetary incentive was offered for participation. Focus groups were conducted in English with Dari translation.

Data collection

Written consent was obtained from all participants. The interview guide contained open-ended questions and prompts and was designed to address major implementation factors identified in previous systematic reviews (*12,14*) and conceptual frameworks (*7,25*). It was pilot-tested on junior clinicians from non-English speaking backgrounds in the United States of America and Afghanistan. All sessions were audio-recorded and accompanied by written field notes, with independent confirmatory translation as necessary.

Data analysis

Transcription, indexing and coding of data was conducted by the same investigators who led the focus groups to maintain consistency. After verification of accuracy, a content analysis approach was used to individually analyse each transcript, code the data and categorize ideas into broad themes. The results were then reviewed by both investigators (H.G., M.T.) to identify findings that were applicable to the entire study, with reference back to the transcripts to confirm or refute emerging hypotheses.

Guideline use was evaluated using Pathman's awareness to adherence framework (*25*), with scores of low, medium and high corresponding to whether each criterion (aware/agree/adopt/adhere) pertained to few (< 1 in 3), some (1–2 in 3), or most (> 2 in 3) clinicians. This was correlated with objective evidence of guideline use during site visits. Comparison tables were constructed to assess whether there was any association between guideline use and any of the implementation factors identified from focus groups.

Results

A total of 22 focus group discussions were conducted in January 2013 and involved 63 clinicians, including 43 doctors and 20 nurses/midwives (Table 1). Senior doctors (paediatricians and obstetricians) generally did not have formal qualifications (due to limited opportunity for postgraduate specialty training in Afghanistan until recently), but all had greater than 5 years of experience and were working in supervisory and teaching roles. All trainees were undertaking postgraduate training in paediatrics or obstetrics, and had between 1 and 4 years of clinical experience. Midwives had formal midwifery training and varied in the number of years of clinical experience (from 1 year to > 5 years). Each focus group involved up to 6 clinicians and was approximately 45–60 minutes in duration. Gender distribution reflected the Afghan norm of predominantly female doctors and midwives in maternity hospitals and male doctors and nurses in other hospitals.

Guideline availability

In total 7 sets of guidelines, protocols or standards were identified in Kabul paediatric and maternity hospitals. Five of these were WHO guidelines: Managing Complications in Pregnancy and Childbirth (IMPAC) (*26*); Integrated Management of Childhood Illness (IMCI) (*27*); Pocketbook of Hospital Care for Children in Low-Resource Settings (Pocketbook) (*28*); Emergency Triage, Assessment and Treatment (ETAT) (*29*); and Training Course on the Management of Severe Malnutrition (Malnutrition guideline) (*30*). The remaining 2 included the MoPH Hospital Standards Manual (MoPH Standards), and the CURE International Hospital (a private hospital department of obstetrics and gynaecology) Protocol Handbook (CURE Handbook). All were available in the national Dari language, except for the CURE Handbook which was only in English (IMCI was also available in Pashto).

Of these, the IMCI, Pocketbook and IMPAC guidelines were all widely known. However, IMPAC was the only guideline that reached moderate or high levels of use in all relevant study hospitals. The ETAT, Malnutrition and CURE guidelines were not widely available but reached moderate or high levels of use in individual hospitals. Table 2 summarizes the main findings regarding guideline availability, use and implementation strategies.

Key themes: role, value and factors associated with use of guidelines

Key themes from the focus groups are listed in Table 3 with selected quotations for illustration.

Clinical guidelines have a small role in clinical practice in Kabul paediatric hospitals and their role as decision-making aids is poorly appreciated. Despite a general belief that "if guidelines were available they would be used", deeper

Table 1 Characteristics of the study participants

Profession	Males	Females	Total	
	No.	No.	No.	%
Paediatrician	8	–	8	14
Paediatric trainee	8	–	8	18
Nurse (paediatric)	5	1	6	10
Obstetrician	1	9	10	18
Obstetric trainee	–	17	17	31
Midwife (hospital)	–	7	7	13
Midwife (AMA)	–	7	7	13
Total	22	41	63	100

AMA = Afghan Midwifery Association (hosted 1 additional focus group with midwives from a variety of urban and rural hospitals).

Table 2 Guidelines and other reference material used in paediatric and maternity hospitals in Kabul, Afghanistan: form, presence, reported use and implementation activities

Reference material	Source & language	Observed presence	Reported use [based on Pathman's level of adherence (26)]				Implementation activities
			Awareness	Agreement	Adoption	Adherence	
Guidelines, standards & protocols							
Integrated Management of Childhood Illness (IMCI)	WHO, 2005[a] (Dari, Pashto, English)	Multiple sites; Wall-chart in OPD; Manual absent	High	High	Low	Low	Integration into pre-service curriculum; Outpatient wall-charts
Pocketbook of Hospital Care for Children in Low-Resource Settings (Pocketbook)	WHO, 2005[b] (Dari, English)	Multiple sites; Pocketbook in office (not clinical area)	High	Low	Moderate (single site); Low elsewhere	Low	Passive dissemination only
Emergency Triage, Assessment and Triage (ETAT)	WHO, 2005[c] (Dari, English)	Single site; Wall-charts in ED and OPD; Manual absent	High	High	High (single site); Low elsewhere	High (single site) Low elsewhere	Participatory implementation process; Multidisciplinary inservice training; Wall charts; Measured outcomes; Senior supervision and enforcement
Training Course on the Management of Severe Malnutrition (Malnutrition)	WHO, 2002 (Dari, English)	Single site; Training manual in clinical area; Excerpts on wall	High (single site); Low elsewhere	High (single site); Low elsewhere	High (single site); Low elsewhere	High (single site) Low elsewhere	Multidisciplinary inservice training; Wall charts; Senior supervision and enforcement
Hospital Standards Manual (Standards)	Afghan MoPH, 2006 (Dari, English)	Single site; Manual in director's office	High (single site); Low elsewhere	Moderate (single site); Low elsewhere	Moderate (single site); Low elsewhere	Low	Audit; MOPH endorsement (for reform hospitals only)
Managing Complications in pregnancy and childbirth: a guide for doctors and midwives (IMPAC)	WHO, 2000 (Dari, English)	Multiple sites; Wall charts in wards; Protocol book in nonclinical areas	High	High	Moderate	Moderate	Integration into pre-service curriculum; Multidisciplinary inservice training; Wall charts; Supervision; Integration into clinical activities (e.g. ward rounds, handover); Measured outcomes; Integrated in QI activities; MOPH endorsement
CURE Protocol Handbook (CURE)	CURE International Hospital, 2013 (English)	Multiple sites; Book on ward; online at 1 hospital; Hand-written translation at 2 hospitals	High (single site); Moderate elsewhere	High (single site); Moderate elsewhere	High (single site); Low elsewhere	High (single site); Low elsewhere	Senior supervision and enforcement; Integration into clinical activities (e.g. ward rounds, handover); Audit and feedback

Table 2 Guidelines and other reference material used in paediatric and maternity hospitals in Kabul, Afghanistan: form, presence, reported use and implementation activities (*concluded*)

Reference material	Source & language	Observed presence	Reported use [based on Pathman's level of adherence (26)]				Implementation activities
			Awareness	Agreement	Adoption	Adherence	
Other							
Essential pediatrics	Ghai et al., 2010 (English)	Book in doctors' office (not clinical area)	High awareness and use at all paediatric hospitals				Main reference text for postgraduate paediatric training programme and examination
Williams obstetrics	Cunningham et al., 2009 (English)	Book in doctors' office (not clinical area)	High awareness among junior doctors; moderate use at all maternity hospitals				Main reference text for postgraduate obstetric training programme and examination
Websites[d]	n/a (English)	Computer; smart phone	Limited availability and use at all but one hospital				Some recommendation from senior doctors

Low = less than one-third of clinicians; Moderate = between one half to two-thirds of clinicians; High = more than two-thirds of clinicians.
WHO = World Health Organization; MoPH = Ministry of Public Health; ED = emergency department; OPD = outpatient department; MSH SPS = Management Services for Health, Strengthening Pharmaceutical Systems; QI = quality improvement;
[c]First translated in 2003; [b]Translated in 2009; [c]Translated in 2010.
[d]Websites include Google search, My Clinics, Wikipedia, Student consult, DynaMed, UpToDate, Medscape;

exploration revealed many factors that influenced the use of guidelines (Box 1).

While reportedly highly valued, guidelines are rarely consulted within clinical settings. There is an expectation that doctors should not need assistance with decision-making and that "it should already be in their head". Consulting resources on the job could mean that "other people will think they are illiterate about their profession". Participants reported that the most frequent use of guidelines on the job was when they were available as wall charts.

Guidelines are most often identified as educational resources, with minimal distinction from textbooks, websites and training materials. Printed guidelines are commonly viewed as "simple textbooks" that are superseded by more comprehensive textbooks. Guidelines that were viewed exclusively as educational references had lower reported levels of use.

Guidelines are valued for helping to define and enhance the clinical role of nurses and midwives: both by doctors and by nurses and midwives themselves. As such, guidelines have challenged the assumption that only doctors make clinical decisions and have promoted effective task-shifting. Guidelines that effectively delineated clinical roles had higher levels of adoption and use.

Nurses and midwives reported valuing guidelines, and particularly guideline-related training opportunities, for broadening their employment prospects and enhancing their professional respect. However, this motivation to participate in guideline-related training activities was not associated with increased use.

Clinicians described the value of guidelines in setting a context-specific standard and resolving conflict between different resources. Guidelines such as IMPAC and the Malnutrition guideline were valued for being more appropriate to the health needs, cultural context and service provision capacities of Afghanistan than other existing resources (such as academic textbooks). Guidelines which clinicians viewed as contextually appropriate had higher levels of reported adoption.

Clinicians reported valuing guidelines which delivered tangible results, particularly improvements in patient outcomes and ease of clinical duties. Evidence of these benefits was reported to be one of the most compelling reasons for clinicians to use guidelines. While many participants reported subjective evidence of effect, guidelines that had activities that sought to measure and report outcomes (e.g. audit and feedback) had higher levels of reported use.

Midwives and doctors were interested in how guidelines were developed (or adapted); describing that there should be a participatory approach. Those who had been involved in guideline development described it as generating ownership of guidelines among hospital staff and motivating clinicians to invest in their implementation. Midwives described disappointment

Table 3 Example quotes from participants to illustrate of the study findings by common themes

Theme	Quote
Role and value	
Doctors should know what to do	"If a doctor (looks at) a book in front of a patient the patient will think he is (simple), he doesn't know anything... This is a big problem here in Afghanistan."
Educational resource	"[The Pocketbook] is good... but it does not have as many details as in the other textbooks."
Define and enhance clinical roles of midwives and nurses	"Lots of improvements have happened between doctors and midwives because now midwives are receiving essential obstetric care [IMPAC] courses... and they know about the guidelines... Doctors trust them now... they know that they can do everything for the patient and now there is more respect between doctors and midwives. " "The ETAT program enabled nurses to be able to evaluate a patient... and do the right things for the patient... Before, the nurse cannot evaluate, or distinguish, what this patient needs."
Context-appropriate standard	"When I go to the last edition of Nelsons, the 19th edition, I see only 5 or 6 sentences about mumps. But here I have many patients with mumps... The diseases which are common in Afghanistan, they are a lot different to the ones in the US or in Europe. That is one of the important reasons we should have a specific guideline to follow that." "CURE guidelines advise IV infusion of magnesium sulfate [for severe pre-eclampsia]. But, we don't have instruments for a pump infusion to regulate magnesium sulfate infusion for patients with severe pre-eclampsia or eclampsia. We just do it with a simple IV line... and with difficulty we adjust the drops. There is not an IV pump... or even enough stands to hang the IV infusions or staff to follow the infusion."
Clarification of conflict	"Right now, the problem is that we don't have one universal guideline that we can implement... The problem here is that we ask the trainees to use the CURE protocol for hypertensive patients. But then the trainer comes along and says: 'OK I don't use that CURE protocol. I don't like that hospital. I have my own...'. So we cannot enforce it." "This ETAT programme, the aim is to reduce the mortality rate in the first 24 hours... At the beginning the (proportion of deaths occurring in the first 24 hours) was 57–58%, it was high... After 6 months from implementing this programme, we reduced it to 33%."
Factors influencing use	
Deliver tangible results / Audit and feedback	"All of the doctors and specialists in the paediatric department they should sit together and make a guideline for all the standard cases..."
Clinician involvement in guideline development	"We should be making the standards here (in Afghanistan) and we should make a decision on the basis on the pathology of Afghanistan."
Perceived as up-to-date	"There is no update in the [WHO Pocketbook]. I think it is about 6, 8 years ago... But here we have very poor and very ill patients. We need to use the updated guidelines. [Therefore we refer] mostly to textbooks... like Nelsons."
Integrated & multi-disciplinary training	"We [doctors] take the ETAT training for 3 days... the person who is sitting at the gate, he must be trained about the ETAT. Also the nurse. So the patient can reach very soon the place for examination." "I graduated by reading the IMPAC book so it is easy. We are reading the IMPAC book in midwifery school, then we are coming to practicals and our teacher is teaching us according to that, and then we are practicing according to that."
Systemic challenges in the work environment	"There is no quality check in our country... When we use a multinational drug from [company X], we don't know if it is the original drug or not... We see the packet. It is beautiful packet, so we think the drug is beautiful. So we use the drug from the package." "At other hospitals we had lack of instruments, lack of facilities, lack of knowledge of the patient, lack of time... We had lots of limitations for applying [maternity] guidelines in the government hospitals... but here the limitations are very little. The administration is very supportive—they find out what we need. They are very cooperative with us."
Influence of senior doctors	"There are some doctors here that didn't take the ETAT programme, because they are junior, but the senior doctors have talked, have explained about the ETAT programme and they are doing accordingly."
Ministry of Public Health endorsement	"[The Pocketbook] is not a national guideline. It is just a [resource] from WHO and the Child and Adolescent Department of the Ministry of Public Health... The Malnutrition guideline it is a national guideline, it is used all over Afghanistan, if you are in Kabul, if you are in Mazar, if you are in Jalalabad, all of you will use this national guideline for malnutrition."

IMPAC = Integrated Management of Pregnancy and Childbirth; ETAT = Emergency Triage Assessment and Treatment; CURE = CURE Protocol Handbook; Pocketbook = Pocketbook of Hospital Care for Children in Low-Resource Settings; Nelson Textbook of Pediatrics 19th edition; Training Course on the Management of Severe Malnutrition (Malnutrition).

Box 1 Factors that influenced use of guidelines in Afghan paediatric and maternity hospitals

1. Level of the guideline
- Epidemiologically and contextually appropriate content
- Presence of conflict between available guidelines
- Lack of distinction between clinical guidelines and textbooks
- Integration of guidelines into clinician training
- Availability as job aids (e.g. wall charts)
- Availability in local languages

2. Level of individual clinicians (and patients)
- Belief that referring to reference material shows lack of clinician competence
- Perception that clinical guidelines exist only for junior doctors and midwives
- Quality of interdisciplinary relations (e.g. doctor–midwife relationship)
- Perception that guidelines are up-to-date and evidence-based
- Perception that guidelines are appropriate to the local context

3. Level of clinical work environment
- Magnitude of workload and patient demand
- Adequacy of facilities and equipment to follow guidelines
- Human resource management (e.g. adequate staffing and safe hours)
- Multidisciplinary involvement in guideline use
- Supervision and enforcement of guideline use by senior clinicians

4. Level of broader organizational and structural milieu
- Clinician involvement and trust in guideline development
- Coordination and endorsement by Ministry of Public Health
- Strength and quality of pre-service and professional education
- Supportive pre-service (medical, nursing and midwifery) supervision
- Emphasis on medical ethics during clinician training (e.g. patient-centred care)

with the lack of midwifery representation during guideline development; although nurses did not expect to be involved. Clinicians emphasized the need for multidisciplinary, multihospital representation when developing guidelines. Guidelines that had strong clinician participation in their development were more likely to be accepted by clinicians.

Clinicians reported that guidelines should be available in local languages (Dari and Pashto) as well as English (particularly for nurses and midwives who have less English language training). Translation into local languages was a necessary but not sufficient factor for guideline adoption; a number of guidelines that have been translated were not widely used.

Clinicians reportedly value guidelines that are up-to-date, context-specific, comprehensive and evidence-based. Yet clinicians' subjective perceptions of these qualities do not always correlate with objective assessments of currently available resources. For example, the Pocketbook was critiqued for being out-of-date and overly simplistic, while ETAT was described as up-to-date, and appropriately detailed (yet, both the Pocketbook and ETAT guidelines were published in 2005 and ETAT's contents are fully contained within the Pocketbook). Guidelines perceived as up-to-date, comprehensive and evidence-based had higher levels of reported acceptance and use.

Training was reported to be a key strategy for overcoming resistance from clinicians to adopting guidelines. While any training was valued by clinicians, only training that was multidisciplinary, practice-based and multimethod correlated positively with guideline acceptance and use. Furthermore, a multidisciplinary approach was reported to enhance team dynamics and professional communication between doctors and nurses/midwives. Guidelines that were integrated into medical, midwifery and nursing curricula had higher levels of reported awareness and acceptance (though not necessarily adherence).

Many barriers to guideline use were reported in the work environment, including: inadequate staffing; poor drug quality and supply; inadequate facilities; and lack of equipment and poor maintenance. Poor resource management and communication between clinicians and administrators reportedly compounded these deficiencies.

Senior doctors' opinions reportedly carried immense weight and influenced junior doctors' perception of and reported adherence to clinical guidelines.

