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المجلة الصحية لشرق المتوسط

La Revue de Santé de la Méditerranée orientale

Strengthening Primary Health Care through family practice-based model of care is an essential bedrock in achieving Universal Health Coverage. However, the shortage of family practitioners in most countries of the Eastern Mediterranean Region remains a daunting challenge. To overcome the shortage of family practitioners, the World Health Organization Regional Office for the Eastern Mediterranean has launched a 12-month regional professional diploma in family medicine as a bridging programme to upgrade the skills of general physicians.

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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 في الصحة العامة والخدمات الصحية والترويج لها، ولتبادل الآراء والمفاهيم والمعطيات الوبائية ونتائج الأبحاث وغير ذلك من المعلومات، وخاصة ما يتعلق منها بإقليم شرق المتوسط. 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.

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Editorial

Research articles

Reviews

WHO events addressing public health priorities

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Promoting family practice-based model of care: the role of WHO's professional diploma in family medicine in the Eastern Mediterranean Region

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Strengthening Primary Health Care (PHC) through family practice-based model of care is an essential bedrock in achieving Universal Health Coverage (UHC), as called for in Sustainable Development Goal (SDG) 3, target 3.8 (1). However, the shortage of family practitioners worldwide and in most countries of the Eastern Mediterranean Region (EMR) is a daunting challenge. The current production rate of family physicians in the EMR is around 700 annually, against the needed estimate of 21 000 physicians per year based on one family physician/1300 population and the current EMR population growth rate, which reflects the huge shortage of family physicians in the Region (2).

In addition to securing the production of qualified family physicians, most EMR countries face a daunting challenge of upgrading the skills of thousands of existing general physicians, without any formal postgraduate training, who have been providing health services based on their basic medical training. Multi-pronged strategies are needed to address the shortage of family practitioners in the Region. Education and training strategies include early introduction of family medicine rotation in undergraduate medical curricula, increasing the production of family physicians through well-structured tailored postgraduate training programmes, and offering well designed, short-term bridging programmes as a transitional solution in order to upgrade general physicians to those with a family practice orientation (3).

To overcome the shortage of family practitioners, the World Health Organization Regional Office for the Eastern Mediterranean (WHO/EMRO), in collaboration with the American University of Beirut (AUB) and the World Organization of Family Doctors (WONCA), launched a 12-month regional professional diploma in family medicine as a bridging programme to upgrade the skills of general physicians. This diploma was endorsed by the Eastern Mediterranean Regional Committee in 2016 (4).

The regional diploma was specially designed to suit the needs of full-time employed general physicians through a blended learning approach. The curriculum was mapped against the competencies of Family Medicine as defined by WONCA, Accreditation Council for Graduate Medical Education (ACGME) and the College of Family Physicians of Canada for Family Medicine. However, the diploma is not a replacement for full-time postgraduate programmes, often consisting of 3 to 4 years of structured training to produce specialized family physicians. It simply provides an opportunity for existing general physicians to enhance their understanding of the basic principles and practice of family medicine in order to transform their existing practices into a family practice-based model of care and allow countries in the EMR to address the gap in family physicians' production in a realistic time frame.

The WHO/EMRO Regional Director has formulated a Steering Committee for promoting family practice in the EMR. The Steering Committee acts as a governing body for the implementation of the diploma programme. It sets standards for programme implementation at the institutional level; develops measurable criteria for ensuring the quality of programme; and grants approval to the institutions to implement the programme. The Committee has members from the Regional Office, partner organizations and academic institutions.

Introducing such a programme in Member States requires effective leadership, coordination, commitment, and multi-pronged strategies, both from the WHO secretariate and its Member States. In response, WHO/EMRO has adopted multiple strategies to introduce

the diploma in the Region. These strategies include involving national, regional, and global stakeholders in family medicine, conducting situation analysis of family medicine in individual countries, and developing national strategies to introduce the programme, based on countries' specific needs. Since 2020, WHO has also signed collaboration agreements with institutions in Member States including Bahrain and Pakistan, to support implementation of the diploma. In addition, several Training of Trainers workshops were conducted to introduce the diploma programme to family medicine potential trainers, to be followed by similar capacity building activities.

Despite this progress, the introduction of the regional diploma is facing numerous challenges, including recognition/accreditation by regulatory bodies, limited number of academic institutions interested in implementing the programme, linking the diploma with career prospects, availability and quality of training sites, potential resistance from board certified family physicians' community, and the substantial impact of the COVID-19 pandemic. WHO/EMRO recently signed a collaborative agreement with the Arab Board of Health Specializations to enhance the implementation of the diploma programme through utilization of the Arab Board expertise and extensive network of accredited training centers in most of the Region's Members States. The Arab Board is also working on standardizing the diploma to better address regulatory requirements and the quest for career progression. Working together, WHO and the Arab Board can secure a favourable environment and a wider professional acceptance for the introduction of the diploma programme.

The horizon for the family medicine diploma is encouraging; the diploma presents a perfect fit to the strategic priorities of the WHO/EMRO's 'Vision 2023: Health for All by All' (5) to expand UHC – especially in PHC facilities – build public health capacities, and strengthen partnerships.

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Epidemiological characteristics of COVID-19 cases among Indians residing in Kuwait

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has rapidly spread to most countries around the world. Disproportionate spread of COVID-19 among the Indian community in Kuwait prompted heightened surveillance in this community.

Aims: To study the epidemiological characteristics of COVID-19 patients and their contacts among the Indian community in Kuwait.

Methods: Data collection was done as a part of contact tracing efforts undertaken by the Kuwaiti Ministry of Health.

Results: We analysed contact-tracing data for the initial 1348 laboratory-confirmed Indian patients and 6357 contacts (5681 close and 676 casual). The mean (standard deviation) age of the patients was 39.43 (10.5) years and 76.5% of the cases were asymptomatic or had only mild symptoms. Asymptomatic patients were significantly older [40.05 (10.42) years] than patients with severe symptoms [37.54 (10.54) years] (P = 0.024). About 70% of the patients were living in shared accommodation. Most of the close contacts were living in the same household, as compared with casual contacts, who were primarily workplace contacts (P < 0.001). Among the different occupations, healthcare workers had the highest proportion of cases (18.4%). Among the 216 pairs of cases with a clear relationship between the index and secondary cases, the mean serial interval was estimated to be 3.89 (3.69) days, with a median of 3 and interquartile range of 1–5 days.

Conclusion: An early increase in the number of COVID-19 cases among the Indian community could be primarily attributed to crowded living conditions and the high proportion of healthcare workers in this community.

Keywords: contact tracing, COVID-19, epidemiology, Kuwait, SARS-CoV-2.

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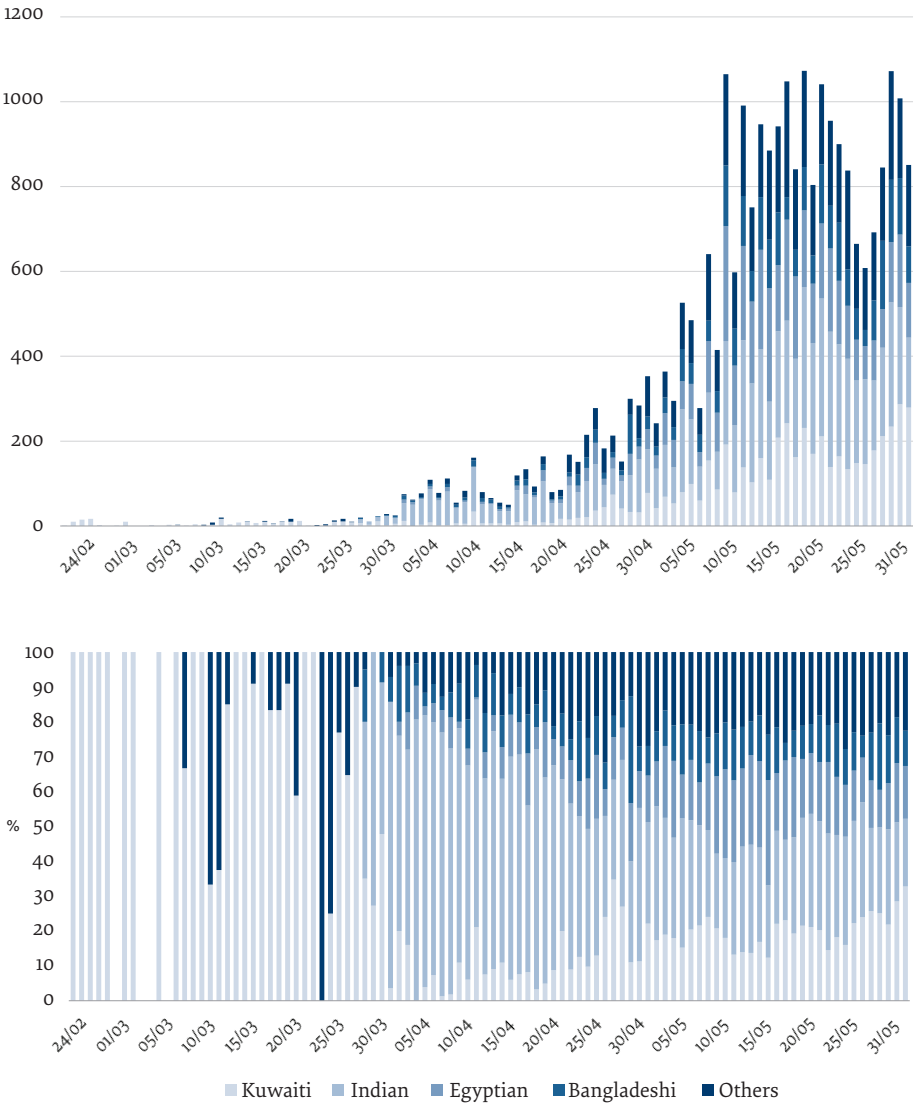
Introduction

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has rapidly spread to most countries around the world. Over 35.6 million cases of COVID-19, including > 1 million deaths, had been reported worldwide as of 8 October, 2020 (*1*). Experience from countries like the United States of America and Italy has demonstrated how quickly the healthcare system can be overwhelmed if the number of cases keeps increasing. Epidemiological models of the spread of SARS-CoV-2 suggest that, unless robust community containment measures are adopted, 40–70% of the population could become infected (*2*).

The first reported case of COVID-19 in Kuwait occurred in the last week of February 2020. As of 8 October, 2020, the Kuwaiti Ministry of Health (MoH) had reported about 109 000 confirmed COVID-19 cases, including 639 deaths, with a recovery rate of 92.7% and fatality rate of 0.6% (*3*). The initial cases were mostly related to international travel, but soon with the emergence of local transmission, the disease began to spread rapidly throughout the country (Figure 1). Various public health measures have been successfully implemented by countries to contain COVID-19. The World Health Organization (WHO) recommends a combination of measures: rapid diagnosis and immediate isolation of cases, and rigorous tracking and precautionary self-isolation of close contacts (*4*). Peto suggested that a policy of population-wide testing and contact tracing would help to rapidly end the pandemic (*5*). Several countries have credited aggressive contact tracing in containing the spread of the pandemic (*6,7*).

A recent study that used a stochastic transmission model of COVID-19 predicted that 70% of contacts should be traced and quarantined to control a pandemic, if the basic reproduction number (R_0) is assumed to be 2.5 (*8*). A recent review of 12 studies form China and overseas estimated the mean R_0 for COVID-19 to be around 3.28, with a median of 2.79 (*9*). This indicates that 50–70% of possible transmissions should be prevented to bring the R_0 value to < 1, which would then result in flattening the epidemic curve (*8*).

Figure 1 Daily number and percentage distribution of COVID-19 cases by nationality in Kuwait (February–May 2020)



Kuwait adopted a strategy of using widespread testing and isolation of cases followed by contact tracing and quarantine of the contacts. There was a clear pattern in the communities affected with COVID-19. In the first few weeks of April 2020, as high as 80% of the total COVID-19 cases in Kuwait were among Indians (Figure 1). By the end of May 2020, the distribution of COVID-19 was about 30% among Indians, followed by Kuwaitis (20%), Egyptians (18%) and Bangladeshis (11%) and other communities (21%) (3). It was necessary to conduct a detailed analysis of the characteristics of the initial cases of COVID-19 affecting Indians to gain better understanding of the causes for the disproportionate spread of the disease in this community.

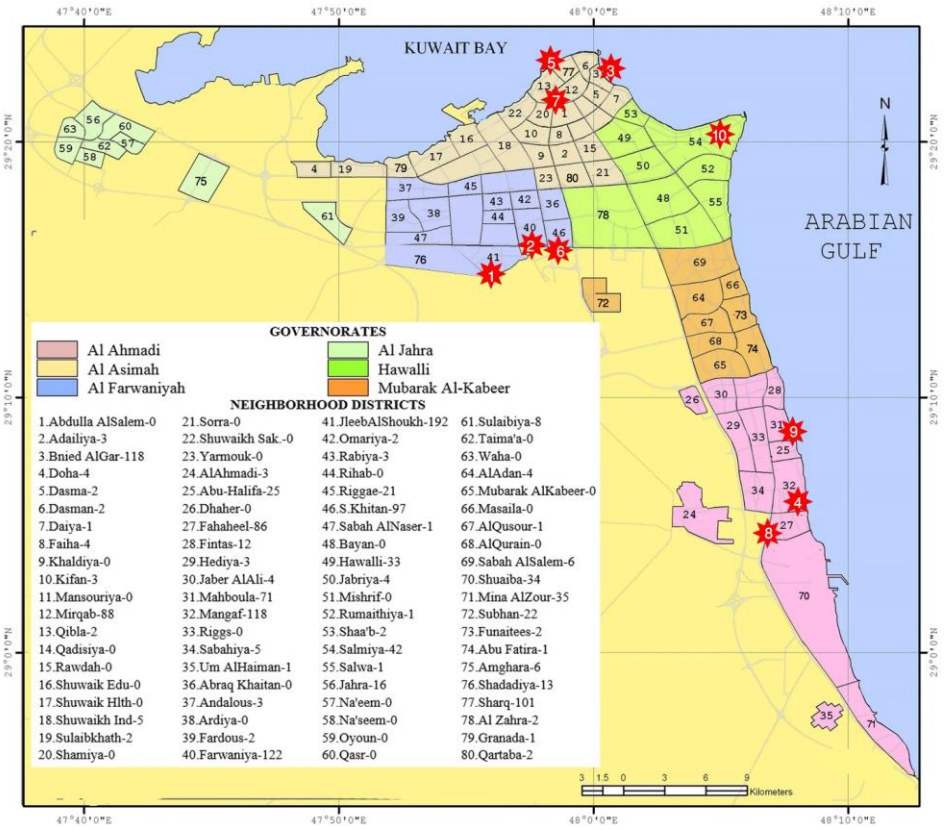
Using the data obtained through contact tracing (February to May 2020), we present the demographic characteristics of the initial 1348 COVID-19-positive Indian patients and 6357 of their contacts.

Methods

Kuwait's surveillance and contact tracing strategy

Data collection was done as a part of contact tracing efforts undertaken by the MoH for surveillance purposes. Review Board approval for this case series study was obtained from the Research Sector of the MoH. Verbal consent was obtained from all patients and their contacts. Suspected cases and their close contacts were tested for SARS-CoV-2 by reverse transcription polymerase chain reaction (RT-PCR) of nasal/throat swabs at the MoH-designated COVID-19 testing centres. All confirmed cases that were asymptomatic were isolated at the central facilities and those who were symptomatic were admitted to the designated area hospitals. Any individual with symptoms after exposure to the case was referred to hospital

Figure 2 Mapping of COVID-19 Indian patients in Kuwait until 31 May 2020. The top 10 districts with the highest number of cases are listed in order (highest to lowest)



for isolation and testing as part of active case finding. Close contacts were all placed under mandatory quarantine for 14 days from their last date of exposure and were either shifted to designated centres or advised to self-isolate.

Definitions

A confirmed case was a person with laboratory confirmation of SARS-CoV-2 by RT-PCR, irrespective of clinical signs and symptoms. Cases exhibiting signs of respiratory distress or any other severe disease complications that required hospitalization for management were classified as severe cases (*10*). A close contact was anyone who had spent > 15 minutes in direct face-to-face contact within 2 m of a confirmed case, lived in the same household, or shared any leisure or professional activity in close proximity with a confirmed case without appropriate personal protective equipment in any setting, 2 days before symptom onset (or, for asymptomatic patients, 2 days prior to positive specimen collection) until the time the confirmed case was isolated. A casual contact was a person who had a close (< 2 m) but brief contact (< 15 min) with a confirmed case, or a distant (> 2 m) contact in public settings, or any other contact in settings that did not match with the previous definition of close contact.

Workflow for contact tracing

A central command centre for conducting contact tracing was established by the Public Health Department, MoH, Kuwait. Contact tracing of Indian patients posed additional challenges due to the different languages spoken by the community. The MoH decided to train voluntary Indian healthcare professionals, speaking different Indian languages, to conduct contact tracing. A total of 71 voluntary doctors/dentists were trained to conduct contact tracing using standardized interview schedules.

Field coordinators received the daily list of laboratory-confirmed SARS-CoV-2-positive Indian cases from the MoH. Multilingual coordinators contacted the cases and recorded the patients' preferred language for communication and then assigned the cases to the volunteer doctors for contact tracing. Assigned volunteers contacted the patients by telephone and collected the movement history 2 days prior to symptom onset until isolation. The following data were collected from every patient: demographic characteristics, travel history, date of onset of symptoms, date of testing, date of isolation and details of contacts.

In the next stage, the volunteers contacted all the close and casual contacts of the patients and advised them appropriately. Close contacts were advised home

quarantine for 14 days after their last exposure to the patient. All contacts were advised to go for testing if they developed any relevant symptoms and the details of the nearest COVID-19 testing centre were provided. Information collected was entered into a predesigned form and was submitted back to the MoH after cross-verification. The entire process was conducted in a time-bound manner. The MoH passed on the relevant information to its field teams to facilitate isolation of cases and quarantine of contacts. Volunteer teams also helped the MoH to identify new COVID-19 hotspots and high-risk cases/contacts.

Statistical analysis

Statistical analysis was carried out using IBM SPSS Statistics for Windows version 25.0 (Armonk, NY, USA). Analyses included frequency distributions, χ^2 and Fisher's exact tests when categorical variables were compared and *t*-tests for continuous variables.