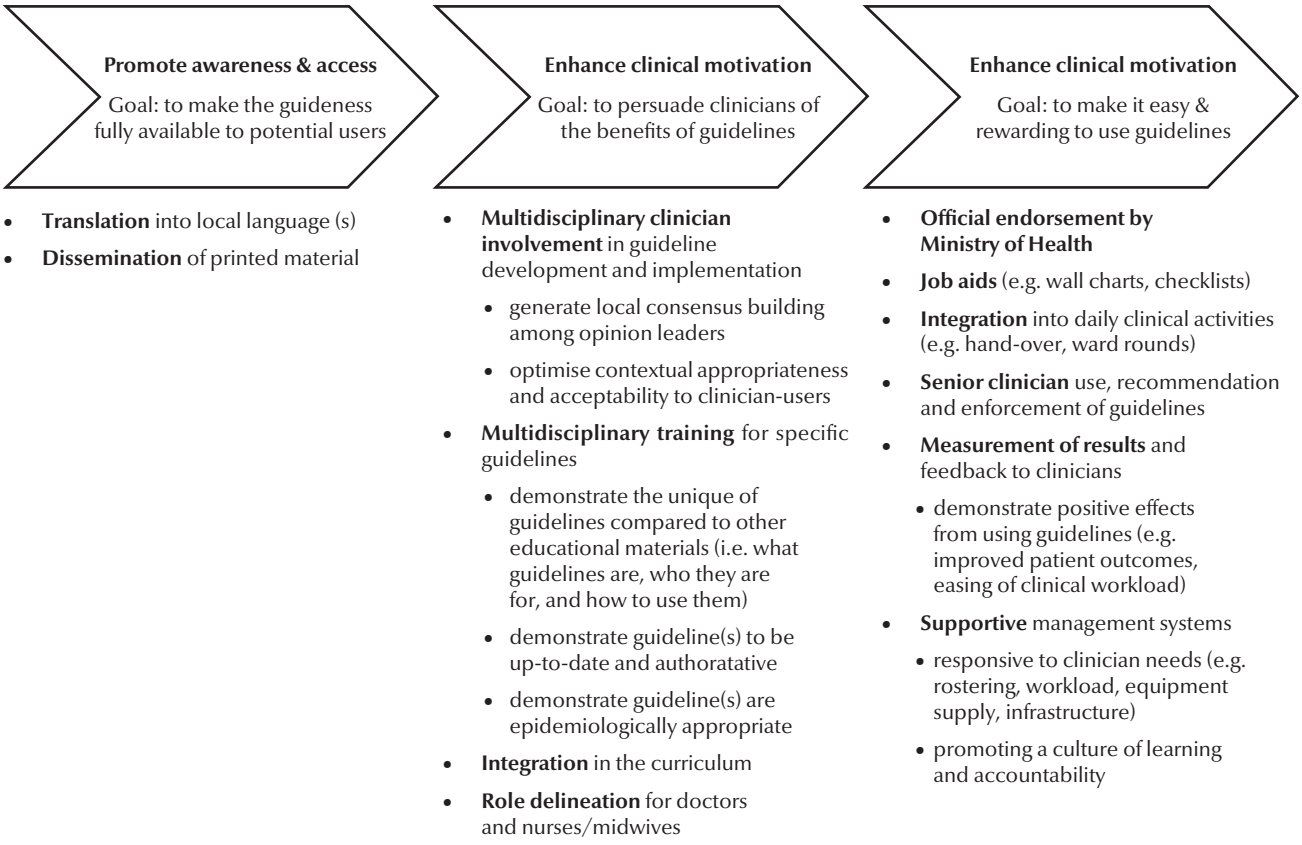

Figure 1 Framework for implementation of guidelines: 3 key tasks, illustrated with examples from Kabul paediatric and maternity hospitals

MoPH support and endorsement of clinical guidelines was highly valued by Afghan clinicians. Guidelines that carried such endorsement had higher levels of reported adoption.

Discussion

Clinical guidelines are recognized as having an important role in Afghan hospitals; however, most are failing to achieve high levels of use despite demand from users and commitment from administrators (*24*). This paper proposes a framework for enabling successful guideline implementation in Afghanistan, and describes 5 core principles of guideline implementation. While this exploratory study limited its focus to urban hospitals in Afghanistan, these principles may be relevant to other low and middle-income countries facing similar challenges.

It should be noted that this study was limited to clinicians based at major paediatric and maternity hospitals in urban Kabul and it evaluated guideline use at a single point in time. This enabled us to compare the use of guidelines at different stages of implementation and across a range of institutions (including the largest paediatric and maternity hospitals). However, this approach cannot fully capture the dynamic nature of clinician behaviour over time, and therefore extrapolation of the findings to other settings (especially non-urban settings) may be limited. Assessing guideline use based on clinicians' reports (rather than direct observation) enabled the collection of qualitative data on why clinicians use guidelines, but risked introducing reporting bias. To increase the validity of this we combined use of Pathman's adherence framework, corroboration across participants and objective observation of the presence of guidelines.

Framework for effective guideline implementation

Dissemination of clinical guidelines alone is ineffective in changing clinician practice (*14,15*). We propose that effective implementation strategies must achieve 3 stepwise goals. First, implementation strategies must promote awareness of and access to guidelines, making them fully available to potential users. Secondly, they must enhance motivation among guideline users, persuading them of the benefits of using guidelines. Thirdly, they must actively facilitate adherence to guidelines, making it rewarding for clinicians to use them. Figure 1 illustrates this framework with examples from Afghan hospitals.

Conceptually, this may explain why there have been only modest

improvements in clinical care from single interventions (e.g. dissemination of educational material; audit and feedback; reminders and "job aids"; patient-directed initiatives; opinion leaders; and financial incentives), and conflicting results when such interventions are combined (*12,31*). Interventions should be conceived and combined to address each step of the framework sequentially (access, motivation, adherence) and no single intervention can be expected to fulfil them all.

Core principles for effective guideline implementation

This study highlights a number of principles that are core to successful guideline implementation. First, clinician-users must be held at the centre of guideline development and implementation. Although the importance of consumer involvement in the guideline development process has been well documented, it is frequently neglected (*12,31–33*). This may be particularly true in post-conflict and resource-constrained settings in which the task of guideline development and implementation often falls on non-governmental organizations and other agencies (and coordinated advocacy by professional groups is weak). Our findings suggest that involving clinicians can increase acceptance and appreciation of guidelines by clinicians, build consensus among opinion leaders and empower clinicians to optimize the clinical work environment. Furthermore, it offers the opportunity to use local knowledge and experience to optimize the contextual appropriateness of guidelines: a critical but commonly neglected activity.

Secondly, there is need for a multidisciplinary approach to guidelines. Involvement of both doctors and nurses/midwives with guidelines in Afghan hospitals was not only strongly associated with their acceptance and use, but was also reported to deliver benefits that went far beyond the scope of the guidelines themselves. These benefits included improved role delineation, task shifting and enhanced recognition and respect for midwives and nurses: all of which are much needed in Afghanistan (*34*). This finding is particularly interesting given the enormous impact that these professional relationships have on quality of care, worker satisfaction and patient outcomes, and the paucity of effective interventions to improve these relationships (*35*).

Training is commonly recognized as having a critical role in implementing clinical guidelines, although there is great variation in the types of training and how effective it is in changing clinician behaviour (*12,14,15*). Characteristics of effective guideline training include: small groups; focussed topics; multiple teaching methods (e.g. role play, practising skills); informed by local culture and context; and explicitly addressing barriers and facilitators to guideline use (*14,15*). Our findings suggest that training can be one of the most effective motivators for clinicians to use guidelines, particularly if it is able to address key concerns of clinicians. For Afghan clinicians this included explicitly demonstrating the guideline(s) to be up-to-date and authoritative, and epidemiologically and contextually appropriate. While these are all essential characteristics of a good guideline, whether a guideline is perceived as such is more critical in determining whether a clinician will use it than whether it is objectively so. It is also important to address the unique role and utility of guidelines as compared to other resource and educational materials (i.e. what guidelines are, who they are for, and how to use them). If a written guideline is not distinguished from other written educational resources it will always risk being seen as too simple or lacking authority. Similarly, if training on guidelines does not go beyond skills training to explicitly address how to use the guideline, it is likely to get lost amidst other educational activities and not be translated into guideline use.

Our study revealed higher use of guidelines in institutions where quality improvement activities were established. Quality improvement activities are based on the plan–do–study–act cycle and typically include standard-based audit and feedback, the creation of job aids (e.g. wall charts, checklists), supportive supervision and attention to improving clinical processes. Given that clinicians reported proof of effectiveness as one of the strongest motivators for them to use guidelines, institutionalizing a measurement and feedback process may improve and sustain the use of guidelines (so long as this produces results). Additionally, health-care systems failures were reported as major barriers to guideline use (and quality of care in general) and quality improvement activities provided a way for clinicians to engage in addressing them. Thus, our study supports previous findings that implementing guidelines within a broader quality improvement process is more effective and sustainable (*15,31*).

Finally, the MoPH and professional organizations have an important role in supporting the implementation of guidelines. Formal endorsement of guidelines was a strong determinant of their use in Afghan hospitals, and clinicians were eager to have endorsed national standards. This may provide an opportunity to facilitate guideline development and implementation activities nationally, provide legitimacy to guidelines and related implementation activities, and use credentialing to foster institutional environments that are conducive to guideline implementation.

Conclusions

This exploratory study into the use of paediatric and maternity clinical

guidelines suggests that guidelines are wanted by clinicians, and can be effectively implemented despite Afghanistan's challenging current context. However, attention must be directed towards implementation activities that: promote awareness and access; enhance clinician motivation; and facilitate clinician adherence to guidelines.

Particular interventions to achieve this are identified and may be useful to inform guideline activities in Afghanistan and other low-resource settings. Further studies to develop this guideline implementation framework and to explore the comparative effectiveness and utility of various implementation strategies are needed in other contexts.

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Breast cancer screening programme: experience from Eastern province, Saudi Arabia

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برنامج للتحرّي عن سرطان الثدي: خبرة من المنطقة الشرقية بالمملكة العربية السعودية

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الخلاصة: هناك نقص في برامج التشخيص المبكر لسرطان الثدي في معظم بلدان إقليم شرق المتوسط. وهذه الورقة تستعرض برنامج غير حكومي للتحرِّي أُطلق في أكتوبر/ تشرين الأول من عام 2009 في المنطقة الشرقية من المملكة العربية السعودية، تمت فيه تغطية 14 مركزاً صحياً بواسطة ماكِنتين متنقلتين للتصوير الشعاعي للثدي. وقد عُرض إجراء تحرٍّ سنوي لجميع النساء اللواتي هنّ بأعمار 40 عاماً فما فوق. فتم حتى فبراير/ شباط من عام 2014 فحص ما مجموعه 8061 امرأة، بمعدل إقبال قدره 15.0٪. وكان معدل الاستدعاء 7.9٪. وكان عدد حالات السرطان المكتشفة 47، بمعدل اكتشاف للسرطان قدره 5.83 لكل 1000 امرأة خضعت للتحرّي. وكان 70.2٪ من السرطانات التي اكتشفت بدون كتلة أو كانت الآفات فيها أصغر من 2 سم. وكان متوسط العمر للنساء المصابات بالسرطان 50.4 عاماً (SD = 7.6). وكانت متثابتات التحرّي في هذه الدراسة مترابطة جيداً مع المعايير الدولية. ويرى الباحثون أنه بالرغم من وجود خلافات بشأن التحرّي لسرطان الثدي للجميع، فإن الحاجة تستدعي وجود برنامج وطني للتحرّي عن سرطان الثدي في المملكة العربية السعودية.

ABSTRACT Programmes for early diagnosis of breast cancer are lacking in most countries in the Eastern Mediterranean Region. This paper reviews a nongovernmental screening programme launched in October 2009 in the Eastern Province of Saudi Arabia, in which 14 health centres were covered by 2 mobile mammography machines. Annual screening was offered to all women aged 40 years and above. Up to February 2014 a total of 8061 women were screened, an uptake rate of 15.0%. The recall rate was 7.9%. The number of cancers detected was 47, a cancer detection rate of 5.83 per 1000 women screened; 70.2% of the cancers detected had either no mass or the lesions were smaller than 2 cm. The mean age of women with cancer was 50.4 (SD 7.6) years. The screening parameters of our study correlated well with international standards. Despite the controversies regarding universal breast cancer screening, a national breast cancer screening programme for Saudi Arabia is needed.

Programme de dépistage du cancer du sein : expérience de la province orientale en Arabie saoudite

RÉSUMÉ Les programmes visant à réaliser le diagnostic précoce du cancer du sein sont inexistants dans la plupart des pays de la Région de la Méditerranée orientale. La présente étude examine un programme de dépistage non gouvernemental lancé en octobre 2009 dans la province orientale de l'Arabie saoudite où deux appareils de mammographie mobiles couvraient 14 centres de santé. Un dépistage annuel était proposé à toutes les femmes âgées de 40 ans au plus. Du début du programme à février 2014, un total de 8061 femmes avaient fait l'objet d'un dépistage, soit un taux de participation de 15,0 %. Le taux de rappel était de 7,9 %. Le nombre de cancers dépistés était de 47, soit un taux de dépistage de 5,83 pour 1000 femmes examinées ; 70,2 % des cancers dépistés ne présentaient pas de masse ou avaient des lésions inférieures à deux centimètres. L'âge moyen des femmes atteintes de cancer était de 50,4 ans (E T 7,6 ans). Les paramètres de dépistage de notre étude s'accordaient bien avec les normes internationales. En dépit des controverses concernant le dépistage universel du cancer du sein, un tel programme au niveau national est nécessaire en Arabie saoudite.

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Introduction

Breast cancer is a global health problem. It is the leading cancer in women worldwide, including Saudi Arabia (*1*). There has been a steady increase in the incidence of breast cancer in Saudi Arabia in the last few decades. This is particularly true in the Eastern Province, which has the highest incidence of carcinoma of the breast in the country (*2*). Another major concern is that, in the absence of a national screening programme, combined with a lack of education about cancer prevention and a number of cultural barriers to screening, most of the breast cancer cases in Saudi Arabia present at a more advanced stage than in developed countries (*2*).

Screening programmes are instrumental in reducing breast cancer mortality (*3*). Despite recent controversies regarding the efficacy of universal screening (*4*), mammography screening remains an effective means of early detection of breast cancer. In October 2009 the Saudi Cancer Foundation, which is a nongovernmental charity organization, launched a limited breast cancer screening programme in the Eastern Province of Saudi Arabia which is continuing to date. This paper reviews the scheme and presents some of the results from the first 5 years, focusing on uptake and cancer detection rates.

Methods

This study includes data from October 2009 to February 2014. Approval for this study was obtained from the institutional review board of King Fahd Hospital of the University and University of Dammam.

Pre-screening awareness initiatives

Prior to starting the screening programme multiple public outreach activities were undertaken by female volunteers, who included doctors, nurses and students. Lecturers and interactive sessions about breast cancer awareness and screening were carried out in universities, schools, residential compounds and shopping malls. Information brochures in Arabic and English were also distributed. Similar activities were undertaken by male volunteers. As Saudi Arabian society is deeply patriarchal, it was imperative to educate the male population about the advantages of early detection of breast cancer. These activities were not a one-time effort but continued throughout the year. The Pink Eastern initiative was started to boost awareness about breast cancer and is held in October (every year), which is the breast cancer awareness month.

Setting and systems

Two mobile screening vans were used and were stationed near primary health care centres in the areas covered by the screening programme. Initially, in the year 2009–2010, only 4 centres were covered. However by October 2013, 14 centres were covered by the screening programme (located in Al Khobar, Dammam, Qatif, Al-Ahsa, Abqaiq, Jubail, Ras Tanura, Dhahran, Hafar Al-Batin, Khafji, No'ayriyah, Urayra, Qaisumah and Qarya Al-Olaya). Prior to the arrival of the mobile vans in a particular area, their visit was publicized in the local media.

Participants

All women were self-referred. No formal invitation was given for screening, as this was a nongovernmental initiative. Annual screening was offered to all females aged 40 years and above. No upper limit was set for screening. Women with a strong family history of breast cancer were offered earlier screening, at age 35 years. The exclusion criteria were age less than 35 years, pregnancy, lactation, symptomatic patient, and suspicious findings on clinical examination. Data from all women who enrolled in the screening programme were included in this study. Verbal consent for participation was taken from all of them.

Data collection and screening

Prior to mammogram examination, a detailed history was taken from each woman. The history included demographic data, age of menarche, age at first child and history of breastfeeding. A trained nurse examined the woman and recorded her weight and height. As the vans reached a few remote areas and as the Saudi Cancer Foundation is a charity organization, some symptomatic patients (who did not have access to mammography due to financial or distance constraints) were also imaged. However, the symptomatic patients were excluded from this study. Figure 1 summarizes the work-up plan followed during the screening programme.

The screening vans were equipped with Lorad Selina™ mammography systems (Hologic). Standard full-field digital mammography was done for all women. Standard craniocaudal and mediolateral oblique views of each breast were obtained. Symptomatic women and those with positive findings were referred to breast clinics for diagnostic workup.

All mammograms were read by a senior radiologist with more than 25 years' experience of breast imaging. A random second reading was done by radiologists with breast imaging experience ranging from 3 to 6 years. The standard American College of Radiology (ACR) lexicon and Breast Imaging Reporting and Data System (BI-RADS) categories were used in reporting. In case of a difference in BI-RADS grading, the higher BI-RADS grade was recorded. All mammograms were initially reported as BI-RADS 0 (incomplete), BI-RADS 1 or BI-RADS 2.

Post-screening and follow-up

Women with BI-RADS category 1 and 2 were reassured and were

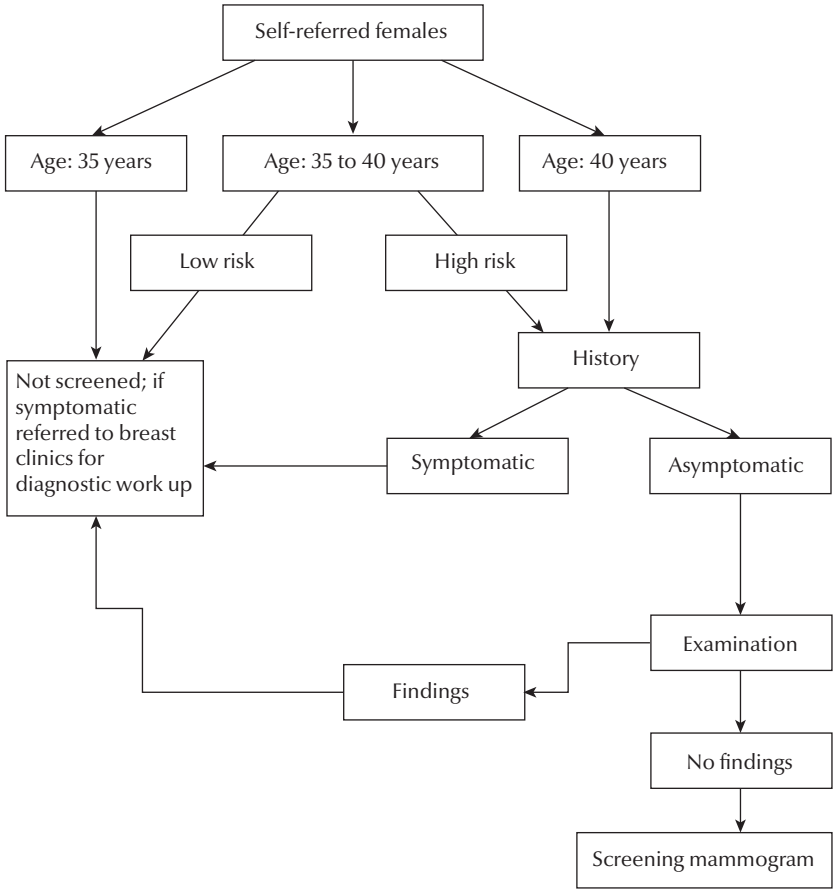

Figure 1 Design of the breast cancer screening programme in the Eastern Province of Saudi Arabia

instructed to do routine annual screening. Those with BI-RADS category 0 were evaluated by additional views and/or ultrasound. Following further evaluation of the BI-RADS 0 cases they were further characterized into BI-RADS 1 to 5. Women with BI-RADS 3 were given short-term follow-up by ultrasound or mammogram as required. Those with BI-RADS 4 and 5 were biopsied either under ultrasound or stereotactic guidance, and also given a surgical consultation.