Results

Characteristics of the initial COVID-19 Indian patients

We analysed the contact tracing data for the initial 1348 laboratory-confirmed cases of COVID-19 among Indian patients and 6357 contacts (5681 close and 676 casual). The median number of contacts per case was 4 (range 0–21). Geographical distribution according to the place of residence of the cases in each of the 6 Governorates of Kuwait is shown in Figure 2. Most patients belonged to the Indian states of Kerala (35%), Rajasthan (14%), Tamil Nadu (9%) and Andhra Pradesh (9%). Among the 1348 confirmed cases of COVID-19, 1031 (76.5%) were asymptomatic or had only mild symptoms and 317 (23.5%) had severe symptoms (Table 1). The mean (standard deviation) age of the patients was 39.43 (10.5) years. Asymptomatic patients were significantly older [40.05 (10.42) years] than patients who had severe symptoms [37.54 (10.54) years] ($P = 0.024$). Most (68.8%) of the patients were living in shared accommodation. There was no significant difference between severe and mild cases in relation to their type of accommodation. Among the different occupations, healthcare workers had the highest proportion of cases (18.4%) and unemployed individuals had the least (4.1%). The mean time interval from symptom onset (or, positive specimen collection for asymptomatic patients) to isolation was 3.78 (4.57) days [median 3 days and interquartile range (IQR) 1–6 days]. Less than 5% of the cases were isolated before symptom onset and most cases (65.5%) were isolated between days 1 and 10. There was a significant difference between symptomatic and asymptomatic patients in relation to the date of isolation ($P < 0.001$). Most symptomatic patients were isolated on the date they knew about the test results, and most asymptomatic patients were isolated before day 10. A higher percentage of asymptomatic patients (11.6%) were not isolated even after day 10 compared to symptomatic patients (4.0%).

Characteristics of contacts

About 90% of the contacts traced were categorized as close contacts (Table 2). There was a significant difference in the age distribution between close and casual contacts, with a higher proportion of close contacts belonging to the younger age group ($P < 0.001$). Similarly, a higher percentage of close contacts were males ($P = 0.002$) and lived in shared accommodations ($P < 0.001$). Most of the close contacts were individuals living in the same household, as compared with casual contacts, who were primarily workplace contacts ($P < 0.001$).

Index and secondary case pairs

There were 216 pairs of cases with a clear relationship between the index and secondary cases (Table 3). Based on the difference in the time of onset of symptoms between the 2 groups, the mean serial interval (the time from illness onset in the index case to illness onset in a secondary case) was estimated to be 3.89 (3.69) days (median 3 days, IQR 1–5 days).

Discussion

Our analysis of the initial COVID-19 cases among Indians in Kuwait and their close contacts provides valuable insights into the epidemiological characteristics of the pandemic in this community. Many unique characteristics that might have contributed to the rapid spread of the disease were observed among the cases.

We calculated the mean serial interval to be about 3.89 days, which is similar to the values reported by Zhao et al. (*11*) and Nishiura et al. (*12*), who estimated a serial interval of 4.4 and 4.0 days, respectively. However, initial studies from Wuhan, China estimated the mean serial interval to be 7.5 days, based on contact tracing data (*13*). Estimates of the serial interval are obtained by linking the dates of onset for infector–infectee pairs, which are difficult to establish and might explain the variations across populations. Several studies have calculated the serial interval of COVID-19 to be shorter than the mean incubation period of the disease, which indicates rapid cycles of transmission and substantial presymptomatic transmission (*12*).

The highest number of cases were reported among healthcare workers as compared with all other professions. A high proportion of the nursing staff in Kuwait are Indians (*14,15*). Nurses are often the front-line workers managing COVID-19 patients. The high number of cases among healthcare workers put unprecedented strain on the healthcare system. The WHO has issued guidelines for protection of healthcare workers that recommend contact and droplet precautions for those caring for suspected COVID-19 patients (*16*). However, a recent study has shown that airborne precautions are more efficacious in protecting healthcare workers even when infections are assumed to be spread by the droplet route (*17*). Since the ability of a country to respond effectively to COVID-19 relies on its healthcare

Table 1 Demographic characteristics of COVID-19-positive cases

Variables	Total (*n* = 1348) *n* (%)	Mild symptoms/asymptomatic (*n* = 1031) *n* (%)	Severe symptoms (*n* = 317) *n* (%)	*P* (χ^2)
Age (yr)				
0–9	12 (0.9)	9 (0.9)	3 (0.9)	0.024
10–19	9 (0.7)	5 (0.5)	4 (1.3)	
20–29	202 (15.0)	140 (13.6)	62 (19.6)	
30–39	487 (36.2)	364 (35.4)	123 (38.9)	
40–49	397 (29.5)	318 (30.9)	79 (25.0)	
50–59	196 (14.6)	159 (15.5)	37 (11.7)	
≥ 60	42 (3.1)	34 (3.3)	8 (2.5)	
Missing values	3 (0.2)	2 (0.1)	1 (0.3)	
Sex				
Male	1141 (84.6)	891 (86.4)	250 (78.9)	0.002
Female	207 (15.4)	140 (13.6)	67 (21.1)	
Accommodation				
Shared	927 (68.8)	704 (68.3)	223 (70.3)	0.27
Independent	421 (31.2)	327 (31.7)	94 (29.7)	
Occupation				
Healthcare worker	216 (18.4)	153 (17.0)	63 (23.2)	0.11
Industry – blue collar	179 (15.2)	138 (15.3)	41 (15.1)	
Technician	161 (13.7)	129 (14.3)	32 (11.8)	
Transportation	122 (10.4)	94 (10.4)	28 (10.3)	
Marketing	113 (9.6)	84 (9.3)	29 (10.7)	
Unskilled	100 (8.5)	73 (8.1)	27 (9.9)	
Administration	93 (7.9)	82 (9.1)	11 (4.0)	
Industry – white collar	91 (7.8)	74 (8.2)	17 (6.3)	
Services	51 (4.3)	39 (4.3)	12 (4.4)	
Unemployed	48 (4.1)	36 (4.0)	12 (4.4)	
Missing values	174 (12.9)	129 (12.5)	45 (14.2)	
Date of isolation				
Before symptom onset	58 (4.7)	58 (5.8)	0 (0.0)	<0.001
On day of symptom onset/testing	247 (19.8)	120 (12.1)	127 (50.6)	
1–10 d after symptom onset/ testing	815 (65.5)	701 (70.5)	114 (45.4)	
Not isolated or isolated > 10 d after symptom onset/testing	125 (10.0)	115 (11.6)	10 (4.0)	
Missing values	103 (7.6)	37 (3.6)	66 (20.8)	

workforce, it is of paramount importance to ensure a safe work environment for healthcare workers.

Most of the patients were either asymptomatic or had mild symptoms, which is similar to the reports from other countries (*18*,*19*). When a substantial proportion of cases are asymptomatic, prevention becomes extremely challenging. Also, unlike SARS, for which most transmission occurred after symptom onset (*20*), COVID-19-positive cases are infectious even before symptom onset (*21*). He et al. (*22*) reported that > 40% of the of secondary cases were infected during the presymptomatic stage of the index cases. This contributes to the rapid spread of the disease, especially when public health measures are not strictly enforced. Since most of the cases were employed, workplace safety was given high priority. Kuwait was quick to adopt a nationwide policy of social distancing and compulsory wearing of facemasks in all public spaces and workplaces, which was enforced in early May.

For contact tracing to be effective, secondary cases should be discovered before they become infectious; hence the time from the primary case becoming infectious to the tracing of their contacts needs to be shorter than the incubation period (*23*). As recommended by the WHO, isolation of cases (either self- or hospital isolation) soon after disease confirmation is important to minimize the

Table 2 Demographic characteristics of close and casual contacts of COVID-19-positive cases

Variables	Total (*n* = 6357) *n* (%)	Close contacts (*n* = 5681) *n* (%)	Casual contacts (*n* = 676) *n* (%)	*P* (χ^2)
Age (yr)				
0–9	232 (5.3)	230 (5.8)	2 (0.5)	<0.001
10–19	118 (2.7)	118 (3.0)	0 (0.0)	
20–29	741 (16.9)	688 (17.3)	53 (13.4)	
30–39	1671 (38.1)	1492 (37.4)	179 (45.1)	
40–49	1087 (24.8)	977 (24.5)	110 (27.7)	
50–59	432 (9.9)	386 (9.7)	46 (11.6)	
≥ 60	100 (2.3)	93 (2.3)	7 (1.8)	
Missing values	1976 (31.1)	1697 (29.9)	279 (41.3)	
Sex				
Male	5123 (81.8)	4618 (82.3)	505 (77.6)	0.002
Female	1138 (18.2)	992 (17.7)	146 (22.4)	
Missing values	96 (1.5)	71 (1.2)	25 (3.7)	
Accommodation				
Shared	3808 (87.3)	3682 (87.9)	126 (72.8)	<0.001
Independent	553 (12.7)	506 (12.1)	47 (27.2)	
Missing values	1996 (31.4)	1493 (26.3)	503 (74.4)	
Place of contact				
Home	4783 (75.2)	4645 (81.8)	138 (20.4)	<0.001
Work	1432 (22.5)	938 (16.5)	494 (73.1)	
Home and work	83 (1.3)	83 (1.5)	0 (0.0)	
Community	59 (0.9)	15 (0.3)	44 (6.5)	

spread of infection (*24*). The average time to isolation in this study was 3.78 days which is similar to time reported in other studies. Bi et al. (*25*) reported a mean time to isolation of 4.6 days and 2.7 days for symptom-based and contact-based surveillance groups, respectively.