The follow-up examinations were done mainly in King Fahd Teaching Hospital, Al Khobar (affiliated to the University of Dammam). Some women preferred to be followed up in centres closer to their homes. Further imaging including additional mammographic projections, tomosynthesis, ultrasound evaluation or magnetic resonance imaging. Only 2 cases were diagnosed in other hospitals (Qatif region) and only their final histopathological diagnosis was available in our records. Stereotactic and ultrasound-guided biopsies were also done in King Fahd Teaching Hospital. For stereotactic biopsies, 9 or 12 gauge vacuum-assisted needles were used. For the ultrasound-guided biopsies 12 or 14 gauge needles were used. Figure 2 sums up the algorithm followed in mammogram interpretation.

Results

Screening uptake

The number of females above the age of 40 years in the Eastern Province was 233 695 according to the Central Department of Statistics and Information's Demographic Research Bulletin of 2007. The target population in the areas covered was estimated to be 53 800. The total number of women screened from October 2009 to February 2014 was 8061. The uptake rate of screening was therefore 15.0%. However, if we included symptomatic women and those with findings on clinical examination (n = 1053) the uptake rate became 16.9%. Most of the women (n = 7819) had one screening and only 3.0% (242 women) were given a second screening. Table 1 summarizes the results of the screening programme.

Background characteristics of screened women

The number of Saudi women screened was 6823 (84.6%), while other nationalities were 1238 (15.4%). The age range was 37–78 years, with the mean age being 47.5 (standard deviation 9.4) years. The highest number of women screened was in the age group 41–50 years. Body mass index data were available only for 3948 women. The majority of these women were overweight, obese or morbidly obese (66.5%). A majority (95.5%) of the study women had 1 or more children; only 5.5% of women were nulliparous. The breast density in the majority (77.0%) of the women was predominantly fatty (less than 25% glandular tissue) with only 4.0% having heterogeneously dense or very dense breasts.

Recall rate

A total of 636 women were called for further work-up, and thus the recall rate was 7.9%. The highest number of women recalled was in the age group 41–50 years.

Screening results

Among the recalled women, 63 were advised to have biopsy, resulting in a

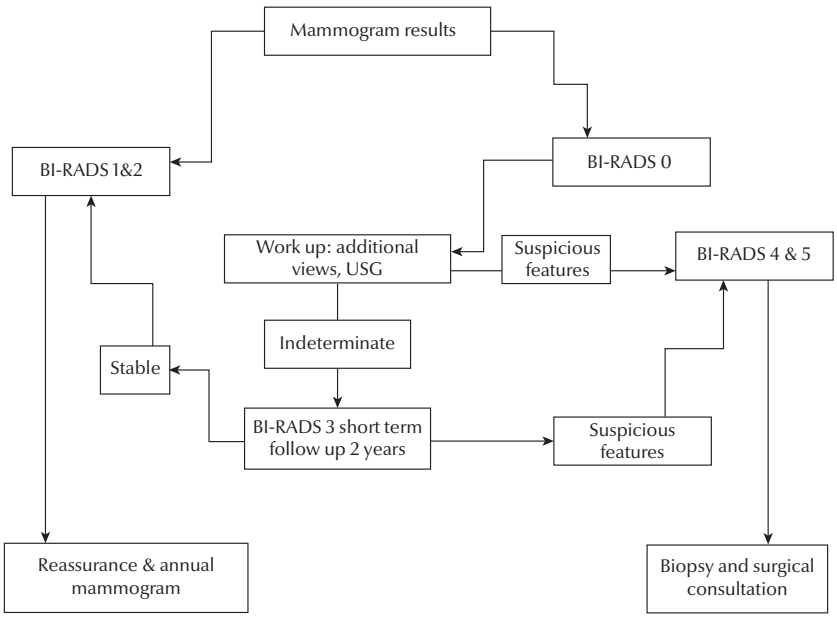

Figure 2 Mammogram interpretation scheme for the breast cancer screening programme in the Eastern Province of Saudi Arabia (BI-RADS = breast imaging-reporting and data system; USG = ultrasonography)

biopsy rate of 10.3% (Table 1). Two cases were diagnosed in another hospital and the nature of their biopsy (surgical or ultrasound guided) is not known. All the remaining biopsies (n = 61) were either ultrasound-guided core biopsies or stereotactic core biopsies. Positive biopsies were obtained in 47 women. The positive biopsy rate was therefore 74.6%. Out of these 47 cases, 46 cases were diagnosed during the first (prevalent) screening and only 1 case was diagnosed on subsequent screening. Of these 39 were Saudi nationals while 8 were of other nationalities.

The size of the lesions ranged from 0.8 × 0.5 cm to 3.5 × 3 cm. In 9 cases no mass was detected. They either had architectural distortion, asymmetrical density or microcalcifications. Ten women had lesions less than 15 mm, while 14 women had lesion between 15 mm to 20 mm and in 14 women the lesions were more than 20 mm. Thus 70.2% of cancer patients had either no mass lesions or lesions smaller than 2 cm.

Table 1 Summary of results of the breast cancer screening programme in the Eastern Province of Saudi Arabia, October 2009 to February 2014

Parameter	Value
No. of women screened	8061
Uptake rate (%)	15.0
No. of women recalled	636
Recall rate (%)	7.9
No. of biopsies done	63
[No. of ultrasound-guided biopsies]	[53]
[No. of stereotactic biopsies]	[8]
No. of benign biopsies	16
No. of cancers detected	47

Table 2 demonstrates the prevalent cancer distribution by age. The mean age of women with cancer was 50.4 (SD 7.6) years; the median age was 50 years. The youngest patient was 38 years old while the oldest was 66 years old. The highest number of cancers was detected in the age group 41–50 years, with 53.2% cancers being detected in this age group.

The commonest location of carcinoma was in the upper outer quadrant. Invasive ductal carcinoma was the commonest carcinoma (37 cases: 78.7%), followed by ductal carcinoma in situ in 7 cases (14.9%). The rest of them were either invasive lobular carcinoma (1 case, 2.1%), lobular carcinoma in situ (1 case, 2.1%) or low-grade papillary carcinoma (1 case, 2.1%).

Cancer detection rate

A total of 47 breast cancer cases were diagnosed by screening 8061 women from October 2009 to February 2014. Thus, the cancer detection rate in our study was 5.83 per 1000 women screened. There were 46 cancers which were prevalent cases detected by screening 7819 women, a cancer detection rate of 5.88 per 1000. Only 1 cancer was detected on subsequent screening in 242 women, a cancer detection rate of 4.13 per 1000 screened.

The results of symptomatic women and those with clinical findings are briefly documented here. A total of 1053 women who attended the screening programme had clinical findings (n = 903) or were symptomatic (n = 78) and were referred for further evaluation. Of these, 72 patients were lost to follow-up and the remaining 981 were studied. The commonest findings/symptoms in this group were as follows: lump in breast (818 cases) followed by nipple discharge (54 cases), skin changes (43 cases), nipple retraction (30 cases), localized breast pain (23 cases) and lump in axilla (13 cases). The most

Table 2 Distribution of prevalent cases of breast cancer by women's age

Age group (years)	No. of women screened	No of cancer cases	Cancer detection rate (per 1000 screened)
35–40	661	3	4.53
41–45	1954	12	6.14
46–50	2012	13	6.46
51–55	1460	8	5.48
56–60	698	4	5.73
61–65	853	5	5.86
≥ 65	181	1	5.52
Total	7819	46	5.88

common age group was 41–50 years. Women with cyclical breast pain were not considered symptomatic. In this group 17 malignancies were detected, 1 of which was Hodgkin lymphoma of the axilla. Therefore, a total of 16 breast cancers were detected in 980 women. This is a cancer detection rate of 16.3 per 1000 women with symptoms or clinical findings, which is almost 3 times the detection rate in asymptomatic patients. Four cancers were detected in the symptomatic women, with a cancer detection rate of 51.5 per 1000. A detailed analysis and discussion of patients with findings/symptomatic patients is beyond the scope of this article. Tables 3 and 4 provide a brief summary of findings in this group.

Discussion

Despite recent controversies regarding the efficacy of mammography screening in the reduction of mortality from breast cancer (*4*), mammography remains the mainstay for the early diagnosis of breast cancer (*3*). The World Health Organization in its report for the Eastern Mediterranean Region (EMR) has stressed early diagnosis to prevent breast cancer mortality (*5*). Unfortunately, a formal national screening programme is lacking most countries of the EMR.

The Eastern Province of Saudi Arabia has experienced an rise in the number of breast cancer cases. The province has the highest number of newly diagnosed breast cancer cases compared with other regions of the country, an age-standardized rate of 33.1 per 100 000. Most of the breast cancer cases in Saudi Arabia present late, at stages 3 or 4 (*2*). As such, there is an urgent need for prevention and early diagnosis of this disease. Considering these factors, the Saudi Cancer Foundation, a nongovernmental organization, started the pilot screening programme described here in October 2009.

Table 3 Carcinomas detected in women who were symptomatic or had positive clinical findings by age group

Age group (years)	No. of women screened	No. of cancers	Types of carcinoma
≤ 40	38	1	Invasive ductal carcinoma
41–50	696	11	Invasive ductal carcinoma, invasive lobular carcinoma, ductal carcinoma in situ
51–60	232	3	Invasive ductal carcinoma
≥ 61	15	2	Invasive ductal carcinoma, Hodgkin lymphoma

The national breast cancer screening policy of Saudi Arabia is still being formulated, and so the age at which mammographic screening should start in our country remains a grey area. The Saudi Cancer Registry in 2009 and 2011 reported that the median age of breast cancer cases in Saudi Arabia was 48 years (*2*). Our scheme therefore offered screening to all women aged 40 years or above, in keeping with the ACR and American Cancer Society recommendations (*6,7*). Both of these advocate screening mammography for the general population after the age of 40 years. In contrast, the National Health Service (NHS) in the United Kingdom (UK) offers screening mammography to the general population only after the age of 50 years (*8*). A pilot screening programme in Qasim region of Saudi Arabia offered screening to women aged 35–60 years. In another screening study in Riyadh, the age at which screening started was not specified; however, the age of their study women ranged from 19–91 years (*9*).

The uptake rate of screening in our study was only 15.0%, which much lower than the international standards of 75% (*8,10*). However, it was similar to that reported by Akhtar et al. in a pilot screening study undertaken in Qasim region of Saudi Arabia which showed an uptake rate of 17.9% (*11*). A variety of sociocultural factors may be responsible for the low uptake. Saudi Arabian society is patriarchal and conservative, making it is difficult for women to discuss issues related to breast cancer. Restrictions in travelling alone and lack of public transport hamper the ability of women to attend for screening. Many women are reluctance to disclose this to their male guardians. Furthermore, Ravichandran et al. reported that knowledge about breast cancer was very low in

Table 4 Distribution of breast cancers in women who were symptomatic or had positive clinical findings

Symptom	Diagnoses (other than carcinoma, in order of frequency	No. of carcinomas	Types of carcinoma
Lump in breast	Simple cysts Fibroadenoma Focal fibrocystic change Hamartoma	10	Invasive ductal carcinoma, invasive lobular carcinoma
Nipple discharge	Simple duct ectasia Papillomas Mastitis	1	Ductal carcinoma in situ
Skin changes	Dermatitis Mastitis Sebaceous cysts	2	Invasive ductal carcinoma (inflammatory carcinomas)
Nipple retraction	Mastitis Duct ectasia	3	Invasive ductal carcinoma, invasive lobular carcinoma
Localized breast pain	Simple cysts Focal fibrocystic changes	0	–
Lump in axilla	Reactive lymphadenopathy Accessory breast	1	Hodgkin lymphoma

the Saudi Arabian female population (*12*); 69.7% of women surveyed were not aware of breast self-examination, only 14.2% had had a clinical breast examination and only 8.1% had had a mammogram. Al Mulhim et al., in a study among female schoolteachers in the Eastern Province, concluded that even educated women had deficient knowledge about screening mammography (*13*).

Knowledge about breast cancer early detection and screening mammography is also lacking among physicians in Saudi Arabia. Al-Amoudi et al. reported that only 11.3% of primary health care (PHC) physicians had done breast examination in routine physical examinations of their patients and that mammograms requested by women above 40 years of age were performed in only 34% of cases (*14*). The uptake rate in any screening programme will depend on the target population's awareness about it. The PHC physician is a very important source of information in this regard. Greater efforts are needed to increase knowledge about breast cancer early detection at the level of PHC providers in particular and the target population in general.

Another important factor that could be responsible for the low uptake rate in our programme was that no formal invitation to screening could be issued as this was a nongovernmental initiative. This is in contrast to the screening programmes in the UK and other European countries, which are state-sponsored.

As 97% of the women in the study came for initial screening, our study may be regarded as a prevalent disease screening. The recall rate for our study was 7.9%. This is comparable to international standards. The European Union recommends a recall rate of 7% or less for prevalent screening and 5% or less for subsequent screening (*10*). In practice, however, recall rates vary greatly even in developed countries. A comparative study of international screening programmes in 2004 found that the recall rate at the initial or prevalent screen varied from 1.4% in the Netherlands to 15.1% in the United States of America (*15*). A similar review of European screening programmes found that recall rates in European screening programmes varied from 1.3% to 18.4% (*16*). The UK NHS reported a recall rate of 8.6% for the initial screen in its annual report of 2008 (*7*). This is comparable to our study.

Akhtar et al. reported a high recall rate of 31.6% in their pilot programme in Saudi Arabia (*11*). They believed that low-volume readings by radiologists and fear of malpractice litigations were the main causes of the high recall rate. Another study in the Riyadh region did not disclose the recall rate (*9*). However, they recalled 10.9% of even BI-RADS 1 and 2 mammograms due to dense breasts, so their true recall rate is likely to be high. In contrast, the recall rate in our study is comparable to international standards. This is because standard digital mammography machines were used and all cases were read by a highly experienced radiologist with more than 25 years' experience in mammography, the technical staff were well trained and random double-reading was used.

The benign biopsy rate per 1000 patients screened in our study was 1.98, which is less than the recommended 3.6 (*8*). Akhtar et al. reported a high benign biopsy rate of 12.3. The UK NHS in 2008 had a benign biopsy rate in the initial screening of 2 (*8*).

The mean age of our breast cancer patients was 50.4 (SD 7.6) years and

Table 5 Comparison of study parameters with other breast cancer screening programmes and international standards

Parameter	Present study (Saudi Arabia)	Akhtar et al. (Saudi Arabia) (*11*)	NHS (United Kingdom) 2008 (*8*)	United Kingdom standards (*8*)
Uptake (%)	15.0	17.9	69.5	≥ 70.0
Recall rate (%)	7.9	31.6	8.6	< 10.0
Biopsy rate (%)	0.8	1.5		
Biopsy rate in recalled women (%)	9.9	4.9		
Benign biopsy rate (per 1000)	2.0	12.3	2.0	≤ 3.6
Cancer detection rate (per 1000)	5.9	2.5	7.7	≥ 3.1
Non-operative detection rate for cancers (%)	95.7	–	80.0	≥ 80.0
No. of ductal carcinomas in situ /1000 screened	0.9	0.6	2.2	≥ 0.4

NHS = National Health Service.

the median age was 50 years with a range of 38–66 years. According to the Saudi Cancer Registry the median age for breast cancer was 48 years in 2011 (*2*). Our findings correlate well with the national figures. Just over half of cancers in our study (53.2%) were found in the age group 41–50 years and the highest cancer detection rate of 6.46 per 1000 screened was found in the age group 46–50 years. The UK Cancer Research Organization reported that nearly half (47%) of female breast cancer cases were diagnosed in the 50–69 age group (*17*). Our study confirms the finding that breast cancer occurs a decade earlier in the EMR population as compared with European/North American populations. This strengthens the argument for starting screening programmes in the EMR at 40 years instead of 50 years as done in European countries.

A majority of the cancers detected in the screening programme (78.7%) were invasive ductal carcinomas. The number of ductal carcinomas in situ detected in our study was 14.9%. This correlates well with the UK NHS study (*8*). Table 5 compares the salient parameters of our screening programme with the UK statistics (*8*), Akhtar et al.'s study (*11*) and the recommended UK standards.

The rate of screen-detected carcinomas in our study was 5.9 per 100 patients screened at the initial screen. This figure is high compared with that reported by Akhtar et al. in Saudi Arabia (*11*). Among international studies the cancer detection rates vary from 3.7 to 10.6 per 1000 at the initial screen (*15*). The UK reported a screen detected carcinoma rate of 8.3 per 1000 screened in 2012–13 (*18*). Other countries in Europe have reported much lower cancer detection rates, e.g. 3.7 per 1000 screened in Finland and 3.6 per 1000 screened in Hungary (*19,20*). A similar study in Egypt had a cancer detection rate of 4.3 per 1000, which is comparable to our study (*21*).

The rate of screen-detected cancer in our study is high when we consider the lower prevalence of breast cancer in Saudi Arabia as compared with developed countries. The reasons for this could include the fact that most our study population was urban. The rate of obesity was also quite high in the study group. Screening was offered to all nationalities, and some of the nationalities screened (e.g. Pakistani) have a high incidence of breast cancer which is similar to that of more developed nations. Due to advance publicity our study population may have included women who were in a higher risk group. It will be interesting to evaluate the causes of the high cancer detection rate in a further study.

A high proportion of cancers detected in our study (70.2%) had either no mass or were smaller than 2 cm. The exact benefits accrued by early detection of these cancers will require long-term follow-up and further research. In general, early detection of cancer in other studies has been associated with reductions in morbidity and mortality (*3,8*). The benefit of universal mammography screening, however, remains a hotly debated topic. Miller et al. have questioned the role of mammography in reduction of breast cancer mortality (*4*). However, Otto et al., in a case–control study in 2012 in the Netherlands, concluded that "women who receive at least three screening mammograms have a 49% lower risk of dying from breast cancer" (*22*). Pace et al., in a systematic review of mammography from 1964–2014, found that "mammography screening is associated with a 19% overall reduction of breast cancer mortality" (*23*). They also stated that over-diagnosis is an important limitation of screening programmes and that further research needs to be done to limit it. The NHS report of 2008 however estimated that 1400 lives were saved annually in the UK as a result of mammographic screening (*8*).

The preliminary results of our screening programme are very encouraging. Most of the parameters in our study, except for the uptake rate, are comparable to the international standards. The low uptake emphasizes that we need more public awareness programmes to educate people about breast cancer and its early detection. Our finding that 70.2% of cancers detected had either no mass or were smaller than 2 cm highlights the fact that screening detects breast cancer early, at a stage when it can be cured. Introduction of a national breast cancer screening programme in Saudi Arabia needs to be considered.

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Risky road-use behaviour among students at the University of Benha, Egypt

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السلوك الخطر في استخدام الطرق بين الطلاب في جامعة بنها بمصر

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الخلاصـــة: تسبب إصابات حوادث الطرق 45٪ من الوفيات الناجمة عن مجمل الإصابات في مصر. وقد كان الهدف من هذه الدراسة المقطعية التعرف وتقصّي السلوكيات الخطرة المتعلقة باستخدام الطرق بين طلاب الجامعة في بنها. فتم ملء استبيان ذاتي من قِبل 953 طالباً. أفاد 19.3٪ من المستطلَعين بأنهم لا يلتزمون بقواعد السلامة المرورية للمشاة، في حين أن 39.4٪ من قائدي السيارات بينهم لم يكن لديهم رخصة قيادة، و44.5٪ ليسوا من مستخدمي حزام الأمان، و63.5٪ كانوا يتجاوزون حدود السرعة القانونية. وفي تحليل التحوّف اللوجستي المزدوج كان تعاطي المخدرات (OR 18.3؛ 95٪ CI: 9.10-23.3) ووجود أقران ذوي سلوكيات مماثلة (OR 2.53؛ 96٪ CI: 1.15–5.55) ينبئ بشكل كبير عن عدم اتباع قواعد السلامة المرورية كمشاة. وكان تجاوز الحدود القانونية للسرعة المرورية كسائقين مرتبطاً بشكل كبير بالجنس الذكري (OR 5.13؛ 95٪ CI: 1.98-13.3) وبضغط الأقران (OR 8.70؛ 95٪ CI: 3.90–17.1) وبتعاطي المخدرات (OR 3.30؛ 95٪ CI: 1.58–13.7). إن السلوكيات غير الآمنة في استخدام الطرق - والتي يمكن أن تتسبب في إصابات غير متعمدة - منتشرة بين طلاب جامعة بنها. هناك حاجة لندوات التثقيف الصحي والدورات التدريبية التي تدعو للسلوكيات الصحيحة للطريق.

ABSTRACT Road traffic injuries constitute 45% of deaths due to injury in Egypt. The aim of this cross-sectional study was to identify and investigate risky behaviours regarding road use among university students in Benha. A self-administered questionnaire was completed by 953 students. Of the respondents 19.3% reported not complying with pedestrian road traffic safety rules, while among drivers, 39.4% had no driving licence, 44.5% did not use a seat-belt and 63.5% exceeded the legal speed limits. In binary logistic regression analysis, substance use (OR 18.3; 95% CI: 9.10–23.3) and having peers with similar behaviours (OR 2.53; 96% CI: 1.15–5.55) were significant predictors of not following road traffic safety rules as a pedestrian. Exceeding the legal traffic speed limits as a driver was significantly associated with male sex (OR 5.13; 95% CI: 1.98–13.3), peer pressure (OR 8.70; 95% CI: 3.90–17.1) and substance use (OR 3.30; 95% CI: 1.58–13.7). Unsafe road-use behaviours that may cause unintentional injuries are prevalent among University of Benha students. Health education sessions and training courses for students on appropriate road behaviours may be warranted.

Comportement routier à risque chez des étudiants de l'Université de Benha (Égypte)

RÉSUMÉ Les traumatismes dus aux accidents de la circulation sont responsables de 45 % des décès causés par des traumatismes en Égypte. L'objectif de la présente étude transversale était d'identifier et d'analyser les comportements à risque sur la route chez des étudiants de l'Université de Benha. Un autoquestionnaire a été rempli par 953 étudiants. Parmi les répondants, 19,3 % ont déclaré ne pas respecter les règles de sécurité de la circulation routière pour les piétons, tandis que 39,4 % des conducteurs n'étaient pas titulaires d'un permis de conduire ; 44,5 % ne portaient pas leur ceinture de sécurité et 63,5 % ne respectaient pas les limitations de vitesse légales. À l'analyse de régression logistique binaire, consommer des substances psychoactives (OR 18,3 ; IC à 95 % : 9,10–23,3) et avoir des pairs adoptant des comportements similaires (OR 2,53 ; IC à 96 % : 1,15–5,55) étaient des facteurs prédictifs importants de non-respect des règles de sécurité routière en tant que piéton. Le dépassement de la vitesse autorisée par le conducteur était fortement associé au sexe masculin (OR 5,13 ; IC à 95 % : 1,98–13,3), à la pression exercée par des pairs (OR 8,70 ; IC à 95 % : 3,90–17,1) et à l'usage de substances psychoactives (OR 3,30 ; IC à 95 % : 1,58–13,7). Les comportements à risque des usagers de la route susceptibles de causer des traumatismes non intentionnels sont répandus chez les étudiants de l'Unitversité de Benha. Des cours de formation et des séances d'éducation sanitaire destinés aux étudiants et consacrés aux comportements adéquats sur la route pourraient être justifiés.

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Introduction

Nearly 1 in 5 people living in the WHO Eastern Mediterranean Region are between the ages of 15 and 24 years. This is a period of transition from the dependence of childhood to the independence of adulthood and is a period during which a number of social, economic, biological and demographic events occur. As the average number of years spent in education increases and marriage is delayed, the transition to adulthood extends over a longer period of time, making adolescence an increasingly important stage for attention by policy-makers (*1*). This period is characterized by high-risk behaviours that can have adverse effects on the overall development and well-being of youth, or that might prevent them from future success and development (*2*). Risky behaviour concerning road use is among the most important youth-related high-risk behaviour.

Road traffic injuries cause an estimated 700 deaths among young people every day (*3*) and constitute 45% of mortalities due to injuries in Egypt. Three-quarters (75%) of these injuries are pedestrian-related (*4*). Traffic-related injuries also include those sustained while walking, riding a bicycle or riding a motorcycle (*5*). Traditionally, research on road traffic injuries has focused on the traffic environment and the vehicles (*6*). Little attention has been given to risky behaviours towards road use and road safety among pedestrians (*7*).

Although college students engage in behaviours that threaten both their current and future health, and almost all these risky behaviours are preventable (*8*), data on road-risk behaviours among university students in Egypt are lacking. It is necessary to collect baseline information about the magnitude of the problem so that intervention programmes can be planned and targeted on those students to raise their awareness towards risky behaviours (*9*). The objectives of this study were to identify and measure the prevalence of some road traffic risky behaviours among University of Benha students and to investigate some of the factors underlying these behaviours.

Methods

This cross-sectional study was carried out among University of Benha students. The fieldwork was conducted during the 2nd term of the academic year 2011–2012.

Sampling

Multistage, stratified sampling was used to select the participants. Initially 3 colleges—2 practical-based (Faculty of Medicine and Faculty of Science) and 1 theoretical-based (Faculty of Commerce)—were chosen by simple random sampling from among 15 colleges in the University of Benha. Each college's population was divided into strata (grades) and then 1 section from each grade was chosen by simple random sampling, except for the 4th grade of the Faculty of Commerce for which a speciality was chosen because the population in this grade presented as specialities not sections.

A questionnaire was distributed to 1121 students (672 from the practical-based colleges and 449 from the theoretical-based one) and completed by 953 (a response rate of 85%).

Data collection

A structured, self-administered, anonymous questionnaire in Arabic language was used to collect the data. The questionnaire was adopted and modified from a previously designed questionnaire (*10*) and was revised by 3 academic professors to assess its content and construct validity. The questionnaire included items about the students' personal and sociodemographic data, relationship with their parents (defined as bad if characterized by tension, arguments all the time and/or no discussions), relationships with friends (defined as bad if characterized by tension and/or violence, either verbal or physical) and religious commitment (regular attendance at the mosque or church to pray). The questionnaire asked about road use behaviours as a pedestrian (following the pedestrian road safety rules, and substance use) and as a driver (possession of a driver's licence, using a seat-belt, obeying the speed limits on roads, and using alcohol while driving). The questionnaire also included a question about having suffered any pedestrian road accident injury in the previous 6 months.

The students' compliance with pedestrian road safety rules was evaluated by 4 items: looking both ways before crossing the road, waiting for the green traffic signal before crossing the road, walking in the road, and walking down an unsafe sidewalk. The participants indicated the frequency of performing these behaviours on a 5-point Likert scale ranging from 1 ("never") to 5 ("always") (*11*). These responses were then grouped and analysed dichotomously as "always" for road crossing and "never" for road walking behaviours, versus all other responses. We defined safe behaviour on the roads as always looking both ways or always waiting for a green traffic signal before crossing the road, and as never walking in the road (*4*). Then a summary score was calculated for this variable, with 1 point awarded for each of the 4 risk behaviours (not always looking both ways before crossing the street; not always waiting for green signal to cross; ever walking in the road; ever walking on an unsafe). Scores from 1 to 4 indicated unsafe behaviour and were considered "not following the road safety rules", while a score of 0 indicated "following the road safety rules".

Students who were drivers were asked about using a seat-belt while driving, obeying the legal traffic speed limit, and substance/alcohol use while driving. This was evaluated in the same manner, using "never" as safe behaviour

for substance and alcohol abuse and "always" for seat-belt use and obeying the legal speed. Possessing a driver's licence was evaluated as "yes/no". To enhance the accuracy of answers about the items on substance and alcohol use, the questionnaire was completed anonymously and the students were assured that all data would be treated in confidence.

The applicability, content and face validity of the questionnaire were tested through a pilot study carried out during the latter half of February 2012 on 50 students chosen randomly from the Faculty of Medicine. The required modifications were done. The results of the pilot study were not included in this work.

Ethical considerations

A written informed consent (in Arabic language) was obtained from all students before participation; this included data about the aims, design, site, timing, subjects and tools of the study. They were informed that all collected data would be confidential and used only for scientific purposes. They were informed also that no invasive or painful techniques would be involved. Approval was obtained from the research ethics committee in University of Benha Faculty of Medicine and from the dean of the faculties and the vice-president for education affairs of the University.

Statistical analysis

The collected data were tabulated and analysed using *SPSS*, version 16 software. Qualitative data were expressed as frequencies and percentages, while quantitative variables were presented as mean and standard deviation (SD). Chi-squared or Fisher exact tests were used as tests of significance. Odds ratios (OR) and the corresponding 95% confidence intervals (CI) were calculated. Binary logistic regression analysis (logit model, enter method) was used to detect the significant predictors of road-risky behaviours. A 2-sided *P*-value < 0.05 was considered significant.

Results

Sociodemographic characteristics of the studied students

The mean age of the 953 respondents was 20.3 (SD 1.4) years and 25.8% were aged < 20 years; 62.1% were females, 57.6% were from rural areas and 61.7% of them studied in the medical or science colleges. Junior students constituted 35.6% of the sample while 64.4% were seniors. The great majority of the students (93.6%) were living with their families and 50.6% of them reported having a "bad" relationship with their parents. On the other hand, 97.1% of them had "good" relationships with their friends and 47.7% had a religious commitment (Table 1).

Road-risk behaviours among the studied students

The responses revealed that 19.3% of the surveyed students did not follow the pedestrian road traffic safety rules (i.e. they neglected 1 or more of the 4 rules). The great majority of them (94.8%) reported that they did not use alcohol or other substances. The results also showed that 26.7% of the studied

Table 1 Frequency distribution of the studied students according to some sociodemographic characteristics (*n* = 953)

Sociodemographic characteristics	No.	%
Age (years)		
< 20	246	25.8
≥ 20	707	74.2
Sex		
Male	361	37.9
Female	592	62.1
College type		
Commerce	365	38.3
Medical/Science	588	61.7
Grade		
Junior[a]	339	35.6
Senior	614	64.4
Residence		
Rural	549	57.6
Urban	404	42.4
Place of living		
With family	892	93.6
Away from family[b]	61	6.4
Student–parent relationship		
Good	471	49.4
Bad	482	50.6
Relationship with friends		
Good	922	97.1
Bad	28	2.9
Religious commitment		
Yes	455	47.7
No	498	52.3

[a]Juniors: years 1–3; [b]Student hostel, living with friends, private flat.

Table 2 Frequency distribution of the studied students according to their self-reported risky behaviours concerning road use when they were pedestrians and when driving a vehicle

Variable	No.	%
All respondents (*n* = 953)		
Non-compliant with pedestrian road safety rules [a]		
Yes	184	19.3
No	769	80.7
Substance use		
Alcohol	5	0.5
Other[b]	45	4.7
None	903	94.8
Drivers (*n* = 137)		
Have driving licence		
Yes	83	60.6
No	54	39.4
Use seat-belt		
Yes	76	55.5
No	61	44.5
Obey speed limits		
Yes	50	36.5
No	87	63.5
Substance use when driving		
Alcohol	4	2.9
Other[b]	26	19.0
None	107	78.1

[a]*Non-compliance with any of the 4 rules: always looking both ways before crossing the street; always waiting for green signal to cross; never walking in the road; or never walking in the sidewalk;* [b]*Marijuana, hashish.*

students had been exposed to road injury in the previous 6 months.

A total of 137 students (14.4%) were drivers (either car owners or not); 54 of them (39.4%) reported having no driving licence, 61 (44.5%) did not use a seat-belt while driving, 87 (63.5%) admitted that they did not obey the traffic speed limits and 2.9% of them used alcohol when driving (Table 2).

Factors affecting road-risk behaviours among the studied students

When we analysed the factors associated with not following pedestrian road safety rules we found a significant relationship with age, peer-group behaviour, substance use and family influences ($P < 0.05$). Students who did not follow traffic rules were more likely to be ≥ 20 years old, have friends with similar behaviour, be substance users and to live away from their family (ORs 1.07, 2.8, 33.2 and 1.83 respectively) (Table 3). After binary logistic regression, however, peers with similar behaviours (OR 2.53; 96% CI: 1.15–5.55; $P = 0.021$) and substance use (OR 18.3 95% CI: 9.10–23.3; $P < 0.001$) were the only significant predictors of not following the pedestrian traffic safety rules (Table 4).

Analysing road safety precautions among the subset of students who drove a car we found that there was no significant association of reported seat-belt use with age, sex, residence, college, grade, place of living, relationship with parents, peer-group behaviour, religious commitment or substance use (all $P > 0.05$) (Table 5). However, among students who reported exceeding the speed limit there was a significant association with male sex, peer pressure and substance use (all $P < 0.05$) (Table 6). Students who exceeded the speed limits when driving were more likely to be males, have peers with similar behaviours and be substance users. In binary logistic regression analysis male sex (OR 5.13; 95% CI: 1.98–13.3; $P < 0.001$), peer-group behaviour (OR 8.70; 95% CI: 3.90–17.1; $P < 0.001$) and substance use (OR 3.30; 95% CI: 1.58–13.7; $P = 0.01$) remained as significant predictors of exceeding the speed limit (Table 7).

Discussion

Young people have specific health and development needs and face many challenges that hinder their well-being (3). The current study identified some risky behaviours concerning road use among the studied university students; 19.3% of them had at least 1 of the 4 risky behaviours related to pedestrian road use rules (not always looking both ways before crossing the street, not always waiting for green signal to cross, ever walking in the road and ever walking in the sidewalk). Similar findings were reported in a cross-sectional study of health-risk behaviour related to road safety among adolescent students in south Delhi which found that 29.8% of the studied students always/mostly/sometimes disobeyed traffic rules (*12*).

This study revealed that 26.7% of the studied students had been exposed to road injury in the past 6 months. This agrees with Ibrahim et al., who conducted a cross-sectional survey among Ain Shams University students in Cairo, Egypt, to study the risk perception and pedestrian injuries. They found that 21.9% of the participants had suffered from a pedestrian injury and that inappropriate road behaviours by youths were significantly associated with pedestrian traffic injuries (*4*).

This study demonstrated that 5.2% of the students reported using

Table 3 Sociodemographic characteristics of the students according to self-reported risky behaviour in terms of non-compliance with pedestrian road safety traffic rules (*n* = 953)

Sociodemographic characteristics	Non-compliant with road safety rules[a]				*P*-value	OR (95% CI)
	Yes (*n* = 184)		No (*n* = 769)			
	No.	%	No.	%		
Age (years)						
< 20	37	20.1	209	27.2	0.049	1.48 (1.00–2.19)
≥ 20 (ref.)	147	79.9	560	72.8		
Sex						
Male	80	43.5	281	36.5	0.081	0.75 (0.54–1.04)
Female (ref.)	104	56.5	488	63.5		
Residence						
Rural	103	56.0	446	58.0	0.619	1.08 (0.79–1.50)
Urban (ref.)	81	44.0	323	42.0		
College type						
Commerce	79	42.9	286	37.2	0.150	0.79 (0.57–1.09)
Medical/Science (ref.)	105	57.1	483	62.8		
Grade						
Junior	68	37.0	271	35.2	0.662	1.08 (0.77–1.50)
Senior (ref.)	116	63.0	498	64.8		
Place of living						
With family	166	92.2	726	94.4	0.039	1.83 (1.03–3.26)
Away from family (ref.)	18	7.8	43	5.6		
Student–parent relationship						
Bad (ref.)	98	53.3	384	49.9	0.418	1.14 (0.83–1.58)
Good	86	46.7	385	50.1		
Peers always disobey traffic rules						
Yes (ref.)	11	6.0	17	2.2	0.007	2.80 (1.29–6.09)
No	173	94.0	752	97.8		
Religious commitment						
Yes	85	46.2	370	48.1	0.640	1.08 (0.78–1.49)
No (ref.)	99	53.8	399	51.9		
Substance use						
Yes (ref.)	43	23.4	7	0.9	< 0.001	33.2 (14.6–75.3)
No	141	76.6	762	91.1		

[a]*Non-compliance with any of the 4 rules: always looking both ways before crossing the street; always waiting for green signal to cross; never walking in the road; or never walking in the sidewalk.*
(ref.) = reference category.
OR = odds ratio; CI = Confidence interval

alcohol and other substances. This is a low figure, but is similar to that reported in Egypt in 2005 by Abd El Rahim, whereby a minority of the student population drank alcohol (5.4%) and used marijuana (3.1%) (*9*). On the other hand, the reported rates published by the Youth Health Risk Behaviour Surveillance Survey in the United States (US) in 2011 were considerably higher; 38.7% of students nationwide had had at least one drink of alcohol on at least 1 day during the 30 days before the survey and 39.9% of students had used marijuana one or more times during their life (*13*). Such a big gap observed between values in the US and those of Egypt could be explained by the cultural, social and religious differences between the societies. Despite the relatively small number of users in our study, alcohol use was found to be significantly associated with and a significant predictor of violation of pedestrian road safety rules and exceeding the legal speed when driving. This variable was also found to be directly

Table 4 Predictors of students' risky behaviour regarding non-compliance with pedestrian road safety traffic rules (*n* = 953)

Variable	Non-compliant with road safety rules[a] OR (95% CI)	*P*-value
Age (≥ 20 years)	1.13 (0.99–1.29)	0.061
Sex (female)	0.76 (0.54–1.08)	0.126
Residence (urban)	1.22 (0.80–1.57)	0.497
College type (practical)	0.83 (0.58–1.19)	0.312
Grade (senior)	0.75 (0.51–1.10)	0.137
Relationship with parents (bad)	1.02 (0.98–1.48)	0.081
Place of living (with family)	0.94 (0.67–1.32)	0.726
Peers always disobey traffic rules (yes)	2.53 (1.15–5.55)	0.021
Religious commitment (no)	1.15 (0.81–1.61)	0.433
Substance use (yes)	18.3 (9.10–23.3)	< 0.001

[a]*Non-compliance with any of the 4 rules: always looking both ways before crossing the street; always waiting for green signal to cross; never walking in the road; never walking on the sidewalk.*
OR = odds ratio; CI = confidence interval.