According to He et al. (*22*), the highest viral loads were detected soon after symptom onset, which then gradually decreased towards the detection limit at about day 21. Since most patients in this study were living in shared accommodation, this could have contributed towards the rapid spread of the disease in this community. The MoH undertook several measures to avoid a delay in isolation. A 24/7 COVID-19 telephone hotline was introduced, where the patients could call for information and assistance. Dedicated ambulance services were employed to transfer suspected or confirmed cases of COVID-19. However, due to the sudden increase in numbers of cases, the healthcare system in Kuwait was quickly overwhelmed. The MoH quickly responded by opening new field hospitals to meet the increasing demand for hospital beds.

One of the most important public health measures to control the spread of infectious diseases is contact tracing (*23*). From the initial days of the pandemic, the MoH focused its efforts on widespread testing and isolation followed by contact tracing and quarantine of contacts. Contact tracing helps to identify contacts, who are then advised to quarantine (*26*). Contact tracing was largely credited with the success in controlling the 2003 SARS pandemic. The MoH cast a wide net while conducting contact tracing to identify all the contacts of the cases. To achieve this goal, the definition of contacts included 2 days prior to symptom onset of the case, as has been done in Hong Kong and Mainland China (*8*). Based on the daily analysis of the data obtained through contact tracing, the MoH was able to identify the hot spots and prioritize assistance (Figure 2).

Several community containment measures were initiated in Kuwait, such as mass fever screening, border restrictions, full/partial curfew, quarantine of buildings, community education and precautions, in addition to multiple social and economic activity restrictions to suppress transmission. Stringent border control measures helped to reduce the number of imported cases, which could have initiated multiple new local chains of transmission. Kuwait instituted nationwide complete lockdown from 10 to 31 May 2020 and currently has enforced partial lockdown. Lockdowns help by reducing the movement of people and, coupled with widespread testing and contact tracing, contribute to limiting the spread of the disease. A study from Italy reported that strict enforcement of a nationwide lockdown significantly contributed to reducing the number of new cases (*27*). In addition, the MoH expanded testing to include sentinel locations such as supermarkets, gas

Table 3 Characteristics of 216 pairs of cases with a clear relationship between the index and secondary cases

Variables	No. of index cases (n = 174)[a] n (%)	No. of secondary cases (n = 261)[a] n (%)
Age (yr)		
0–9	0 (0.0)	7 (2.7)
10–19	0 (0.0)	6 (2.3)
20–29	21 (12.1)	60 (23.1)
30–39	65 (37.4)	101 (38.5)
40–49	50 (28.7)	58 (22.3)
50–59	31 (17.8)	21 (8.1)
≥ 60	7 (4.0)	8 (3.0)
Sex		
Male	149 (85.6)	218 (83.5)
Female	25 (14.4)	43 (16.5)
Accommodation		
Shared	128 (73.6)	210 (80.5)
Independent	46 (26.4)	51 (19.5)
Occupation		
Healthcare worker	33 (19.0)	35 (14.8)
Industry – blue collar	15 (8.6)	31 (13.1)
Technician	25 (14.4)	36 (15.2)
Transportation	15 (8.6)	19 (8.0)
Marketing	19 (10.9)	31 (13.1)
Unskilled	10 (5.7)	17 (7.2)
Administration	13 (7.5)	20 (8.4)
Industry – white collar	14 (8.0)	15 (6.3)
Services	10 (5.7)	12 (5.1)
Unemployed	2 (1.1)	21 (8.9)
Missing Values	18 (10.3)	24 (9.2)
Symptoms		
Asymptomatic/mild symptoms	127 (73.0)	158 (60.5)
Severe symptoms	47 (27.0)	103 (39.5)

[a]*Some index cases had > 1 secondary cases*

stations, and other critical locations that involved high levels of human interaction, to identify areas that could have been involved in community spread of COVID-19. Multiple surveillance mechanisms are required to ensure wide coverage because each missed case can initiate a new chain of transmission (*28*).

One of the major strengths of this study was the large number of cases that were analysed. Also, language competence between the interviewer and the patients was ensured, which is essential while conducting telephone interviews. The present study had some limitations. Firstly, there was potential for recall bias as data collection was done through telephone interviews. However, considering the circumstances, telephone data collection can be considered as a pragmatic and feasible option. Secondly, we used 2 days before symptom onset as the starting date for contact tracing in contrast to some studies that used 4 days (*21*). Reducing the time period in the definition of a contact might have increased the risk of undetected contacts. However, this may not have been significant in this population as most of the contacts were household contacts. Thirdly, cases were identified from a daily list obtained from the MoH. As a result, there may have been selection bias, where individuals belonging to a certain region or occupation were prioritized for contact tracing. Finally, as with any pandemic response, the initial surveillance was primarily symptom-based, therefore, it is likely that asymptomatic cases would have been missed. These limitations limit our ability to generalize the results.

Conclusions

An early increase in the number of COVID-19 cases among the Indian community in Kuwait could be primarily attributed to crowded living conditions and the high proportion of healthcare workers in this community. Aggressive contact tracing followed by immediate isolation of cases and quarantine of close contacts play a vital role in breaking the local chains of transmission. However, contact tracing is a resource-intensive activity that is difficult to sustain in the long run. Also, the longer the pandemic lasts, the higher will be community transmission, making it difficult to link the contacts with cases.

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Caractéristiques épidémiologiques des cas de COVID-19 chez les Indiens résidant au Koweït

Résumé

Contexte : La pandémie de maladie à coronavirus 2019 (COVID-19) s'est rapidement propagée vers la plupart des pays du monde. La propagation disproportionnée de la COVID-19 au sein de la communauté indienne du Koweït a incité à une surveillance accrue de cette communauté.

Objectifs : Étudier les caractéristiques épidémiologiques des patients atteints de COVID-19 et de leurs contacts au sein de la communauté indienne du Koweït.

Méthodes : La collecte des données a été effectuée dans le cadre des efforts de traçage des contacts menés par le ministère de la Santé koweïtien.

Résultats : Nous avons analysé les données relatives à la recherche des contacts pour les 1348 patients indiens initiaux confirmés en laboratoire et les 6357 contacts (5681 contacts rapprochés et 676 occasionnels). L'âge moyen (écart type) des patients était de 39,43 ans (10,5) et 76,5 % des cas étaient asymptomatiques ou ne présentaient que des symptômes légers. Les patients asymptomatiques étaient significativement plus âgés [40,05 ans (10,42)] que les patients présentant des symptômes graves [37,54 ans (10,54)] p = 0,024). Environ 70 % des patients résidaient dans un logement partagé. La plupart des contacts rapprochés vivaient dans le même foyer, alors que les contacts occasionnels étaient principalement des contacts sur le lieu de travail (p < 0,001). Parmi les différentes professions, les agents de santé présentaient la plus forte proportion de cas (18,4 %). Sur les 216 paires de cas présentant une relation claire entre le cas index et le cas secondaire, l'intervalle sériel moyen a été estimé à 3,89 jours (3,69), avec un intervalle médian de 3 et un intervalle interquartile de 1 à 5 jours.

Conclusion : Une augmentation précoce du nombre de cas de COVID-19 au sein de la communauté indienne pourrait être principalement attribuée aux conditions de surpeuplement des logements et à la forte proportion d'agents de santé dans cette communauté.

الخصائص الوبائية لحالات الإصابة بمرض كوفيد-19 بين الهنود المقيمين في دولة الكويت

جاجان باسكارادوس، عائشة السميط، شاهر مالك، جيتندرا أريجا، أمريتا جيفارجيز، روي فرانسيس، آجاي فازيودان، راجيش ألكسندر، برامود مينون، سحر بهزادي، فاطمة الوهيب، فهد الغملاس، محمد الصيادين، بثينة المظف

الخلاصة

الخلفية: انتشرت جائحة مرض فيروس كورونا 2019 (كوفيد-19) بسرعة في معظم بلدان العالم. وأدى الانتشار المفرط لمرض كوفيد-19 بين الجالية الهندية في الكويت إلى زيادة الترصد في هذا المجتمع.

الأهداف: هدف هذا البحث الى دراسة الخصائص الوبائية لدى مرضى كوفيد-19 ومُخالِطيهم في الجالية الهندية بالكويت.

طرق البحث: جُمِعَت البيانات في إطار جهود تتبُّع المُخالِطين التي قامت بها وزارة الصحة الكويتية.

النتائج: حلَّلنا بيانات تتبُّع المُخالِطين لعدد أولي شمل 1348 مريضًا هنديًا مؤكَّدة إصابتهم مختبريًا و6357 من المُخالِطين (5681 من المُخالِطين مخالطة مقربة و676 من المُخالِطين مخالطة عارضة). وبلغ متوسط عمر المرضى (الانحراف المعياري) 39.43 (10.5) عامًا، وكان 76.5٪ من الحالات عديمة الأعراض أو لَديهم أعراض خفيفة فقط. وكان المرضى عديمو الأعراض أكبر سنًا بكثير [40.05 (10.42) عامًا] من المرضى الذين يعانون من أعراض وخيمة [37.54 (10.54) عامًا] (الاحتمالية = 0.024). وكان نحو 70٪ من المرضى يعيشون في أماكن إقامة مشتركة. وكان معظم المُخالِطين المقربين يعيشون في المنزل نفسه، مقارنة بالمُخالِطين الذين كانوا على اتصال عارض بالمرضى في محل العمل في المقام الأول (الاحتمالية < 0.001). ومن بين المهن المختلفة، كانت أعلى نسبة للحالات بين العاملين في مجال الرعاية الصحية (18.4٪). ومن بين 216 زوجًا من الحالات ذات العلاقة الواضحة بين الحالات المرجعية والثانوية، قُدِّر متوسط الفاصل المتسلسل بما يبلغ 3.89 (3.69) يومًا، بمتوسط 3 أيام والمدى الربيعي 1–5 أيام.