Table 5 Sociodemographic characteristics of students according to self-reported risky behaviour in not wearing a seat-belt when driving (drivers only, *n* =137)

Sociodemographic characteristics	Not wearing seat-belt				*P*-value	OR (95% CI)
	Yes (*n* = 61)		No (*n* = 76)			
	No.	%	No	%		
Age (years)						
< 20 (ref.)	11	18.0	13	17.1	0.887	1.07 (0.44–2.58)
≥ 20	50	82.0	63	82.9		
Sex						
Male	45	73.8	58	76.3	0.732	1.15 (0.53–2.49)
Female (ref.)	16	26.2	18	23.7		
Residence						
Rural	25	41.0	32	42.1	0.895	0.96 (0.48–1.89)
Urban (ref.)	36	59.0	44	57.9		
College type						
Commerce	23	37.7	35	46.1	0.326	1.41 (0.71–2.80)
Medical/Science (ref.)	38	62.3	41	53.9		
Grade						
Junior (ref.)	24	39.3	28	36.8	0.764	1.11 (0.56–2.23)
Senior	37	60.7	48	63.2		
Place of living						
With family	56	91.8	70	92.1	0.95	1.04 (0.30–3.59)
Away from family (ref.)	5	8.2	6	7.9		
Student–parent relationship						
Good	29	47.5	39	51.3	0.66	1.16 (0.59–2.28)
Bad (ref.)	32	52.5	37	48.7		
Peers neglect seat-belt use						
Yes (ref.)	53	86.9	65	85.3	0.82	1.12 (0.42–2.99)
No	8	13.1	11	14.5		
Religious commitment						
Yes (ref.)	32	52.5	33	43.4	0.29	1.44 (0.73–2.83)
No	29	47.5	43	56.6		
Substance use						
Yes (ref.)	18	29.5	12	15.8	0.057	2.23 (0.98–5.10)
No	43	70.5	64	84.2		

(ref.) = reference group; OR = odds ratio; CI = confidence interval.

implicated in road traffic accidents in India (*12*).

This study showed that among the 14.4% of students who were car drivers, 39.4% admitted to not having a driving licence, 44.5% to not using a seat-belt and 63.5% to not always obeying the speed limits on the roads. Although we did not investigate students' socioeconomic status, this finding could reflect the effect of social class on road-risk behaviours, as those who drove a car were mostly car owners and were likely to be of a higher socioeconomic status.

The percentage of student drivers who reported that they did not use seat-belts in this study was high in comparison with the results obtained by the National College Health Risk Behaviour Survey in the US performed on 4609 undergraduate college students from public and private universities in 2003, in which only 10.2% did not use a seat-belt when driving (*14*). This difference could be due to differences in culturally determined attitudes to risk-taking between the countries and also to the lack of application of existing traffic laws in Egypt.

The present study showed that sex was not an important factor in neglecting to use a seat-belt. This was clear in a study performed on private university students in Egypt which showed that the percentage of male students who did not use a seat-belt was comparable to that of female students (*9*). This could be explained by the lack of strict application of legislation in Egypt to prevent these risky behaviours.

The current study showed that there was no significant difference in the percentage of students in commerce- or

Table 6 Sociodemographic characteristics of students according to self-reported risky behaviour in exceeding traffic speed limits when driving (drivers only, *n* =137)

Demographic characteristics	Exceeding traffic speed limits				*P*-value	OR (95% CI)
	Yes (*n* = 87)		No (*n* = 50)			
	No.	%	No.	%		
Age (years)						
< 20	12	13.8	12	24.0	0.13	1.97 (0.81–4.80)
≥ 20 (ref.)	75	86.2	38	76.0		
Sex						
Male (ref.)	75	86.2	28	56.0	< 0.001	4.90 (2.15–11.2)
Female	12	13.8	22	44.0		
Residence						
Rural (ref.)	36	41.4	21	42.0	0.943	0.98 (0.48–1.97)
Urban	51	58.6	29	58.0		
College type						
Theoretical	33	37.9	25	50.0	0.169	1.64 (0.81–3.30)
Practical (ref.)	54	62.1	25	50.0		
Grade						
Junior (ref.)	32	36.8	20	40.0	0.709	0.87 (0.43–1.78)
Senior	55	63.2	30	60.0		
Place of living						
With family	77	88.5	49	98.0	0.082	6.36 (0.79–51.3)
Away from family (ref.)	10	11.5	1	2.0		
Student–parent relationship						
Good	44	50.6	24	48.0	0.772	0.90 (0.45–1.81)
Bad (ref.)	43	49.4	26	52.0		
Peers exceed speed limits						
Yes (ref.)	73	83.9	17	34.0	< 0.001	10.1 (4.47–22.9)
No	14	16.1	33	66.0		
Religious commitment						
Yes	48	55.2	20	40.0	0.087	0.54 (0.27–1.10)
No (ref.)	39	44.8	30	60.0		
Substance use						
Yes (ref.)	26	29.9	4	8.0	0.005	4.90 (1.60–15.0)
No	61	70.1	46	92.0		

(ref.) = reference group; OR = odds ratio; CI = confidence interval.

Table 7 Predictors of students' self-reported behaviour in exceeding traffic speed limits (drivers only, *n* =137)

Variable	Exceeding traffic speed limits	
	OR (95% CI)	*P*-value
Age (≥ 20 years)	1.17 (0.82–1.76)	0.39
Sex (male)	5.13 (1.98–13.3)	0.001
Residence (urban)	1.24 (0.53–2.90)	0.618
College (practical)	2.28 (0.99–5.26)	0.053
Grade (junior)	0.73 (0.25–2.17)	0.576
Place of living (away from family)	1.47 (0.63–3.41)	0.371
Relationship with parent (bad)	0.54 (0.27–1.08)	0.082
Peers exceed speed limits (yes)	8.70 (3.90–17.1)	< 0.001
Religious (yes)	1.17 (0.51–2.69)	0.713
Substance use (yes)	3.30 (1.58–13.7)	0.01

OR = odds ratio; CI = confidence interval.

medical/science colleges who did not use seat-belts when driving. This is in accordance with a study of Egyptian students, in which the percentages of students with practical or theoretical fields of study were similar in terms of seat-belt use (*9*).

Numerous studies have shown that peer pressure has a significant effect on risky behaviours during adolescence. Our study showed that students who did not follow pedestrian road safety rules were nearly 3 times more likely to have friends with similar behaviour (OR 2.80). Peer-group behaviour was also a highly significant factor associated with drivers not obeying the traffic speed limits. This is in accordance with Allen and Brown, who examined a range of developmental and structural factors that potentially increase the risks associated with adolescent driving. They stated that motor vehicle crash rates and fatality rates rise dramatically when teen drivers are accompanied by peer passengers (*15*). These findings underscore the need to pay closer attention to the ways in which peers influence teen driving behaviour.

The findings of this study were subject to some limitations. First, the data were collected only from youth who attended university and therefore were not representative of all persons in this age group (although this did not impact our objective which was to study university students). Secondly, there may have been misreporting of responses, as the questionnaires were applied under observation during classes. This may have meant that some students did not respond truthfully, especially to the questions on alcohol and drug use. Nevertheless, our results are broadly consistent with the literature.

Conclusions and Recommendations

Unsafe road-use behaviours that may cause unintentional injuries, such as not following pedestrian road safety rules, non-compliance with seat-belt laws and exceeding the legal speed limit when driving were prevalent among University of Benha students.

A behavioural approach through health education sessions and training courses on appropriate road behaviours could be arranged in the universities. Furthermore, stricter application of the existing legislation in Egypt would help to reduce risky behaviours such as driving without a licence, neglecting seat-belt use or driving under the influence of alcohol.

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Knowledge about hepatitis B vaccination among women of childbearing age: a cross-sectional study from a rural district of Punjab, Pakistan

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المعرفة عن التلقيح ضد الالتهاب الكبدي (ب) لدى النساء في سن الإنجاب: دراسة مقطعية من منطقة ريفية في ولاية البنجاب بباكستان

نبيلة نورين، راميش كومار، بابار تسنيم شيخ

الخلاصة: تعتبر باكستان بمثابة منطقة متوسطة للعدوى بفيروس الالتهاب الكبدي (ب)، حيث يتراوح معدل الانتشار بين السكان بين 2–7٪. قامت هذه الدراسة بتقييم المعرفة عن فيروس الالتهاب الكبدي (ب) والتلقيح ضده لدى النساء في سن الإنجاب في وسط ريفي في إقليم البنجاب بباكستان. فقد أجري في عام 2012 مسح مجتمعي مقطعي لـ 430 امرأة باستخدام استبيان شبه منظَّم. فكان لدى أقل من نصف النساء(43٪) اللواتي خضعن للمسح معرفة صحيحة عن التلقيح ضد فيروس الالتهاب الكبدي (ب)، وكانت المعرفة ضعيفة – بشكل خاص – لدى الفئات الاجتماعية والاقتصادية الدنيا. وقد ارتبط عمر المستطلَعات ومستواهن التعليمي وتاريخهن التوليدي – بشكل كبير – بالمعرفة عن فيروس الالتهاب الكبدي (ب) والتلقيح ضده. وكانت المصادر الرئيسية للمعلومات المتعلقة بالتلقيح ضد فيروس الالتهاب الكبدي (ب) السيدات العاملات في مجال الصحة (53٪) والقابلات التقليديات (22٪). فلا بد من التخطيط للقيام بحملات لتعزيز الصحة وتغيير السلوك تسلط الضوء على أهمية لقاح الالتهاب الكبدي (ب) لتلبية احتياجات المناطق الريفية التي يقلُّ فيها تعرض النساء لوسائل الإعلام العامة.

ABSTRACT Pakistan is considered as an intermediate zone of hepatitis B virus (HBV) infection, with an estimated population prevalence of 2–7%. This study assessed knowledge about HBV and vaccination among women of childbearing age in a rural setting of Punjab province, Pakistan. In 2012 a cross-sectional, community-based survey of 430 women was conducted using a semi-structured questionnaire. Less than half of the women (43%) surveyed had correct knowledge about HBV vaccination, and knowledge was especially poor among the low socioeconomic groups. Age, level of education and obstetric history of the respondents were significantly associated with knowledge about HBV and its vaccination. The main sources of information regarding HBV vaccination were lady health workers (53%) and traditional birth attendants (22%). Health promotion and behaviour change campaigns highlighting the importance of hepatitis B vaccine need to be designed to meet the needs of rural areas where women have little exposure to the mass media.

Connaissances sur la vaccination contre l'hépatite B chez des femmes en âge de procréer : étude transversale dans un district rural du Pendjab (Pakistan)

RÉSUMÉ Le Pakistan est considéré comme une zone intermédiaire pour l'infection par le virus de l'hépatite B, et l'on estime que la prévalence dans la population est comprise entre 2 et 7 %. La présente étude a évalué les connaissances sur le virus de l'hépatite B et la vaccination chez des femmes en âge de procréer en milieu rural dans la province du Pendjab (Pakistan). En 2012, une enquête communautaire transversale a été menée auprès de 430 femmes au moyen d'un questionnaire semi-structuré. Moins de la moitié des femmes (43 %) ayant participé à l'enquête avaient des connaissances exactes sur la vaccination contre le virus de l'hépatite B, et les connaissances étaient particulièrement médiocres dans les groupes socioéconomiques inférieurs. L'âge, le niveau d'études et les antécédents obstétricaux des répondantes étaient significativement associés aux connaissances sur le virus de l'hépatite B et la vaccination. Les principales sources d'informations sur la vaccination contre le virus de l'hépatite B étaient les femmes agents de santé (53 %) et les accoucheuses traditionnelles (22 %). Des campagnes de promotion de la santé et de modification des comportements soulignant l'importance de la vaccination contre le virus de l'hépatite B sont à élaborer pour répondre aux besoins des zones rurales, où les femmes sont peu exposées aux médias.

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Introduction

Many Asians are infected with hepatitis B virus (HBV) at birth or in early infancy from HBV-infected mothers (*1*). Although the risk of intrauterine infection is relatively low because the fetus is protected from HBV by the placenta, horizontal transmission from fathers, mothers and playmates with HBV is a significant factor in transmission of this deadly disease. Evidence from long-term follow-up studies on the impact of the implementation of universal HBV vaccination programmes has clearly demonstrated that prevention of mother-to-child transmission is the mainstay for the control of HBV infection in the Asia-Pacific region (*2,3*).

Improving knowledge about vaccination against HBV among women of childbearing age is crucial in reducing the HBV infection rate among newborns (*4,5*). Nonetheless, prevention of vertical transmission from HBV-infected mothers to their children reduces HBV-related mortality in the long run. This can be achieved by the birth-dose of hepatitis B vaccine to newborns (*6*).

A recent study has reported a very high prevalence of HBV (12%) among pregnant women in Pakistan (*7*). The rural areas of Pakistan—facing low literacy levels, minimal exposure to the mass media and bogus health promotion campaigns—suffer even more. There is a scarcity of research in Pakistan about the knowledge of HBV vaccination among women of childbearing age. Although there are many factors that need to be studied it is important to assess the knowledge of mothers regarding prevention of HBV transmission in endemic areas, especially in rural parts of Pakistan. This study was designed to assess knowledge about HBV and vaccination and the determinants of correct knowledge among women of childbearing age in a rural setting of Punjab province, Pakistan.

Methods

This was a descriptive cross-sectional study conducted from September to November 2012.

Study setting

Khanbela union council was selected for the study as it is a very remote and rural area of the Rahim Yar Khan district in the southern part of Punjab province; around 80% of the population live in rural areas. Literacy rates among the population are very low (males 43% and females 22%) (*8*). The area is predominantly agricultural and receives moderate rainfall. Therefore, in dry spells, it faces drought, food shortages, hunger and poverty.

Sampling

The formula below was used to determine the sample size (n). P, the proportion of women who have adequate knowledge of hepatitis B, was assumed to be 0.50 to obtain the maximum sample size, with $z = 1.96$ for a 95% confidence interval, $\alpha = 5\%$. The P-value was taken to be significant at 0.05, and the SE is the standard error that predicts the difference estimated and true proportion by not more than 5%.

$$n = \frac{z^2_{1-\alpha/2} \times P(1-P)}{SE^2}$$

The required sample size was 384 which was increased to 430 to allow for cluster effects (*9*).

Women aged 14–45 years from the study area were enrolled if they were willing to participate in the study, were not suffering from any acute illness and were not busy with any other commitments in the family. A 2-stage randomization was used for sampling. First, the households were randomly selected using the right-hand rule. In no woman of childbearing age was available in a particular house, the next house was visited. If more than one eligible woman were found in a household, the "pick from hat" method was used for selecting one respondent. The response rate was 100%.

Ethical considerations

All participants were assured about the confidentiality and anonymity of their responses and they gave written consent to participate. The study was approved by the institutional review board at the parent organization of the principal investigator. Filled forms were kept under lock and key and did not reveal the respondents' identity.

Data collection

A validated questionnaire was adapted, translated, pre-tested and used for this study (*10*). Pre-testing of the questionnaire was done to check the format, language, sequence and comprehension of the questions, as well as to measure the duration of one interview. The final data collection instrument was slightly modified and then adapted by adding a few open-ended questions to assess knowledge about hepatitis B vaccination. The reliability and validity of the tool was again checked by the principal investigator, using Cronbach alpha test and was found acceptable, i.e. with less than 5% error.

Knowledge about hepatitis B was assessed by asking about sources of information, mode of transmission of disease, signs and symptoms of hepatitis and knowledge about the vaccine; questions were closed-ended with respondents given a list of options. There were 18 closed and 5 open questions (for triangulation of the response from both qualitative and quantitative responses). The questionnaire took about 30 minutes to complete and was guided by the data collectors.

A trained team of 6 female data collectors administered the questionnaire to the selected women in their homes. The data collection was supervised by the principal investigator,

who conducted reliability checking of a sample of completed questionnaires. This was done by selecting forms to be rechecked for each of data collectors; assigning the task of reliability checking to another interviewer; data collection of a set of variables by the nominated person; and verification of reconciliation of the primary and reliability checking forms by the principal investigator. Greater than 5% discrepancy led to rejection of the original form and required refilling the questionnaire. As a result of reliability checking, it was ensured that the interviewers actually did visit the specific household and interviewed the eligible respondent. The overall discrepancy was well below 5%.

Data management and analysis

Each knowledge question were scored as 1 for a correct response and 0 for an incorrect response. The total score range for an individual was therefore 0–20, with scores ≥ 8 defined as correct knowledge and scores < 8 as incorrect/poor knowledge.

The data were cleaned and checked for consistency using *SPSS*, version 17. The association of selected independent variables with correct knowledge of the disease was analysed by both general descriptive and inferential statistics, using bivariate analysis.

Results

The mean age of the respondents was 28.7 (standard deviation 7.1) years; 72% were married, 56% were illiterate, 41% were housewives and 78% had a monthly income below Pakistani rupees (PkRs) 10 000 (about US$ 90) (Table 1).

Knowledge about hepatitis B

Only half of these women of childbearing age (48%) had heard of hepatitis B and one-third (34%) had knowledge of the vaccine used for prevention. The main sources of information about hepatitis B vaccination were lady health workers (53% of respondents), followed by trained birth attendants (22%); other sources included relatives (5%), friends (8%) and the media (12%), e.g. newspapers. Less than half of the women (44%) knew that HBV was transmitted via blood and 22% via sexual intercourse. One-fifth (20%) had the belief that hepatitis B was transmitted through water, and the some thought that the disease can be transmitted through food (13%), mosquito bites (5%) and heat (3%). A majority of the 310 married women (72%) agreed that hepatitis B vaccination is important, whereas only 26% of never married respondents had the same opinion.

Factors associated with knowledge

Overall 43 of women had correct knowledge about HBV transmission and vaccination. Age, level of education and obstetric history (i.e. pregnant or non-pregnant at the time of interview) of the respondents were significantly associated with knowledge about HBV and vaccination, but marital status, occupation and income were not (Table 1). Younger women, i.e. those aged 26–35 years (20%) and 14–25 years (18%), were more likely to have correct knowledge than those aged 35–49 years (7%) ($P < 0.005$). Twice as many women with higher (22%) and matriculation level of education (21%) had correct knowledge than did illiterate women (10%) ($P < 0.01$). Pregnant women (32%) were more likely to have correct knowledge than non-pregnant women (19%) ($P < 0.04$). The rate of correct knowledge was very low among housewives (5%), the jobless (4%) and labourers (5%) compared with those working in the government (15%) or private sector (21%), but the difference was not statistically significant ($P = 0.51$). Married women had better knowledge (29%) than unmarried women (10%), but again this was not statistically significant ($P = 0.43$). Women with lower income tended to be less knowledgeable (17%) than those with higher income (25%) ($P = 0.83$).