الاستنتاج: يمكن أن تعزى الزيادة المبكرة في عدد حالات الإصابة بمرض كوفيد-19 بين الجالية الهندية في المقام الأول إلى الظروف المعيشية المزدحمة والنسبة المرتفعة للعاملين في مجال الرعاية الصحية في هذه الجالية.

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Determining the risk factors associated with delayed sputum conversion at the end of the intensive phase among tuberculosis patients

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Abstract

Background: In pulmonary tuberculosis (PTB), the sputum conversion rate at 2 months is frequently used to evaluate treatment outcomes and effectiveness of a TB control programme.

Aims: The study aimed to estimate the rate of delayed sputum conversion and explore its predicting factors at the end of the intensive phase among smear-positive PTB (PTB +ve) patients.

Methods: A 3-year retrospective study was conducted in the government hospital in Pulau Pinang from 2016 to 2018. During the study, a standardized, data collection form was used to collect data from the patient record. Patients aged over 18 years were recruited. Multivariable logistic regression analysis was used to identify significant independent variables associated with delayed sputum conversion.

Results: A total 1128 of PTB patients were recorded visiting the TB clinic, 736 (65.2%) were diagnosed as PTB +ve; of these, 606 (82.3%) PTB +ve had a record of sputum conversion at the end of the intensive phase. Age ≥ 50 years, blue-collar jobs, smoking, heavy bacillary load, relapsed and treatment interrupted were significantly ($P < 0.05$) associated with delayed sputum conversion. Delayed sputum conversion rate at the end of the intensive phase was 30.5%.

Conclusion: The rate of sputum smear conversion in the intensive phase of treatment was independently associated with high sputum smear grading at diagnosis, relapsed and treatment interrupted categories, old age and blue-collar occupations.

Keywords: delayed conversion rate, tuberculosis, sputum, bacillary count, treatment outcomes

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Introduction

Sputum smear conversion from positive to negative is one of the useful indicators to determine the efficacy of anti-tuberculosis treatment and essential in the clinical evaluation of patients with smear-positive pulmonary tuberculosis (PTB +ve). Delayed sputum smear conversion after 2 months of intensive phase has been associated with possible continuity of infectiousness, higher risk of treatment default, treatment failure, development of drug-resistant tuberculosis (TB) and the potential increase in TB mortality (*1*). The sputum smear conversion rate is defined as the percentage of registered smear positive TB cases in a given period converting to smear negative after 2 months of anti-tuberculosis treatment (*2,3*). The World Health Organization (WHO) recommends an annual assessment of treatment outcomes to identify risk and create policies to improve the efficiency of national TB control plans.

The most effective way of preventing the transmission of TB is the identification and cure of infectious PTB +ve patients (*4*). Active PTB and PTB +ve with a heavy bacillary load are the primary sources of infection (*5*) besides having the capacity of transmitting TB to 15 people a year (*6*). According to WHO, all PTB +ve patients should be evaluated for bacteriological status after the intensive phase to determine treatment outcomes (*7*).

In Malaysia, TB is a significant health problem with the current incidence rate of 92 per 100 000 and an annual mortality rate of 4.1 per 100 000 population (*7*). Malaysia is a multi-racial country with 3 different main ethnic groups: 67.4% Malay, 24.6% Chinese and 7.3% Indian, 0.7% other (*8*). The TB control programme encompasses various indicators to examine TB prevention and control. For the past 5 years, the sputum conversion rate was reported in the range of 60–80% and the treatment success rate 75–78%, despite the 85% TB treatment success rate defined by the WHO global target (*1,9*). Therefore, evaluating risk factors for delayed sputum conversion is necessary for health care providers and policy-makers to ensure the correct measures to avoid unfavourable outcomes. Factors affecting sputum smear conversion have previously been studied in Malaysia (*1,10–12*) and some research has discussed treatment outcomes of TB therapy (*9*). The present study is different from previous

studies (conducted in Malaysia) in evaluating the trends of PTB over the past 3 years, estimating the rate of delayed sputum conversion, and exploring its predicting factors together with the association of delayed sputum conversion rate with treatment outcomes among PTB +ve patients. Hence, the objective of the current study is to determine the sputum conversion rate and identify the risk factors of delayed sputum conversion at the end of the intensive phase of treatment.

Methods

Study design and settings

We conducted a retrospective study of PTB +ve patients registered from 2016 to 2018 in Pulau Pinang hospital, a tertiary care public hospital with 1017 beds situated in northern Malaysia. Tuberculosis-related information was indexed and analysed using hospital case records of patients over 18 years old with all comorbid conditions.

Data collection

A data collection form was specially designed for this study and all data information was transferred on it from the patient record file. The main variables of data tool were sociodemographics, clinical presentation of TB, bacteriological examination during management, patient's previous medical record, duration of therapy, and treatment outcomes. We retrospectively reviewed all PTB +ve patients who visited or were transferred in and diagnosed with confirmed bacteriological and radiological evidence of PTB.

Diagnosis

Initial TB diagnosis is based on bacteriological results of sputum smear examination of acid-fast bacilli (AFB), (Xpert MTB/RIF assay, Cepheid, New Jersey), sputum culture, chest X-ray, and histopathology examination of any tissue in the case of extra-pulmonary TB. Sputum samples are collected from each patient over 2 or 3 consecutive days and sent to a local laboratory for microscopic examination. For PTB +ve patients, the Xpert MTB/RIF assay is used as an add-on diagnostic to detect rifampin-resistant strains and bronchoalveolar lavage for patients who are unable to expectorate sputum. Laboratory tests, including full blood count, liver function test, blood glucose level, human immunodeficiency virus (HIV) screening and erythrocyte sedimentation rate are carried out on diagnosis. Posteroanterior chest X-rays are performed for all patients before treatment, at the end of the intensive phase and at the end of TB treatment. The severity of disease is measured by the number of lobes and the presence of cavitation (2).

PTB+ve patients with at least 2 initial sputum smear examinations positive for AFB or one sputum smear examination positive with radiological abnormality or sputum culture positive for mycobacterium TB were receiving a standard 6-month course of antituberculosis treatment. First, 2 months of intensive treatment have fixed-dose combination tablets containing rifampicin (600 mg), isoniazid (300 mg), pyrazinamide (1500 mg), and ethambutol (1200 mg). This is followed by a 4-month continuous phase with a daily dose of isoniazid and rifampicin. Patients who remained smear positive even after the intensive phase or who had cavitary disease received more extended treatment with the first-line anti-tuberculosis treatment continuing till the end of the 3rd month. Treatment outcomes in Malaysian guidelines are defined as per WHO recommendations (Table 1) (*13*).

Cured and treatment complete were represented as TB treatment success; treatment failure, died and transferred were classified as unsuccessful treatment outcome. Sputum grading is categorized according to the current number of AFB at the time of sputum smear microscopy after scanning using the Ziehl–Neelsen technique. The WHO recommends 4 grades of PTB +ve cases: scanty (1–9 AFB/100 fields), 1+ (10–99 AFB/100 fields), 2+ (1–9 AFB/50 fields), and 3+ (> 10 AFB/field in at least 20 fields) (*14*).

Data analysis

Data were analysed using *SPSS*. The Pearson chi-squared test was used for categorical variables to make a comparison of proportions. Multivariable logistic regression analysis was used to examine the possible association between a dependent variable and independent risk factors for delayed bacteriological conversion at the end to the intensive phase of TB management. *P*-value < 0.05 was considered statistically significant. The adjusted odds

Table 1 Definitions for treatment outcomes

Outcome	Definition
Cure	Patient who was sputum smear-positive at the start of treatment and has become smear-negative at the end of treatment and on at least one previous occasion
Treatment complete	Patient who was smear-negative initially and completed his treatment but without evidence of the negative bacteriological status and on at least one previous occasion
Default	Patient who had interrupted his treatment for consecutive 2 months or more after getting registered
Treatment failure	Patient whose sputum smear or culture is positive at 5 months or later during treatment. Also included in this definition are patients found to harbour a multidrug-resistant strain at any point of time during the treatment, whether they are smear negative or positive
Died	Patient who died during TB treatment due to TB or any disease
Transferred out	Patient who has been transferred to another TB unit during treatment

Adapted from = Treatment of tuberculosis: guidelines (14).

ratio (AOR), 95% confidence interval (CI), beta, standard error and *P*-value were reported for each predictor. Sex, age, weight, occupation, ethnicity, smoking, intravenous drug use, bacillary load, patient's registration category, treatment outcomes, chest X-ray lesion, adverse drug reactions and comorbidities were analysed.

Ethical approval

The study was approved by the Medical Research Ethics Committee, Ministry of Health, Malaysia (Registration ID: NMRR-18-1145-40397; MREC reference: dim. KKM/NIHSEC P18-1198 (6).

Results

Figure 1 represents the total number of PTB patients who visited the TB clinic. Of 1128 patients, 736 (65.2%) were diagnosed as PTB +ve but 606 (82.3%) of these had a record of sputum conversion at the end of the intensive phase.