Perceptions about hepatitis B vaccination

Some of the open-ended questions recorded interesting answers with regard to perceptions about vaccination for hepatitis B prevention. A number of myths related to the vaccine emerged in responses, for example: "This vaccine is only meant for pregnant or married women", "The vaccine will be more effective in pregnant women", "Hepatitis B vaccine campaigns are just a showoff", "Boiling water can prevent hepatitis B" and "Not eating outside is enough for hepatitis B prevention".

Discussion

Hepatitis B is a common and easily transmitted disease that has serious long-term consequences. It is established that this deadly disease can be prevented by immunization, especially of women of childbearing age, who constitute a large segment of the vulnerable population. Our study showed that knowledge regarding hepatitis B and vaccination among women of childbearing age in a rural region of Punjab was strongly associated with education level. Since a majority of the participants were illiterate, it is not surprising that the overall level of knowledge regarding hepatitis B and its vaccination was poor or incorrect. Working with illiterate populations on such public health issues can be very challenging (*11*). In 2008, another study from the same areas reported similar findings on hepatitis B vaccination knowledge among women of reproductive age (*12*). So not much has changed since then, despite interventions by government and nongovernmental organizations and the hepatitis B vertical programme which has a significant budget for health

Table 1 Association between sociodemographic characteristics of respondents and correct knowledge about hepatitis B and its vaccination

Variables	Total		Correct knowledge		*P*-value
	No.	%	No.	%	
Total	430	100	185	43	
Age group (years)					
14–25	179	42	32	18	0.005
26–35	221	51	44	20	
35–49	30	7	2	7	
Marital status					
Married	310	72	90	29	0.43
Unmarried	112	26	11	10	
Widowed	3	1	1	33	
Separated	5	1	1	20	
Obstetric history					
Pregnant	153	36	49	32	0.04
Not pregnant	277	64	54	19	
Education					
Illiterate	241	56	24	10	0.01
Primary	77	18	12	16	
Middle	47	11	8	17	
Matriculation	47	11	10	21	
Higher	18	4	4	22	
Occupation					
Government service	34	8	5	15	0.51
Private business	43	10	9	21	
Housewife	176	41	9	5	
Jobless	69	16	3	4	
Labourer	56	13	3	5	
Student	52	12	6	12	
Monthly income (PkRs)					
< 10 000	336	78	57	17	0.83
10 001–15 000	90	21	20	22	
> 15 000	4	1	1	25	

PkRs = Pakistani rupees.

promotion and awareness raising. The interventions are perhaps weak in design, are not contextual and are not addressing the core issues.

Most of the women of childbearing age in this study did not know the exact causes of hepatitis B and had a number of incorrect beliefs.. These findings are similar to another study conducted in Pakistan that reported very low knowledge about the spread of infection among hepatitis B patients (*13*). Studies in urban settings in Pakistan have also shown poor knowledge among Pakistani women and misconceptions about hepatitis B transmission (*12,14*).

Married women were more knowledgeable about HBV than unmarried women, although the difference was not statistically significant, and this corroborates another study conducted in Pakistan (*15*). Correct knowledge can lead to positive attitudes and subsequently good practices pertaining to hepatitis B prevention (*13*). Poverty is another major determinant in this regard. Low socioeconomic status jeopardizes other factors such as employment, lifestyle, nutrition, access to information and education and capacity to employ hygiene measures (*16,17*). In our study too, a higher level of education had a strong significant association with knowledge of hepatitis and its vaccine, and those who were employed in government service or private business tended to have better knowledge than housewives, the jobless and labourers.

Very few women in our study knew that HBV can spread through sexual intercourse and contact with infected blood products through transfusion, sharing of needles and unsafe injecting equipment. Women in this rural area of Punjab province reported that lady health workers or trained birth attendants were their main source of information about HBV. Studies elsewhere show that people rely on locally available health personnel for information on a variety of health issues (*18,19*). Health professionals, community health workers, teachers, volunteers and local media have a huge responsibility to address the knowledge gaps and in addressing the myths related to the subject. This problem has been observed in other south and south-east Asian countries (*20,21*). Community health workers have good rapport with the communities and therefore their knowledge as well as the role needs to be strengthened in this regard (*22*).

Conclusion

Misconceptions and myths related to HBV transmission and vaccination in rural Pakistan must to be addressed. Better health promotion and behaviour change campaigns are needed. Lady health workers and community midwives are likely to be important components of the national programme on hepatitis, to assist in the efforts to combat ignorance about the disease and its prevention.

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Changes in antibiotic use in a general surgery unit over a 5-year period

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التغيرات في استخدام المضادات الحيوية في وحدة للجراحة العامة خلال فترة 5 سنوات

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الخلاصة: لقد تم الإعراب عن مخاوف بشأن فرط استخدام المضادات الحيوية لمرضى الأقسام الداخلية بالمستشفيات. وقد قام الباحثون بمقارنة نمط استخدام المضادات الحيوية في عام 2010 في إحدى الوحدات الجراحية بمستشفى جامعي في جمهورية إيران الإسلامية مع بيانات مماثلة من عام 2006. وتم حساب الجرعات اليومية المحددة لكل 100 يوم سريري . وقد ازداد إجمالي استخدام المضادات الحيوية في هذه الوحدة الجراحية بشكل ملحوظ من ما متوسطه 4.9 (SD = 5.1) جرعة لكل 100 يوم سريري في عام 2006 إلى 7.7 (SD = 10.3) جرعة لكل 100 يوم سريري في عام 2010. وقد نجمت هذه الزيادة بشكل رئيسي عن ازدياد استخدام المضادات الحيوية في معالجة الأمراض المُعدية، ولم يُظهِر الاستخدام الوقائي للمضادات الحيوية زيادة كبيرة. وكانت هناك زيادة في استهلاك سيفترياكسون وإيميبينيم وسيفالوتين ومترونيدازول وفانكومايسين، وانخفاض في استخدام إريثرومايسين وسيفتازيديم، ولم يكن هناك تغير في استخدام سيبروفلوكساسين وكليندامايسين. لقد كانت أكبر زيادة في استخدام سيفترياكسون (5.1 ضعفاً) بينما أكبر انخفاض كان في استخدام إريثرومايسين (8 أضعاف).

ABSTRACT Concerns have been expressed about the overuse of antibiotics in inpatient settings. We compared the pattern of antibiotic use in 2010 in a surgical unit of a university hospital in the Islamic Republic of Iran with similar data from 2006. Defined daily doses per 100 bed-days (DBD) were calculated. Overall use of antibiotics in our surgical unit increased significantly from a mean of 4.9 (SD 5.1) DBD in 2006 to 7.7 (SD 10.3) DBD in 2010. This increase was mainly due to increases in the use of antibiotics for treatment of infections; the prophylactic use of antibiotics did not show a significant increase. There was an increase in the consumption of ceftriaxone, imipenem, cefalotin, metronidazole and vancomycin, a decrease in the use of erythromycin and ceftazidime and no change in the use of ciprofloxacin and clindamycin. Ceftriaxone showed the greatest increase (5.1-fold) and erythromycin the sharpest decrease (8-fold) in use.

Modifications dans l'utilisation des antibiotiques dans un service de chirurgie générale sur une période de cinq ans

RÉSUMÉ Des préoccupations ont été formulées concernant l'utilisation excessive des antibiotiques en milieu hospitalier. Nous avons comparé le mode d'utilisation des antibiotiques en 2010 dans un service de chirurgie d'un hôpital universitaire de la République islamique d'Iran à des données similaires datant de 2006. Des doses journalières définies ont été calculées pour 100 jours-lits. L'utilisation globale des antibiotiques dans notre service de chirurgie a nettement augmenté, passant d'une moyenne de 4,9 jours-lits (E T 5,1) en 2006 à 7,7 jours-lits (E T 10,3) en 2010. Cette augmentation était principalement due à l'utilisation accrue des antibiotiques pour le traitement d'infections. En revanche, l'utilisation prophylactique des antibiotiques n'a pas augmenté significativement. La consommation de ceftriaxone, d'imipénem, de céfalotine, de métronidazole et de vancomycine a augmenté, tandis que l'utilisation de l'érythromycine et de la ceftazidime a diminué et qu'aucun changement n'a été observé pour la ciprofloxacine et la clindamycine. Le recours à la ceftriaxone a connu l'augmentation la plus importante (multiplication par 5,1) tandis que la consommation d'érythromycine a connu la diminution la plus importante (division par 8).

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Introduction

Health-care-associated infections are a concern, especially in developing countries, where the rates may be higher than in industrialized countries (*1,2*). Surgical site infections are a leading cause of health-care-associated infections and this encourages surgeons to adopt a liberal approach to prescribing antibiotics (*3–5*). Although such as practice may seem to be beneficial in reducing infection rates in inpatient settings, it can potentially lead to emergence of resistant microorganisms and consequent increases in health-care costs. In fact the causal association between the amounts of antibiotics used and rates of resistance to antibiotics has been well established in several studies (*6–9*). Furthermore, antibiotics are widely used for perioperative prophylaxis in surgical units, and appropriative antibiotic prescribing for this purpose is also of great importance for monitoring quality of care, infection control and costs and to avoid the emergence of multi-resistant organisms.

There is a need for strict guidelines for antibiotic use designed for each specific geographical area to avoid overuse and misuse of antibiotics. The first step in developing such guidelines is to determine the pattern of antibiotic consumption in these countries. Previous studies in the Islamic Republic of Iran have shown a dramatic rise in antibiotic use over a 5-year period starting from 2000 (*3,10*). But more recent data are not available and there are a paucity of studies that define the pattern of antibiotic use in hospitals in general and in surgical units in particular. To tackle this shortcoming we designed a study to investigate the pattern of antibiotic use in the surgical division of a university hospital in Tehran and to compare it with data obtained 5 years ago to assess if these had been a change in the trend in antibiotic use over this 5-year period. Such data will help health-care authorities to design appropriate guidelines for prescribing antibiotics in hospital settings.

Methods

Study setting and sample

This cross-sectional study was conducted in the department of surgery of Imam Hossein University Hospital. Our hospital is a tertiary referral centre for the east and south-east of Tehran and our surgical department has a dominant gastrointestinal and trauma practice. Approval for the study was obtained from the local ethics committee.

Data for the periods January 2006 to December 2006 and January 2010 to December 2010 were extracted from the charts of the patients who were admitted for general surgery in these 2 years.

Data collection

Patients' demographic and clinical data were collected. The total consumption of antibiotics for each patient in defined daily doses (DDD) was collected for all the available antibiotic substances (class J01). No medication was given to any patient without being recorded in his/her chart and all data used in this study were extracted from the patients' hospital charts. The types of surgical procedures were similar in 2006 and 2010 and there were no changes in the procedures in place within this 5-year period with regard to any recommendations for antibiotic use in our institution. The number of bed-days in the surgical unit was also recorded from each patient's chart and used for further calculations. Data from these 2 years were then compared to investigate any potential changes in antibiotic use over the 5-year period.

Definitions and parameters used

Antibiotics were defined as antibacterials for systemic use and were equivalent to group J01 of the Anatomical Therapeutic Chemical (ATC) classification system from the World Health Organization (WHO) collaborating centre for drug statistics methodology (*11*). It is important to note that according to WHO the J01 catergory does not include antifungals, antibacterials used for treatment of tuberculosis or topical antibiotics.

Hospital bed-days measures the use of a particular hospital inpatient unit or health care institution. It can be calculated in the following way: first to determine the total inpatient days of care by adding together the daily patient census for 365 days, then to determine the total bed-days available by multiplying the total number of beds available in an inpatient unit by 365 and finally by dividing the total inpatient days of care by the total bed-days available and multiplying the result by 100 in order to express this figure as a percentage.

DDD is a WHO statistical measure of drug consumption and is used to standardize the comparative use of various drugs within drug categories or different health care environments. This parameter is used to overcome shortcomings in the use of traditional units of drug consumption and provides a fixed unit of measurement independent of price and formulation and enables the researcher to perform comparisons between population groups. This parameter is the assumed average maintenance dose per day in adults for a certain medication, when used for its main indication.

In addition to the total DDD, we also calculated defined daily doses per 100 bed-days (DBD). DBD is the number of DDD per patient bed-days during the observation period and provides an estimate of drug consumption among hospital inpatients.

Statistical analysis

Data were entered into a Microsoft *Excel* database and reported as mean and standard deviation (SD), unless otherwise specified. The Student *t*-test was

used to compare continuous variables. Differences were considered significant at $P < 0.05$. Statistical analyses were performed using *SPSS*, version 11.5.

Results

The number of hospital bed-days in the general surgery unit of Imam Hossein University Hospital was 17 800 in the year 2006 and increased to 20 400 in the year 2010. The mean length of hospital stays were 4.5 (SD 2.4) and 5.1 (SD 4.9) days for the years 2006 and 2010 respectively. Appendectomy, herniorrhaphy and surgeries performed in patients with penetrating traumas were the 3 most common procedures performed in the year 2006, accounting for 40% of all operations performed in our general surgery division in this year. These operations were also the 3 most common procedures performed in the year 2010 and accounted for 43% of all surgeries performed in this year.

Injection was the most popular method of administration of the antibiotics with regard to both DDD consumption and prevalence of use. This was true for both 2006 and 2010.

Overall use of all antibiotics in our surgical unit increased from a mean DBD of 4.9 (SD 5.1) in 2006 to 7.7 (SD 10.3) in 2010 ($P = 0.01$). Use of antibiotics for prophylaxis purposes also increased from a mean DBD of 5.0 (SD 5.1) in 2006 to 6.2 (SD 7.6) in 2010 but this difference did not reach statistical significance ($P > 0.05$). When antibiotics used for prophylaxis were excluded from the analysis, the mean DBD were still significantly higher in 2010 compared with 2006 [6.2 (SD 7.6) versus 2.9 (SD 2.5)] ($P = 0.005$).

The comparison for overall use of antibiotics expressed as DBD for the years 2006 and 2010 are shown in Figure 1. Metronidazole, cefalotin and ceftazidime were the 3 most commonly used antibiotics in our surgical unit in 2006. This changed in 2010 and ceftriaxone, cefalotin and then metronidazole were the most prescribed antibiotics.

When the DBD data for antibiotics used for prophylaxis were analysed, metronidazole, cefalotin and ceftazidime were found to be the 3 most commonly used antibiotics in 2006, and cefalotin, ceftriaxone and metronidazole were the 3 most common in 2010. Analysis of the prevalence of antibiotic use showed that metronidazole was the most prevalent antibiotic, prescribed for 35.6% of patients in 2006. Similar analysis for 2010 showed that cefalotin was then the most prevalent antibiotic and was used for prophylaxis in 35.9% of the patients in that year (Figure 2).

Table 1 summarizes the DBD data for antibiotic use for overall and prophylaxis purposes for the years 2006 and 2010. The overall consumption of ceftriaxone, imipenem, cefalotin, metronidazole and vancomycin increased in 2010 compared with 2006. Ceftriaxone showed the highest increase in consumption, with a 5.1-fold increase in DBD (6.6 versus 34.0), then imipenem with a 3.2-fold increase (5.5 versus 17.9) and vancomycin with a 3.1-fold increase (2.4 versus 7.7). In contrast, erythromycin showed an 8-fold use decrease in DBD (2.5 versus 0.3) and ceftazidime a 4-fold decrease (12.4 versus 3.0). Ciprofloxacin and clindamycin showed no significant change in consumption over this 5-year period.

Discussion

Antibiotics are one of the most frequently used medications among hospitalized patients in surgical units. Over recent years we have witnessed an increasing tendency for widespread and

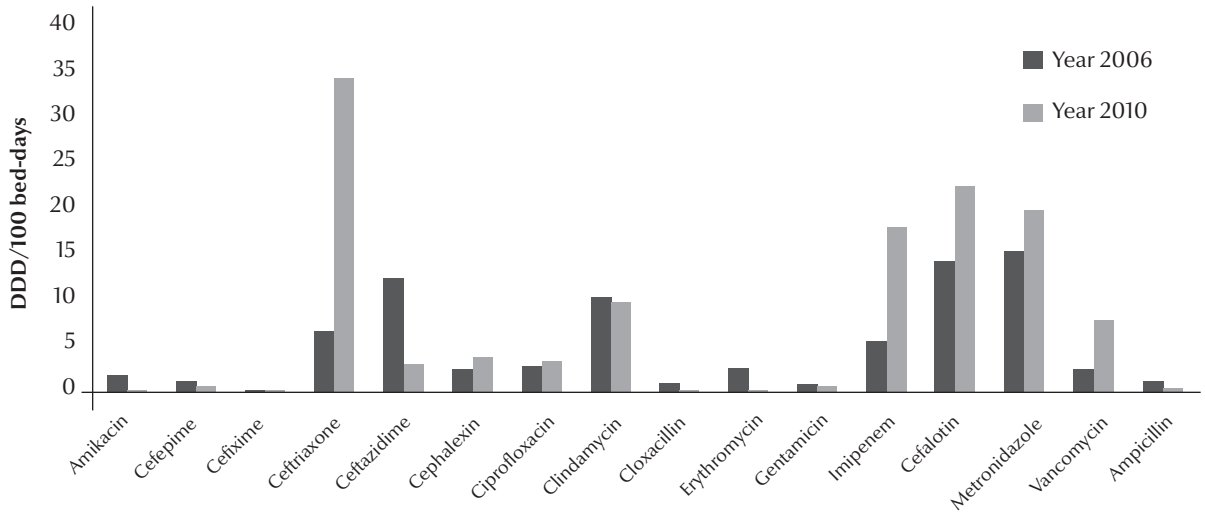

Figure 1 Overall use of antibiotic expressed as defined daily doses (DDD) per 100 bed-days in the years 2006 and 2010

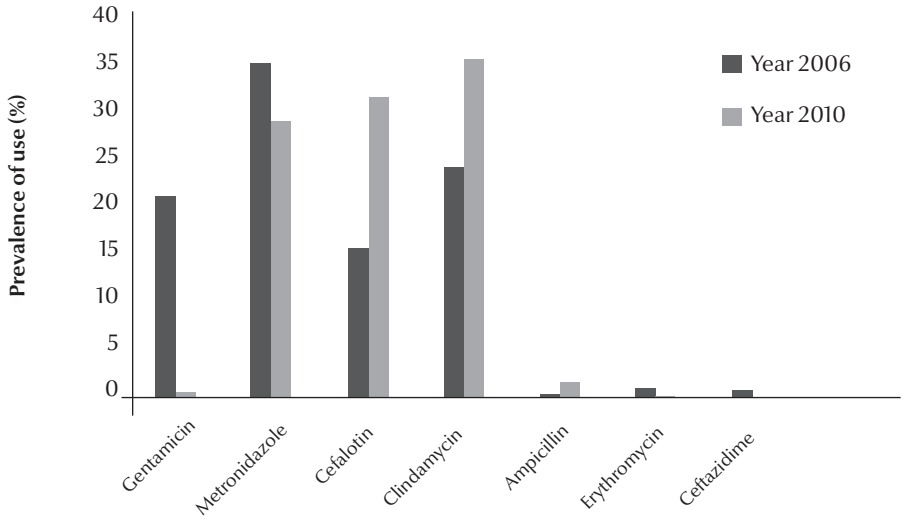

Figure 2 Prevalence of antibiotic used for prophylactic purposes in the years 2006 and 2010

indiscriminate use of newer antibiotics in surgery practice in our country. This observation is supported by data showing a dramatic raise in the use of antibiotics in the Islamic Republic of Iran and is further confirmed by our finding of a 1.6-fold increase in antibiotic use in our surgical unit over a 5-year period.