Initially the number of PTB +ve patients was 230 in 2016, which increased slightly to 270 in 2018 (Figure 2). Conversely, a higher drop-off rate was observed in delayed sputum converted PTB +ve patients from 93 cases in 2016 to 32 cases in 2018.

The sociodemographic profile of sputum smear converted and delayed sputum converted patients at the end of intensive phase is described in Table 2. Of the 606 PTB +ve patients, 445 (73.4%) were males, 268 (44.2%) were aged ≥ 50 years and 299 (49.3%) were Chinese. Of these 606 patients included in the analysis with record of sputum smear conversion after the intensive phase of TB treatment, 421 (69.5%) converted their sputum while 185 (30.5%) failed to become sputum negative. Of the delayed sputum conversion patients, 152 (82.2%) became sputum negative in the 3rd month of treatment and the remaining patients eventually recovered in the first week of the 4th month.

Table 3 presents a full description of the clinical characteristics of PTB +ve patients. Pretreatment examination microscopy results for PTB +ve patients who were analysed at the end of the intensive phase include the highest number of patients with 3+ grading (30.4%) and the lowest number with grading 4+. The treatment success rate in this study was 69.1%. The comorbidities included HIV 36 (5.9%), diabetes 107 (17.6%), hepatitis 21 (3.4%) and other comorbidities 45 (7.4%). Other comorbidities were: hypertension 14 (31.1%), dyslipidaemia 5 (11.1%), chronic obstructive pulmonary disease 15 (33.3%), cancer 4 (8.8%) and fractures 7 (15.5%).

The factors found to be statistically significantly associated with delayed sputum conversion treatment in multivariable logistic regression analysis are shown in Table 4. They include treatment failure (AOR 4.7; 95% CI: 1.6–12.6), relapsed PTB patients (AOR 4.6; 95% CI: 2.7–7.9) and high bacillary load with sputum grading 2+ and 3+ (AOR 2.4; 95% CI: 1.5–4.6) and (AOR 2.6; 95% CI: 1.7–4.2) respectively.

Discussion

Our study focused on describing the delayed sputum conversion rate among PTB +ve patients treated in Pulau Pinang hospital, Malaysia from 2016 to 2018. In the present study, an increase in PTB +ve cases was noted during

Figure 1 Algorithm showing the distribution of tuberculosis (TB) patients and pulmonary tuberculosis (PTB) positivity

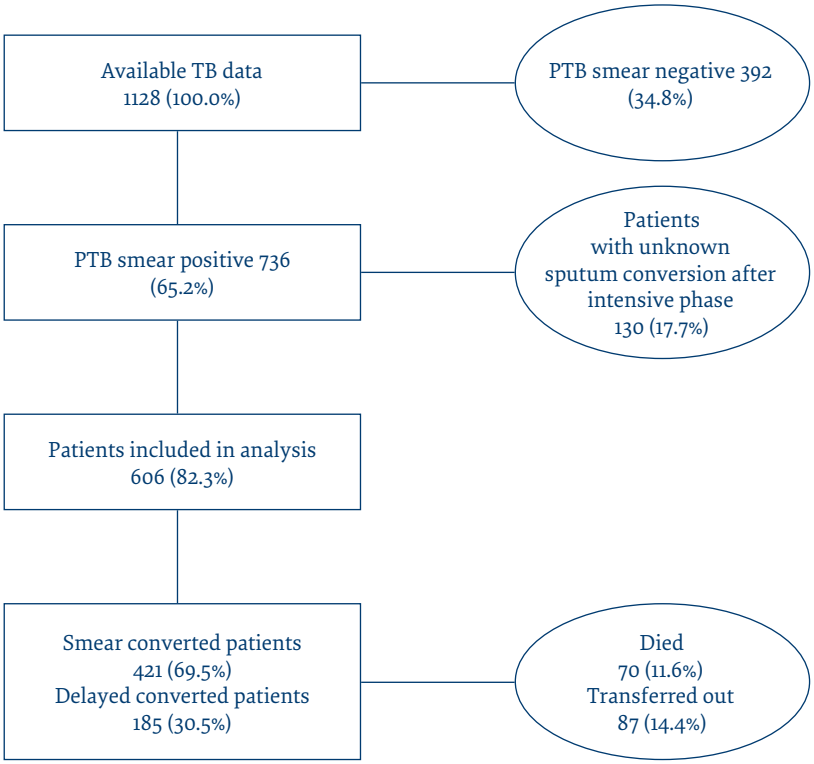
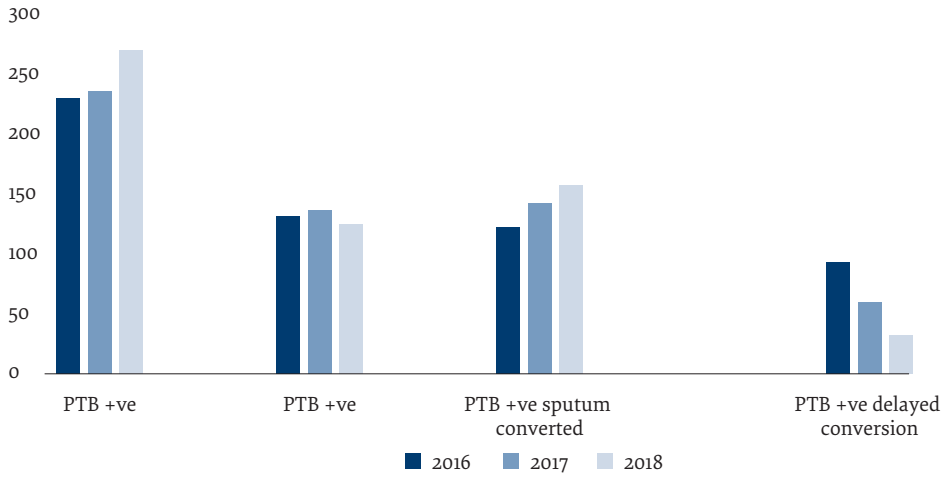


Figure 2 Trends for pulmonary tuberculosis (PTB) cases in Pulau Pinang, Malaysia, 2016–2018



the study period and these findings need great attention from the health care perspective. Furthermore, essential steps are required to limit this increase in infectiousness and overall number of TB cases at the study site as well as in the whole of Malaysia.

We evaluated 606 PTB +ve patients to study delayed sputum conversion at the end of the intensive phase of treatment. Approximately 70% had converted their sputum status in time while 30% failed to achieve standard sputum conversion at the end of the intensive phase. Previous research in Malaysia also reported sputum conversion rates in the range 55–75% (*9,10,15*). In previous research in Rwanda and Lithuania, the delayed sputum conversion rate has been reported at around 25% (*3,16*). Our findings also verified that the conversion to negative sputum and decrease in PTB infection during treatment does not occur rapidly in all patients (*4,5*). Our study findings are contrary to the view that after 2 months of standard treatment patients become non-infectious.

Delayed sputum conversion might many a number of explanations: first and foremost is the presence of viable bacteria detected by microscopic examination. In resource-limited TB endemic settings, cure is declared through sputum smear examination for AFB without performing a culture, which leads to erroneous treatment outcomes as viable bacteria may be missed due to the low sensitivity of the direct smear method. Therefore, culture may be the best technique to evaluate the viability of *Mycobacterium tuberculosis* (*4,17*). Other potential causes for delayed sputum conversion might be non-compliance of patients, poor implementation of the DOT therapy, inappropriate dose calculation, probability of drug resistance, pretreatment high bacillary load (*18*) and the high proportion of relapse and treatment failure cases (*19*). In our study, age ≥ 50 years, blue-collar jobs, smoking, heavy bacillary load and relapsed TB patients showed a significant association between delayed sputum conversions.

In line with current results, many studies stated that older age ≥ 50 years was an independent risk for of delayed sputum conversion in TB patients due to the elevated incidence of physical disabilities among such patients, the ineffective bacilli clearance because of fragile immunity, and delay in pursuing diagnosis and treatment (*6,14,19–21*). Blue-collar work was another contributing factor for delayed sputum conversion at the end of the intensive phase. Patients with manual jobs generally have low incomes, and thus possibly poor access to health facilities, a poor lifestyle, low education level, lower motivation and less seriousness regarding illness and malnutrition, which lead to reactivation of TB and poor treatment outcomes (*22*).

Smoking as an independent predictor of delayed sputum smear conversion had been supported by other studies as well (*23,24*). Tobacco smoke suppresses the antigen expression to develop a specific immune response and stimulates the alveolar macrophages for inflammatory activity, thus causing T-cell anergy (*25,26*). Hence, this weak immunity pattern in the lungs of smokers leads to delayed bacillary clearance.

With regard to bacillary load, our findings identified it as a potential risk for delayed sputum conversion at the end of the intensive phase. Patients with a high sputum grading were more likely to be smear positive in the intensive phase as compared to patients having a lower sputum grading (*27*). Other more extensive retrospective studies corroborate our findings (*28,29*). Singla et al. reported 6 times greater probability of delayed sputum conversion in patients with heavy bacillary load at the pretreatment stage (*29*).

The observed treatment success rate was 69.1% with respect to sputum conversion, i.e. less than the target success rate (85%) for PTB +ve patients. The treatment success rate in Malaysia has been documented in a research report, consistent with our findings, showing a declining pattern in the success rate (*9*). This decline is linked with inconsistent sputum monitoring, relying

Table 2 Sociodemographic profile of smear positive patients (*n* = 606)

Characteristic	Converted (*n* = 421) No. (%)	Delayed converted (*n* = 185) No. (%)	Total (*n* = 606) No. (%)
Sex			
Male	307 (68.9)	138 (31.0)	445 (73.4)
Female	114 (70.8)	47 (29.1)	161 (26.5)
Age (years)			
18–35	131 (75.3)	43 (24.7)	174 (28.7)
36–50	123 (75.0)	41 (25.0)	164 (27.1)
≥50	167 (62.3)	101 (37.7)	268 (44.2)
Weight (kg)			
30–45	157 (83.0)	32 (16.9)	189 (31.2)
46–60	79 (61.7)	49 (38.2)	128 (21.1)
61–75	133 (65.5)	70 (34.4)	203 (33.5)
> 75	52 (60.5)	34 (39.5)	86 (14.2)
Occupation			
White-collar	18 (69.2)	8 (30.8)	26 (4.3)
Blue-collar	133 (60.4)	87 (39.5)	220 (36.3)
Unknown status	270 (75.0)	90 (25.0)	360 (59.4)
Ethnicity			
Malay	145 (74.7)	49 (26.4)	194 (32.0)
Chinese	200 (66.9)	99 (33.1)	299 (49.3)
Indian	44 (67.7)	21 (32.3)	65 (10.7)
Foreign	32 (66.7)	16 (33.3)	48 (7.9)
Smoking habit			
Smoker	127 (59.1)	88 (40.9)	215 (35.5)
Non-smoker	275 (76.2)	86 (23.8)	361 (59.6)
Ex-smoker	19 (63.4)	11 (36.6)	30 (5.0)
Intravenous drug use			
Yes	37 (72.5)	14 (27.4)	51 (8.4)
No	377 (69.4)	166 (30.5)	543 (89.6)
Ex-user	7 (58.3)	5 (41.6)	12 (2.0)

on sputum microscopy not considering sputum culture, frail treatment scrutinization, and the relapse of TB symptoms after sputum conversion and the substantial proportion of patients with unevaluated status or being transferred out. In our study, a large number of PTB patients were reported as treatment interrupted and transferred out, and this may illustrate the issues faced by migrant workers, especially those with poor or no legal documents.

Our study had some limitations. It was conducted in a state-level tertiary care hospital, but a non-subsequent proportion of patients, retrospective study design, inaccessibility of subjective evaluation of certain clinical features and lack of data indicate that the current findings do not depict the overall delayed sputum conversion rate and TB treatment success rate for Malaysia. Therefore, our findings should be applied with caution in assessing the general TB treatment success rate in Malaysia.

Conclusion

To conclude, this study demonstrated that PTB +ve patients aged ≥ 50 years and those with blue-collar jobs (manual labour), smoking, heavy bacillary load and the relapsed and treatment defaulter category of PTB were significant independent predictors of delayed sputum conversion at the end of the intensive phase of treatment. Sputum positivity at 2 months is also associated with poor treatment outcomes. These potential risk factors examined may aid in recognizing patients who may have delayed sputum conversion and may result in poorer treatment outcomes.

Table 3 Clinical characteristics of PTB positive patients

Characteristic	Converted (*n* = 421) No. (%)	Delayed converted (*n* = 185) No. (%)	Total (*n* = 606) No. (%)
Sputum grading			
Scanty	118 (96.7)	4 (3.2)	122 (20.1)
1+	97 (65.5)	51 (34.4)	148 (24.4)
2+	92 (63.0)	54 (36.9)	146 (24.1)
3+	111 (60.3)	73 (39.6)	184 (30.4)
4+	3 (50.0)	3 (50.0)	6 (1.0)
Tuberculosis category			
New	375 (74.5)	128 (25.4)	503 (83.0)
Relapse	35 (43.7)	45 (56.2)	80 (13.2)
Treatment after default	8 (42.1)	11 (57.8)	19 (3.1)
Treatment after failure	3 (75.0)	1 (25.0)	4 (0.7)
Treatment outcome			
Cure	283 (67.5)	136 (32.4)	419 (69.1)
Treatment default	23 (76.6)	7 (23.3)	30 (5.0)
Died	49 (70.0)	21 (30.0)	70 (11.6)
Transferred out	66 (75.8)	21 (24.1)	87 (14.4)
Chest X-ray			
Unknown status	90 (63.8)	51 (36.1)	141 (23.2)
No lesions	24 (68.5)	11 (31.4)	35 (5.7)
Far advanced lesions	195 (76.7)	59 (23.2)	254 (41.9)
Moderate lesions	64 (60.3)	42 (39.6)	106 (17.4)
Minimal lesions	31 (63.2)	18 (36.7)	49 (8.08)
Other[a]	17 (80.9)	4 (19.2)	21 (3.4)
Adverse drug reaction			
Yes	31 (57.4)	23 (42.6)	54 (8.9)
No	391 (70.8)	161 (29.2)	552 (91.1)
Comorbidity			
HIV	21 (58.3)	15 (41.6)	36 (5.9)
Diabetes mellitus	75 (70.0)	32 (29.9)	107 (17.6)
Hepatitis	13 (61.9)	8 (38.0)	21 (3.4)
Other[b]	39 (75.0)	13 (25.0)	45 (7.4)
None	268 (63.6)	129 (69.7)	397 (65.5)

HIV = human immunodeficiency virus.
Other[a] = pneumothorax, plural effusion, reticular nodular shadowing.
Other[b] = hypertension, dyslipidaemia, chronic obstructive pulmonary disease, cancer, fractures.

Table 4 Multivariable analysis of factors associated with delayed sputum conversion

Independent factor	*β*	Standard error	Adjusted odds ratio (95% CI)	*P*-value
Moderate CXR lesions	0.369	0.250	1.4 (0.9–2.4)	0.14
Age ≥ 50 years	0.640	0.200	1.8 (1.3–2.8)	0.001
Blue-collar work	0.647	0.200	1.9 (1.3–2.8)	0.001
Smoking	0.759	0.200	2.1 (1.4–3.2)	< 0.001
Sputum grading 2+	0.905	0.248	2.4 (1.5–4.6)	< 0.001
Sputum grading 3+	0.981	0.234	2.6 (1.7–4.2)	< 0.001
Relapsed	1.531	0.275	4.6 (2.7–7.9)	< 0.001
Treatment interrupted	1.564	0.498	4.7 (1.8–12.6)	0.002

CI = confidence interval.
CXR = chest X-ray.

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Détermination des facteurs de risque associés à une conversion tardive des expectorations à la fin de la phase intensive du traitement chez les patients atteints de tuberculose

Résumé

Contexte : Dans le domaine de la tuberculose pulmonaire (TBP), le taux de conversion des expectorations à deux mois est fréquemment utilisé pour évaluer les résultats du traitement et l'efficacité d'un programme de lutte contre la tuberculose.

Objectifs : La présente étude visait à estimer le taux de conversion tardive des expectorations et à explorer ses facteurs prédictifs à la fin de la phase intensive du traitement chez les patients atteints de TBP à frottis positif.

Méthodes : Une étude rétrospective sur trois ans a été menée dans l'hôpital public de Pulau Pinang de 2016 à 2018. Au cours de l'étude, un formulaire de collecte de données standardisé a été utilisé pour recueillir les données à partir des dossiers des patients. Des patients âgés de plus de 18 ans ont été recrutés. Une analyse de régression logistique multivariable a été utilisée pour identifier les variables indépendantes significatives associées à la conversion tardive des expectorations.

Résultats : Au total, 1128 patients atteints de TBP ont été enregistrés lors de leur consultation à la clinique de la tuberculose, 736 (65,2 %) ont été diagnostiqués comme des patients atteints de TBP à frottis positif ; parmi eux, 606 patients (82,3 %) avaient une conversion des expectorations à la fin de la phase intensive du traitement. Les facteurs suivants étaient significativement associés ($p < 0,05$) à la conversion tardive des expectorations : âge supérieur à 50 ans, emploi d'ouvrier, tabagisme, charge bacillaire élevée, rechute et interruption du traitement. Le taux de conversion tardive des expectorations à la fin de la phase intensive du traitement était de 30,6 %.

Conclusion : Le taux de conversion des frottis d'expectoration dans la phase intensive du traitement était indépendamment associé à un classement élevé des frottis d'expectoration pendant le diagnostic, aux catégories d'interruption et de rechute du traitement, à l'âge avancé et aux professions ouvrières.

تحديد عوامل الخطر المرتبطة بتأخر تحول البلغم في نهاية المرحلة المكثفة من العلاج بين مرضى السل

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الخلاصة

الخلفية: يستخدم معدل تحول البلغم بعد شهرين عادة مع مرض السل الرئوي، لتقييم مخرجات العلاج وفعالية برنامج مكافحة السل الرئوي.

الأهداف: هدفت هذه الدراسة إلى تقدير معدل تأخر تحول البلغم، وتحديد عوامل التنبؤ بحدوثه في نهاية المرحلة المكثفة من العلاج بين مرضى السل الرئوي الإيجابي اللُّطَاخة.