We have witnessed a decline in the numbers of new antibiotics being marketed in recent years and the medical community is struggling to preserve our current armamentarium (*12*). Investigators and health-care officials in the United States and Europe are working on a more uniform approach to antibiotic stewardship. The limited data available from developing countries shows that overuse and misuse of antibiotics is a very common problem in these countries. This is partially due to lack of guidelines and policies for antibiotic usage. To develop such guidelines it is necessary first to determine the pattern of antibiotic use in these counties and this was our motive for conducting the current study.

The main finding of our study was a 1.6-fold increase in antibiotic use in our surgical unit over a 5-year period ending 2010. Data on the use of antibiotics in hospital settings in the Islamic Republic of Iran are very limited and to the best of our knowledge our study was the first to assess this issue in a surgical unit in the country. Our data appear to be consistent with data published on antibiotic use trends in other countries over the same time frame. Similar increases were described in studies from Western Europe (*13,14*) and some studies from Mediterranean and North African countries (*6,7*).

We also found a dramatic increase in the use of newer antibiotics in the year 2010 compared with 2006. For example, vancomycin use demonstrated a 3-fold increase in this time period in our surgical unit. This is also consistent with the findings of similar papers on this topic from other countries. A study of the use of glycopeptide antibiotics in German hospitals showed a sharp increase in consumption of these types of antibiotics over a 3-year period ending 2000 (*15,16*). The authors found that prophylactic and empirical indications accounted for only 50% of all prescriptions and in the remaining patients the use of this antibiotic was inappropriate and unnecessary. Over the 5-year period of our study, no change in the guidelines or recommendations was introduced in our institution and therefore market pressure may be one of the causes of this observed widespread increase in the use of new antibiotics. This is a matter of great concern as excessive use of these antibiotics increases the risk of development of resistant strains among *Enterococcus* spp. and *Staphylococcus* spp. bacteria.

We acknowledge some limitations to our study. One is the lack of microbiological information about patients' infections. This information is necessary to document whether the change in the trend of antibiotic use in our department has led to greater emergence of resistant strains. Although it may sound intuitive that a more liberal use of antibiotics is associated with development of more resistant bacteria, there is a need for future studies to correlate the data of antibiotic use to the microbiological findings to confirm this hypothesis. The second limitation of our study is that the use of DDD can potentially overestimate antibiotic use in those patients who require a higher dose. In contrast, since the DDD definition does not account for dose adaptation in children this parameter may underestimate the calculated antibiotic use in children,

Table 1 Overall and prophylactic use of antibiotics in the years 2006 and 2010, expressed as number of defined daily doses per 100 patient bed-days (DBD) during the observation periods

Antibiotic	Overall use of antibiotics (DBD)		Prophylactic use of antibiotics (DBD)	
	Year 2006	Year 2010	Year 2006	Year 2010
Metronidazole	15.2	19.8	6.1	7.1
Cefalotin	14.0	22.4	9.6	17.4
Ceftazidime	12.4	3.0	5.6	0.1
Clindamycin	10.3	9.7	0.7	0.5
Ceftriaxone	6.6	34.0	0.1	15.7
Imipenem	5.5	17.9	0.0	0.0
Ciprofloxacin	2.8	3.4	0.0	0.0
Erythromycin	2.5	0.3	0.0	0.0
Vancomycin	2.4	7.7	0.0	0.0
Cephalexin	2.3	3.7	0.0	0.0
Amikacin	1.7	0.2	0.0	0.0
Cefepime	1.2	0.6	0.0	0.0
Ampicillin	1.1	0.4	0.5	0.5
Cloxacillin	1.0	0.2	0.0	0.0
Gentamicin	0.7	0.6	0.5	< 0.1
Cefixime	< 0.1	0.0	0.0	0.0

who usually take antibiotics in dosages lower than adults. However, the majority of patients admitted to our surgical unit were adults and this limitation is unlikely to have affected our results.

In conclusion, a logical approach to managing infected patients and to the use of preoperative prophylactic antibiotics in surgical units is necessary. Such an approach requires strict guidelines that allow appropriate selection of antibiotics and limits overuse and misuse of antimicrobial agents. In the absence of such guidelines, there is a risk that other influences will shape the pattern of antibiotic use and will lead to an increase in the overall consumption of antibiotics and in particular the new broad-spectrum ones.

Competing interests: None declared..

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Report

Towards an electronic national injury surveillance system in Saudi Arabia

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نحو نظام إلكتروني وطني لترصد الإصابات في المملكة العربية السعودية

فيصل مرضي العنزي، عارف سيد حسين، أحمد أمين منديل، نورة مزيد العمرو

الخلاصة: نظراً للحاجة إلى نظام ترصد إلكتروني موحد شامل على الصعيد الوطني للإصابات في المملكة العربية السعودية فقد تم تصميم نظام يهدف إلى إنشاء ملف وبائي للإصابات في البلاد، وتقييم مؤشرات الإصابة على أساس مستمر، وتحديد الفئات العالية الاختطار التي تتطلب تدخلات نوعية، ومراقبة التدخلات وتقييمها بالنسبة للفعالية، وإعداد تقارير للمساعدة في التخطيط وتخصيص الموارد. وتم تصميم استمارة خاصة لهذا الغرض معدلة عن استمارات مصادق عليها تستخدم في أماكن أخرى لترصد الإصابات. ويتوقع من مبادرة وزارة الصحة هذه أيضاً أن تساعد في التحقق من صحة البيانات التي تُجمع من قبل قطاعات أخرى؛ مثل وزارة الداخلية. إن هذه الورقة تستعرض معالم بناء النظام، وتهدف إلى المطالبة بإجراء نقاش ضمن الأوساط العلمية – خصوصاً في إقليم شرق المتوسط – حول أفضل طريقة لتصميم نظم لترصد الإصابات في الإقليم، بغية تهذيب النظام المقترح قبل تطبيقه على نطاق واسع.

ABSTRACT Given the need for a uniform, comprehensive, electronic nationwide surveillance system for injuries in Saudi Arabia, a system was designed with the objectives of establishing an epidemiologic profile of injuries in the country; evaluating injury indicators on an ongoing basis; identifying high-risk groups requiring specific interventions; monitoring and evaluating interventions for effectiveness; and producing reports to assist in planning and resource allocation. A special form for this purpose was designed, modified from validated forms used elsewhere for injury surveillance. This initiative of the Ministry of Health is also expected to help validate data collected by other sectors, such as the Ministry of Interior. This paper reviews the milestones of building the system and aims to prompt a debate within the scientific community, especially within the Eastern Mediterranean Region, about the best way to design injury surveillance systems for the Region in order to fine-tune the proposed system before its full-scale implementation.

Vers un système électronique national surveillance des traumatismes en Arabie saoudite

RÉSUMÉ Compte tenu de la nécessité d'établir un système électronique pour la surveillance des traumatismes au plan national en Arabie saoudite qui soit exhaustif et uniforme, un système a été élaboré pour définir le profil épidémiologique des traumatismes dans le pays, évaluer les indicateurs de traumatismes de manière systématique, identifier les groupes à haut risque nécessitant des interventions spécifiques, surveiller les interventions et évaluer leur efficacité, et établir des rapports facilitant la planification et l'allocation des ressources. Un formulaire spécifique a été conçu, inspiré des formulaires validés déjà utilisés ailleurs pour la surveillance des traumatismes. Cette initiative du ministère de la Santé devrait également permettre de valider les données recueillies par d'autres secteurs, tels que le ministère de l'Intérieur. Le présent article examine non seulement les étapes de développement de ce système, mais vise aussi à susciter un débat au sein de la communauté scientifique, notamment dans la Région de la Méditerranée orientale, sur la meilleure façon de mettre au point des systèmes de surveillance des traumatismes pour la Région afin d'améliorer le système proposé avant sa mise en œuvre à grande échelle.

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Introduction

Injuries account for at least 9% of the global burden of mortality and are a threat to health in every country of the world. For every death it is estimated that there are dozens of hospitalizations, hundreds of emergency department visits and thousands of doctors' appointments. A large proportion of people surviving their injuries incur temporary or permanent disabilities. Although injuries and violence are health threats in every country, the pattern and extent of different injuries varies from country to country (*1*).

According to the World Health Organization (WHO), injuries account for 11.3% of total deaths in the Eastern Mediterranean Region (EMR) (*2*). In Saudi Arabia the Ministry of Health (MoH) reported in 2010 that injuries represent the second cause of death in MoH hospitals, accounting for 19.2% of all causes of death. There were 2 006 907 injury-related visits to MoH hospitals and 563 051 to primary-care centres in 2010 (*3*). A conservative estimate of the annual cost of road traffic accidents in the country is 21 billion Saudi riyals (*4*). Local studies have been carried out in Saudi Arabia on several types of injuries, including burns (*5–7*), drowning (*8*) and gunshots (*9*); none have been carried out on a regional or national scale. Violence too has been sporadically reported in the literature on Saudi Arabia. A retrospective study at the Forensic Medicine Centre in Dammam, Saudi Arabia during 2002–06 showed 64 fatalities from gunshot injuries: 55 homicides, 7 suicides and 2 accidental shootings (*10*). Child abuse and neglect were presented in a retrospective collection of data on all children evaluated by the suspected child abuse and neglect (SCAN) team in King Abdulaziz Medical City for the National Guard from 2000 to 2008 (*11*).

Reports on injuries and violence have therefore generally been small-scale and in isolated settings, only indicating what we consider the tip of the iceberg of the morbidity and mortality burden of injuries in Saudi Arabia. A complete picture of the situation in the country is required for efficient planning and implementation of effective interventions.

Injury surveillance systems: a global perspective

There are many injury surveillance systems and databases around the world. All of them include unintentional injuries and some include intentional ones as well, while rarely they concentrate on specific types of injuries only. Some examples are provided below.

The United States Consumer Product Safety Commission's national electronic injury surveillance system (NEISS) is a national probability sample of hospitals in the US and its territories. The Canadian hospitals injury reporting and prevention program (CHIRPP) was established as an emergency-room based injury surveillance system that operates in 10 paediatric and 6 general hospitals (*12*). In Australia, the injury surveillance information system (ISIS) was designed, developed and piloted by the national injury surveillance and prevention program (*13*), with other examples in place as well (*14–16*). The United Kingdom's home/leisure accident surveillance system (HASS/LASS) is a national injury surveillance system that reports on home injuries among all ages since 1978 (*17*). The Dutch injury surveillance system (LIS) is run by the Consumer Safety Institute at emergency departments of a subset of Dutch hospitals and reports all types of injuries among all ages (*18*). Greece also has the emergency department injury surveillance system (EDISS) that covers all injury types in all ages (*19*). All the above surveillance systems share the fact that they are emergency-department based on a national level. On a regional level, the European home and leisure accident surveillance system (EHLASS) is a Europe-wide system that reports home injuries among all ages (*20*).

In the EMR, different agencies record data on injuries in most countries. Notable sources are hospitals, the police and other health-related agencies such as universities. Many EMR countries possess a health information system which records information such as deaths and other health statistics. The Egyptian injury surveillance system was implemented back in 1999. The system is decentralized and injuries are reported by the relevant facilities (hospitals, health centres, health groups and health units) (*21*). According to WHO, the major impediment in collating data from different sources is the lack of coordination among the concerned sectors, which substantiates the argument that a uniform injury surveillance system should be in place to capture the occurrence of injuries at each level, regardless of which agency takes responsibility to set up the surveillance system.

Background to the EISS

Recognizing the burden of injuries in Saudi Arabia, the MoH launched the injury and accident prevention programme (IAPP) based in the Non-Communicable Disease Directorate of MoH. The programme is mandated to establish and maintain an efficient and effective injury surveillance system; prepare the national annual injury report; provide assistance to the government in devising and reviewing policies and strategies for injury prevention; operate campaigns to educate the community at all levels about the high burden of injuries in the country; and develop the capacities of medical professionals in injury prevention and control. Under such a programme, an electronic national injury surveillance system (EISS) is currently being built, which is designed (in its initial phases) to be comprehensive, covering both

non-intentional and intentional injuries diagnosed and managed at MoH facilities. Detailed information on the system is available in the MoH document prepared for this purpose (*22*).

The paper reviews the milestones of building the electronic facility-based injury surveillance system and is shared with the objective of starting a debate within the scientific community, especially in the EMR, about the best methods to be applied in the Region, to critique our methods and fine-tune the proposed system before its implementation phase.

Objectives of the EISS

Given that the current surveillance systems in Saudi Arabia are fragmented, do not capture the whole range of injuries and suffer from frequent under-reporting, a need was identified for a uniform nationwide surveillance system for injuries. A simple and practical EISS has therefore been designed to address these issues. The objectives of the EISS are to: establish the epidemiological profile of injuries in Saudi Arabia (evaluate the magnitude, burden, incidence and characteristics of specific injuries); compute and evaluate the indicators for injuries on an ongoing basis; identify high-risk groups requiring specific interventions; monitor and evaluate interventions for effectiveness; and produce reports on a periodic basis (annually and quarterly) that will help in planning and resource allocation at the national, regional and facility levels.

Building the EISS

Building the EISS passed through several phases, as outlined below.

Acquiring the political will

First and foremost, the political will and approval to establish the system was obtained at the highest levels in Saudi Arabia, both at the Council of Ministers and the MoH. This included preparation of policy briefs and presentations by the IAPP to the forums and clarifying the queries with convincing arguments to secure the final approvals. A high-profile visit of a team from the WHO Regional Office for the Eastern Mediterranean and from WHO Headquarters also paved the way towards the final agreement of the senior management in MoH.

Formation of expert teams

A team of experts was constituted that comprised public health specialists and consultants from within and outside MoH. The team interacted closely during the whole process and built consensus for all the steps.

Preparation of background documents

The team prepared the necessary documents, especially the background document of the IAPP (*22*) as well as the EISS. The document outlined the steps to be taken in the formalization of the system within the country, taking it through the different phases. An operations manual was prepared delineating the operational details of the process (*23*).

Preparation and formalization of the EISS tool

The team of experts prepared the initial draft of the EISS tool, taking inputs from the *Injury surveillance guidelines* of WHO and the US Centers for Disease Control and Prevention (*24*), the *International classification of external causes of injury* (ICECI) (*25*) and other international injury surveillance formats. A series of workshops and consultations were held in order to refine the tool, whereby stakeholders from outside the health sector were involved to get their inputs. The tool was formally endorsed by the higher level National Committee of the MoH.

Planning for the pilot of the surveillance system

Data collection was planned to take place through 2 phases: an initial phase during the first year of operation (2013–14), which is considered a multi-centre pilot phase (involving 10 regions), and a second phase during subsequent years, which is expected to be nationwide (involving all 20 of Saudi Arabia's health regions), and to build on the results and lessons learned from the pilot phase.

Training for the pilot phase

Physicians and nurses were trained from these facilities for a period of 2–3 days each to start the data collection. The pilot phase is in progress and the results will be shared after its completion.

Design of the EISS

The EISS is an integrated nationwide system for ongoing, systematic collection, analysis and interpretation of injury-related data across Saudi Arabia that is essential for the planning, implementation and evaluation of interventions, closely integrated with the timely dissemination of these data to different stakeholders, including decision and policy-makers, health-care delivery institutions, health professionals, international agencies and the general public.

Components of the EISS

The EISS includes the following components (Figure 1).

- Sensors: actual surveillance reporters/data collectors who identify injuries and report them. These include emergency and trauma physicians and nurses at peripheral hospitals and primary health-care centres (PHCC), in different health regions of Saudi Arabia.
- Reference signal (sensor report): the report of the above-mentioned reporters/data collectors.

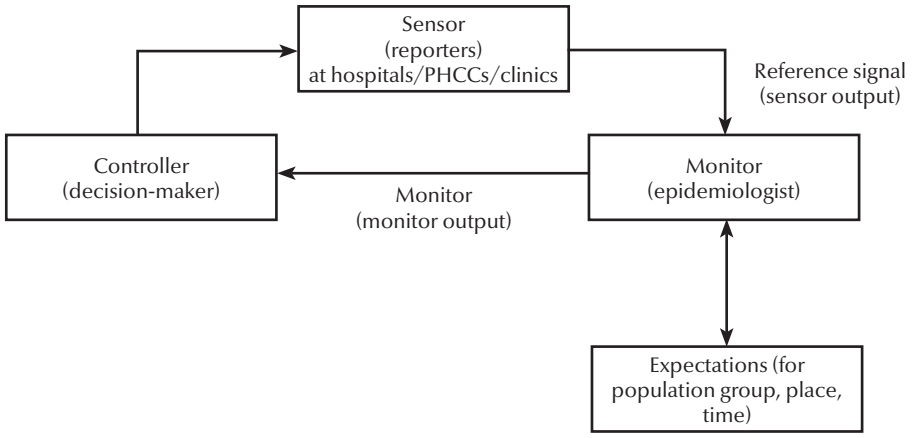

Figure 1 Components of the electronic injury surveillance system in Saudi Arabia

- Monitor and expectations: compares the reference signal (sensor report) with expectations. This is usually carried out by epidemiologists and biostatisticians at the central level, who compare the injury occurrences with prior expectations (threshold of concern) for the population group, place and time-period and produce their own report.
- Monitor signal: report (output) of the monitor which measures the difference between the reference signal/sensor reports and expectations, in order to assist in evidence-based decision- and policy-making.
- Controller: decision- or policy-makers who take corrective action aimed at handling the monitor signal, i.e. initiating prevention and control activities. This might be the district health officer regionally or the chief medical officer (e.g. MoH) if a national decision is needed, as applies here to injury control activities.

Surveillance team

The EISS team includes the following: the MoH core team (central team at IAPP in Riyadh); regional coordinators (in the 20 health regions); health facility coordinators; sensors (data collectors in each health facility); monitors (epidemiologists and biostatisticians at the central level): controllers (policy- and decision-makers at the regional and national levels); and scientific committee members. Figure 2 illustrates the flow of data in the proposed surveillance system.

Operations manual

A detailed manual has been formulated and compiled by the core team and consultants to be distributed to each sensor (data collector), monitor and coordinator (regional/facility) in order to elaborate on concepts and types of surveillance; highlight the importance and objectives of the EISS; explain the components of the EISS and sampling procedures; emphasize the job descriptions of each component of the system; provide detailed description of the 2 sections of the EISS data collection tool with relevant examples; and introduce EISS expected outcomes. It therefore will act as an independent resource of information for all EISS personnel.

The EISS is considered to be a passive surveillance system, based on intensive training of staff to ensure understanding of the operations manual of the system; a form for data collection and standardization of operations; supervised data collection and production; related incentives at the health facility, regional and national levels; review of collected data at the regional and central levels; controller decisions built on surveillance data; and feedback to sensors (reporters) on a periodic basis.

Moreover, the EISS is considered to be sentinel surveillance, as data collection will take place from selected sentinel sites, in the form of randomly selected hospitals and PHCC that are expected to receive, manage and report injuries accordingly.

Data collection

Data collection form

A special form has been designed, as a modified version of several validated forms previously used for injury surveillance (*24*,25). The form includes 2 main sections:

- Part 1: General information: health facility code (to be provided by the MoH core team); injury information (date, time, place, intent, nature, mechanism, site, severity); and injured-related personal information (national ID, sex, age, pregnancy [if female], occupation, education, driving under the influence of a substance, mode of arrival, disposition).
- Part 2: Information on the specific type of injury: e.g. road traffic injury (place of injury, injured person, type of vehicle, helmet use, reasons for accident, vehicle condition, climate, driver's characteristics, road characteristics); falls; burns; drown-

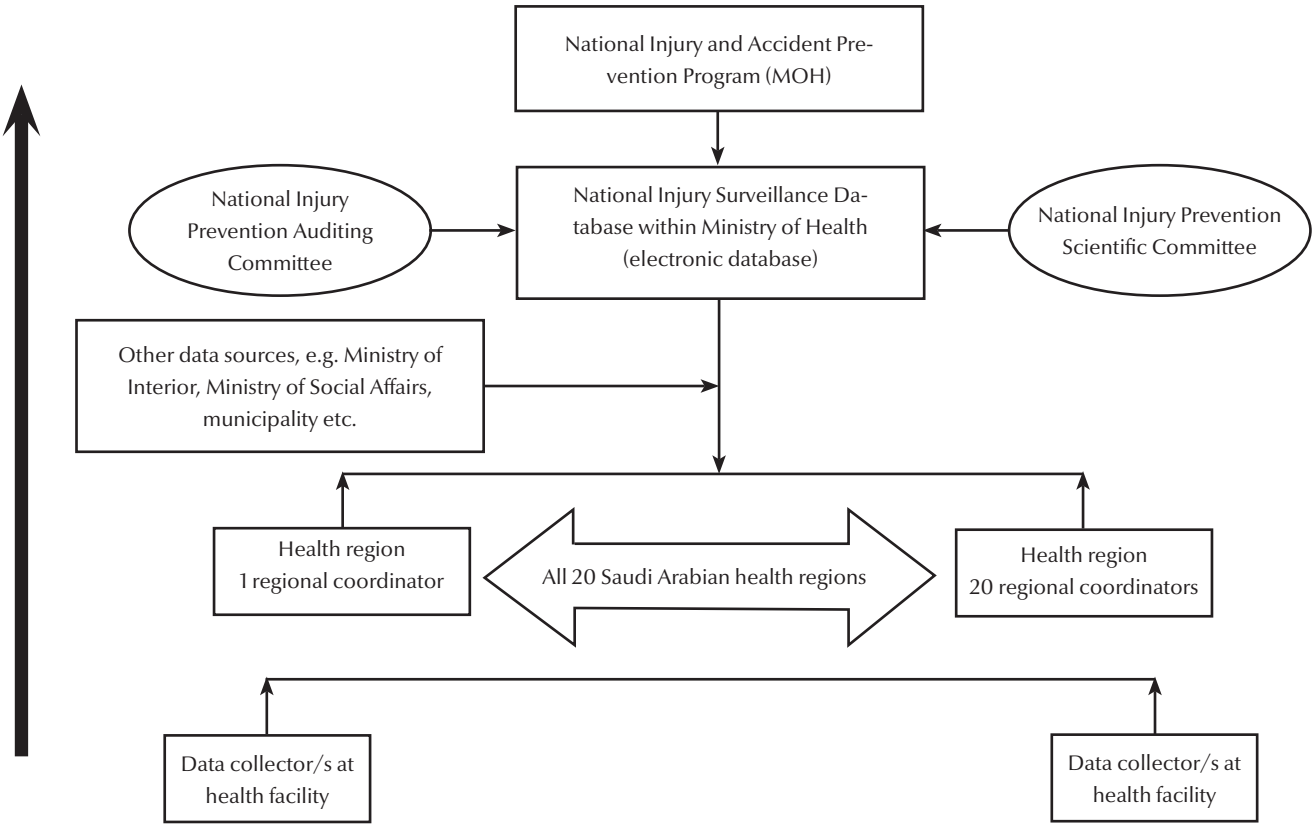

Figure 2 Flow of data during the surveillance process in the electronic injury surveillance system in Saudi Arabia

ing; violent injury (type, method); sports injury (type, contact with others); poisoning (type, mode). Also includes: additional information the respondent wishes to add, not requested by the data collection tool; data collector's code (to be provided by the MoH core team); date and time of completing the form.

Data collection phases

The data collection will be taking place in 2 main phases: a pilot phase and a nationwide phase. The pilot phase will involve a multi-stage stratified random sampling technique, as follows. From each of Saudi Arabia's geographical areas (eastern, northern, western, southern and central) 1 densely populated and 1 less populated health region will be selected (10 in total). This aims at recognizing variations, especially environmental, in terms of culture, climate, transportation facilities, roads, etc. during the pilot phase, which need to be addressed before implementing the system on a larger scale. For the pilot phase a total of 14 health facilities will be selected from each health region as follows: 3 MoH hospitals; 5 PHCC; 1 governmental non-MOH hospital; 1 university hospital; and 1 private hospital; 3 private clinics. These initial sentinel sites will be gradually scaled up in a phased manner.

The nationwide stage will involve all health regions of Saudi Arabia, including hospitals and PHCC, whether belonging to MoH or other health-care agencies, with tertiary-care facilities included.

The electronic system

After design and review of the data collection form, it was transformed into a user-friendly electronic data entry form. It was designed to be used at all levels of the surveillance system. Thus, data collectors at the periphery in hospitals and PHCC will complete and submit the form online, to be reviewed by both the site coordinator and regional coordinator for completeness and accuracy, and edited accordingly. This will form the regional database, which will remain available for regional data management if needed. Thus, regional and local tables and statistics can be produced. After this process, forms will be transmitted to the central offices in Riyadh. All forms received at the central office will be subject to final review before inclusion in the national database. Data management processes include coding, entry, cleaning, analysis and interpretation. Periodic reports are to be produced on an annual or quarterly basis or even sooner as needed. This system also allows real-time information on a regional and national basis, as data are collected for central follow-up in Riyadh, which provides the profile of injuries by class, type, cause and outcome.

Expected outcomes

The EISS is expected to provide comprehensive information on the injury situation in the country including information on the extent and nature of injuries. This information will help planners to allocate resources so as to achieve the greatest impact in preventing injuries, reducing the harm they may inflict, and treating and re-habilitating injured persons. Translated into reports, it is hoped that such data would provide the basis for strategic prevention and control policies and programmes. Specifically, the EISS is expected to provide the necessary national information about:

- epidemiological profile of injuries in Saudi Arabia (magnitude of the problem by type, site, nature and severity of injury, characteristics of specific injuries);
- high-risk populations for injuries (i.e. which kind of people are most likely to incur each type of injury), requiring specific prevention interventions;
- risk factors for injuries (i.e. which exposures contribute to or are associated with which type of injury);
- time trends of injuries in the country (i.e. whether a particular type of injury occurs more or less frequently, and is doing more or less harm);
- periodic calculation of selected injury indicators;
- comparison with data collected by other sectors (e.g. Ministry of Interior);
- identification of priorities for an injury prevention and control programme for decision and policy-makers, which allows needs-based and sound resource allocation;
- assessment of the cost-effectiveness of different implemented interventions;
- further behavioural research that would provide an insight for future interventions targeting injury prevention practices.

As a unique and innovative system for injury surveillance in Saudi Arabia, we expect such a system to be integrated with other existing and relevant surveillance systems, such as those of the MoH (noncommunicable diseases), the Ministry of Interior (police systems) and other health-care delivery agencies' systems. We expect the information generated to assist in sound policy- and decision-making for prevention and control of injuries in Saudi Arabia and thus to have an impact on the national development plans of the country. Moreover, we expect the system, once it is in action, to be a role model for the establishment of similar systems in neighbouring nations in the EMR and abroad.

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WHO events addressing public health priorities

Improving the quality of care and patient safety in the Eastern Mediterranean Region

Health care quality in the EMR: current situation

People attending health care facilities, whether in primary care or hospital, deserve to receive quality health care. Fundamental to health care quality is patient safety. No patient should be at risk of being harmed by the very process of health care.

Member States of the Eastern Mediterranean Region (EMR) have expressed high commitment to improving quality of care. In 2009 they endorsed a Regional Committee resolution EM/RC56/R.6 on improving hospital performance in the Eastern Mediterranean Region (EMR) that recalled resolution EM/RC50/R.9 in 2003, specifically those aspects relating to accreditation of hospitals, and requested WHO to provide technical support and guidance to Member States to improve hospital performance through all available tools, including the WHO framework of management and leadership, and develop a strategic plan for strengthening hospital service management.

However, follow-up activities in the area of quality improvement programmes have been minimal. Few countries have shown progress with the ownership of quality and developed national agencies for monitoring and improving quality. For three countries in the Region the national standards in quality have been approved by Isqua; others have adopted international standards. Some of middle- and low-income countries have started structural and organization preparations for quality improvement.

Most of the work that has been done has addressed patient safety which is noted as a priority for most of the EMR countries in their operational plans. Some progress has been achieved to promote patient safety in EMR; for example, the regional research study on the magnitude and scope of adverse events in 6 EMR countries, as well as the following patient safety interventions being undertaken in the Region and coordinated in WHO-EMRO.

- "Save Lives: Clean Your Hands" where countries are encouraged to register through the WHO website to show their commitment to address health-care acquired infection (HAI) and to use the WHO hand hygiene self-assessment framework for HAI, as well as implement guidelines to prevent and reduce the incidence of HAI.
- "Safe Surgery Saves lives" that aims to reduce the incidence of adverse events in surgery by the compliance with specific standards and the implementation of the WHO safe surgery checklist.
- The WHO-EMRO patient safety friendly initiative whose objective is to develop a culture which approaches patient safety as a comprehensive programme addressing patient safety domains, such as leadership and management, evidence-based practices, patient and family involvement, environmental safety and lifelong learning. This initiative comprises 140 standards classified as critical, core or developmental. An updated version of the Patient safety friendly hospitals initiative assessment manual is now finalized and being expanded throughout the EMR countries.
- The patient safety tool kit that includes the methodology that field teams may refer to and a set of tools (solutions) to support them in reducing patient safety gaps at the institutional level. It includes the most needed patient safety tools to assist teams at the field level especially in the field HAI, safe surgery, medication safety, surgical site infections, inculcating a patient safety culture, and implementing successful incident reporting systems.
- Other interventions address education issues, such as the multi-professional patient safety curriculum guide that is being implemented in some universities in the Region, and the Patient for Patient safety that aims to identify and build the capacities of patient safety champions as advocates for a safer care.

Despite these initiatives and tools, much work remains to be done in the Region. More commitment and leadership for the ownership and actual implementation of patient safety initiatives at the field level is required. There is a huge gap in our knowledge of the status of current quality improvement programmes and indeed the quality in health care in the Region. We need an evaluation of health care quality in the Region and what quality improvements have been made that not only identifies the challenges and gaps, but also the priorities and needed future action.

Addressing the issue

Given the need for information and direction on improving health care quality in the Region, WHO EMRO, in partnership with the Saudi Central Board for Accreditation of Healthcare Institutions, held a regional consultation in Jeddah, Saudi Arabia, in June 2014 to address improving the quality of care and patient safety in EMR countries. The consultation was attended by representatives from the majority of countries of the Region, as well as relevant WHO staff and external experts. The meeting aimed to review the current status of quality and safety of health care in EMR, the initiatives taken and the

existing challenges and gaps in information, discuss various approaches to improving the quality of health care, share successful experiences of selected countries from within and outside the Region and agree concrete actions to be taken to help improve the quality of care in EMR countries.

Challenges identified in the EMR

Although a comprehensive picture for quality and safety is difficult to draw, some of the factors identified as responsible for the suboptimal state of safety and quality in many countries of the Region include:

- The heavy burden of non-quality unsafe care, highly preventable maternal mortality, limited access to healthcare services in some areas, the prevalence of health care associated infections and adverse events.
- The absence of a clear vision and strategic direction to guide and support the implementation of quality and safety interventions.
- The growing role of the private sector, public/private division of the funding and delivery of services.
- The focus on advanced and tertiary care, primarily hospital care, and low interest in primary and preventive health care.
- The focus on disease-centred practices rather than a patient/community-centred approach.
- The absence of institutionalization of quality and safety.

The consultation also addressed quality and patient safety challenges more specifically for the 3 groups of EMR countries, which are summarized in Table 1. EMR countries have been categorized into three groups based on population health outcomes, health system performance and level of health expenditure. Group 1 comprises countries where socioeconomic and health development has progressed considerably over the past decades (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates). Group 2 comprises largely middle-income countries which have developed extensive public health infrastructure but face resource constraints (Egypt, Islamic Republic of Iran, Iraq, Jordan, Lebanon, Libya, Morocco, occupied Palestinian territory, Syrian Arab Republic and Tunisia). Group 3 comprises countries which face constraints in improving population health outcomes as a result of lack of resources, political instability and other complex development challenges (Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen).

The way forward

Progress on improving health care quality and patient safety in the Region has not been optimal. The recommendations below that arose from the consultation provide the countries and WHO with clear and concrete actions to undertake in order to advance health care quality and patient safety in the Region. Committing to and implementing these recommendations should be a priority for both the countries and WHO.

Actions agreed to move forward

1. Build on the previous efforts by the patient safety friendly hospital initiative.
   a. Ministries of health to nominate 1-2 hospitals as pilots for patient safety friendly hospital initiative;
   b. WHO to provide the tools and technical assistance for supporting implementation and disseminate the patient safety assessment manual and complete the patient safety toolkit.
3. Remap the status of health care accreditation in EMR.
   a. WHO to update the regional status of accreditation based on standardized assessment instrument. Countries to provide the requested information on the status of accreditation.
2. Consider the role of clinical governance as a complementary approach to strengthening quality of care and patient safety.
   a. Countries to initiate in pilot hospitals: support the introduction of clinical governance as an approach to reinforce quality and safety, organize appraisal meetings, set up clinical governance committee, establish a feedback process, develop a communication strategy for all staff, set up a group to look at causes of mortality and one to review clinical procedures and practice;
   b. WHO and its external experts to provide the technical back-up and support.
3. WHO to raise the issue of quality and safety at the policy level in EMR countries.
   a. Develop policy briefs on quality and safety and disseminate these widely;
   b. Present the issue of quality and safety in policy forums, such as the Regional Committee;
   c. Bring quality and safety for discussion in national ministerial level forums.
4. Undertake research in the area of quality and safety.
   a. WHO to identify priority areas for research in quality and safety for the three groups of EMR countries
   b. WHO to provide the technical support in undertaking these activities
   c. Countries and WHO to undertake joint efforts at mobilizing resources for research on patient safety.
4. Intensify efforts to establish networks on quality and safety
   a. WHO to establish a network of civil societies from the Region that are engaged in the work on quality and safety and build their capacity in raising the voice of patients and population at the country level
   b. WHO to revive the network of quality and safety experts from the Region in order to provide technical support to countries in establishing quality and safety programmes.

Table 1 Challenges and needed actions to improve quality and safety identified by the participants for the three groups of EMR countries based on population health outcomes, health system performance and level of health expenditure

	Group 1 countries[a]	Group 2 countries[b]	Group 3 countries[c]
Main Challenges	Sustainability of the measures already in progress Lack of expertise in various areas of quality and safety Lack of coordination of primary health care services and improvement of the quality and patient safety in PHC. Low capacity for research and training on patient safety	Lack of national policies & legislation due to political instability and financial limitations Organizational management issues due to centralization of all services and inadequate training on safety Lack of automation of information systems and limited number of skilled human resources Insufficient quality and safety culture at the institutional level with no incident reporting system No revalidation of licences for health care facilities and professionals	External and internal instability, civil war, low priority for health care, quality and patient safety Primary health care : immunization, childhood diseases, unsafe childbirth, access to health care facilities Secondary and tertiary health care: facilities overburdened beyond capacity; limited resources; lack of trained work force Attitude: patient safety/quality perceived as a luxury not a necessity Resistance to change
Required actions	Ensure stronger leadership and governance capacities for quality and safety improvement programmes	Adapt a framework for quality needs and plan with strong political commitment Budget allocation for accreditation programme: capacity building and provision of needed resources Engage civil society and use of universal health coverage in advocacy for quality improvement Improve communication among stakeholders	Data to assess the magnitude of the problem. Standardization and successful implementation of priority programmes System for referral Improvement of the Infrastructure Involvement of the top leadership, ministers of health Training aiming to achieve behavioural change that aims to introduce a culture of quality and safety improvement Data on quality and patient safety and a response system Adopt existing standards and set targets realistic within a defined time frame
How to ensure sustainability	Partnership with NGOs and community involvement Continuous engagement for quality and safety from health care professionals and professional associations	Availability of a national plan for institutionalization of quality; enforcement of laws & regulations; provision of incentives related to performance Involvement of the media and civil society Engagement of health care professionals	Clear vision, insight and commitment of the leadership Directorate/departments dedicated to patient safety/quality training. Regulations Policies Audits Accountability
WHO support	Assist in capacity building and research Build partnership with training and education institutions	Assist in identification of gaps & in analysis Advocate for buy-in by decision-makers Activate projects like the Performance Assessment Tool for Hospitals, patient safety friendly hospital initiative, etc. Network for benchmarking	Provide technical support Advocate for pledges and commitments Conduct seminars & workshops for leadership.

[a] *Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.*
[b] *Egypt, Islamic Republic of Iran, Iraq, Jordan, Lebanon, Libya, Morocco, occupied Palestinian territory, Syrian Arab Republic and Tunisia.*
[c] *Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen.*

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Contents