طرق البحث: أُجريت دراسة استعادية لمدة 3 سنوات في المستشفى الحكومي بولاية بولاو بينانج، في الفترة من عام 2016 إلى عام 2018. وخلال الدراسة، استُخدِم نموذج موحد لجمع البيانات من سجل المرضى. وتم استقطاب مرضى تزيد أعمارهم عن 18 عامًا. واستُخدِم تحليل الانحدار اللوجستي المتعدد المتغيرات لتحديد المتغيرات المستقلة المهمة المرتبطة بتأخر تحول البلغم.

النتائج: سُجِّلت زيارة 1128 من مرضى السل الرئوي لعيادة السل، وشُخِّصت إصابة 736 مريضًا (65.2٪) بالسل الرئوي الإيجابي اللُّطَاخة، ومنهم 606 مريضا (82.3٪) كان لديهم سجل بتحول البلغم في نهاية المرحلة المكثفة من العلاج. وكانت عوامل بلوغ 50 عامًا أو أكثر من العمر، والوظائف العمالية، والتدخين، والحمل العَصَويّ الثقيل، والانتكاس، وانقطاع العلاج مرتبطة بصورة كبيرة بتأخر تحول البلغم (الاحتمالية < 0.05). وبلغ معدل تحول البلغم المتأخر في نهاية المرحلة المكثفة 30.6٪.

الاستنتاج: ارتبط معدل تحول لُّطَاخة البلغم في المرحلة المكثفة من العلاج ارتباطًا مستقلاً بارتفاع تصنيف لُّطَاخة البلغم عند التشخيص، والفئات التي تعرضت للانتكاس وانقطاع العلاج، والشيخوخة، والمهن العمالية.

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Good hygiene practice application in the private sector, Tunisia

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Abstract

Background: Healthcare-associated infections (HCAIs) occurring outside of health facilities are underestimated because there are a lack of structured preventive organization and absence of epidemiological surveillance. HCAI prevalence is likely to grow with the increase in patient care outside of health institutions.

Aims: To set up a situational analysis of good hygiene practices among private general practitioners (GPs) to better organize HCAI prevention in this sector.

Methods: A descriptive cross-sectional study was conducted between November 2017 and March 2018, using a self-administered questionnaire among all GPs in Sousse City, Tunisia.

Results: Participation rate was 93.1%. There was a predominance of male GPs (63%), with a sex ratio of 1.7:1. Up-to-date vaccination status was reported by 82 (75.9%) of GPs. Fifty-six (51.3%) GPs used hydroalcoholic solutions, 13 (12.1%) adopted autoclaving, and 106 (98.1%) wore gloves during invasive care. Blood exposure accidents (BEAs) were reported by 38 (35.2%; declared in 26.3% of cases) and were more prevalent in the group aged > 50 years who used significantly more reusable equipment. BEAs were primarily due to needle-stick injuries (86.8%).

Conclusion: We identified the priority axes to be considered in organizing HCAI prevention in the private sector, which allows guidance of GPs, avoiding their isolation and compensating for their lack of training and information. This requires willingness and a culture of improving the quality and safety of care in this sector. Committed involvement of several stakeholders at different levels of decision-making in health care is needed.

Keywords: good hygiene practices, healthcare-associated infections, general practice, liberal sector, Tunisia

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Introduction

Prevention of healthcare-associated infections (HCAIs) aims to ensure the safety of both patients and healthcare workers (HCWs). The World Health Organization (WHO) reports that, at any given time, > 1.4 million people worldwide have HCAIs (*1–3*). In Tunisia, the latest national HCAI prevalence survey conducted in 2012 reported a prevalence rate of 6.66%, which is 1 in 15 patients affected, compared to 6.9% according to the first national HCAI prevalence survey in 2005 (*4*).

In healthcare facilities, infection risk management is part of a programme to prevent HCAIs (*5*). However, this risk is not limited to health facilities (state or private), but extends to city practices, although its quantitative importance is more difficult to assess. Private practitioners provide care that necessarily generates risks, particularly infectious risks (*6*). HCAIs contracted in the private sector are underestimated due to the absence of a suitable epidemiological surveillance system with no structured preventive organization. HCAIs are likely to increase with the increase in care of vulnerable patients outside healthcare institutions. In this context, the application of good hygiene practices (GHPs) is universally recognized as the best guarantee of effective prevention of HCAIs (*7,8*).

Academic medical training courses, combined with hospital internships, should theoretically contribute to the establishment of quality care and safety culture, with appropriate risk management in parallel with continuing training for physicians. This could include postgraduate training in hygiene or participation in scientific events addressing management of HCAI risk (*9–11*).

In Tunisia in the private sector, unlike in public institutions, no data are available for quantifying the infectious risk associated with care and assessing application of GHP. Thus, the objective of the present study was to draw up an inventory of GHP among private general practitioners (GPs) to propose measures to improve the prevention of HCAIs in this sector. We followed the example of countries with structured and organized control and prevention programmes in the private sector, such as professional practice assessments and oversight by health authorities, as well as continuing professional development (CPD) and certification of health professionals.

Methods

We conducted a cross-sectional descriptive study from November 2017 to March 2018 among all GPs in the pri-

vate sector in Sousse City, Sousse Governorate, Tunisia. The Governorate had 674 818 inhabitants, according to the general census of the Tunisian population of 2014, with 213 private GPs, and Sousse City had 349 392 inhabitants, with 116 private GPs (*12*). The list of GPs and their addresses were provided by the Regional Council of the Tunisian Medical Association. They were contacted individually and succinctly informed of the study's progress and objectives.

The questionnaire comprised: (1) general characteristics of the respondents (age, sex, year of graduation, training, year of installation in the private sector, vaccination status etc.); (2) characteristics of hygiene products and equipment used in medical practice; (3) caregivers' practices concerning GHP and type of blood exposure accidents (BEAs); (4) organization for best management of infectious risk in medical practice; and (5) proposals from respondents relating to actions judged priorities for the best observance of GHPs. The questionnaire was developed by hospital hygienists and physicians specifically for the purpose of our study and was validated by senior medical experts in hygiene and quality of care. The questionnaire was designed to apply only to GPs in the private sector and was tested among 10 private GPs in another governorate near Sousse. It was delivered directly and an appointment was made to recover it, and several visits were sometimes essential. Data entry and analysis were carried out using SPSS 20.0 software.

For each estimate, a confidence interval was calculated according to the classical formula. When the conditions of application were not met, the Wilson continuity correction procedure was used (*13*). The descriptive part of the results described the quantitative variables as mean (standard deviation) and the qualitative variables by their relative and absolute frequencies. We used Pearson's χ^2 test (with a significance level $P < 0.05$) to compare the general characteristics of respondents according to GP age (≤ 50 and > 50 years) and the occurrence of BEAs. We used the c^2 test with Yates correction or Fisher's exact test if the conditions of application were not met.

Results

A total of 108 of 116 GPs responded to our survey (participation rate 93.1%). There was a male predominance (63%) with a sex ratio of 1.7:1. Participants had average seniority of service of 14.5 (2.1) years (range 1–45 years). Sixty-seven (62.1%) respondents were under the age of 50 years. An average interval of 4 years separated final medical study and office setup.

The medical practices of the GPs as well as the characteristics of BEAs are detailed in Table 1. BEAs occurred in 33 (86.8%) GPs during stitching and 29 (76.3%) during antiseptic application.

The obstacles perceived by GPs to hinder application of GHPs, as well as the training associated with their expectations and proposals are reported in Table 2. Seventy-nine (73.1%) GPs perceived that basic training was adequate for the application of GHPs. High product cost was perceived as a barrier to the application of GHP by 64 (59.4%) GPs. Eighty-five (78.7%) GPs expressed a wish for a change in the training methods for the application of GHPs. Sixty-one (73.5%) GPs identified waste management as a barrier to the application of GHP.

There was a significant difference in favour of respondents aged ≤ 50 years with regard to up-to-date immunization status, waste sorting by the caregivers themselves, use of sharp-edged-object containers, and desire to receive GHP training (Table 3). Respondents aged > 50 years had significantly more BEAs.

GPs who carried out less self-sorting of waste, used fewer sharp-edged-object containers, and adhered less to GHP training had significantly more BEAs (Table 4).

Discussion

Our study is the first step in taking stock of the current state of affairs with regard to GHP in the private sector in Tunisia, and serves as a precursor to a strategic plan for improving the quality and safety of ambulatory care. The study helped to raise awareness among GPs and remind them of the importance of GHP, and involved caregivers in devising a strategy to address the risk of infection in the private sector.

An average interval of 4 years separated the end of medical studies and the year of office setup. Guily reported an interval of 5 years and insisted that the majority of postgraduate training should be carried out between completion of basic medical studies and internship (*15*).

The efficacy and good tolerance of hepatitis B vaccination among HCWs has been widely reported (*14–18*). In our study, 75.9% of doctors declared having a current HBV vaccination status, which is similar to previous studies (*16,17*). Vaccination is only 1 part of infection control programmes for HCWs, and Abiteboul reported that vaccination should not substitute for collective and individual protection measures. Immunization of HCWs has a double aim of protecting HCWs and their patients from infection. In France, some vaccinations are mandatory in HCWs, such as hepatitis B vaccination (*8*).

In our study, all practices were equipped with a waiting room and an office room. We chose to address this concept to emphasize the importance of the principle of sectorization. Less than half of the respondents (49, 45.4%) stated that they did not have a separate care room, which implies that patients were examined and care was provided in the same consultation room. The inert environment of the office can be contaminated by the mixing of people, frequent contact of surfaces with the hands of the consultants but also patient morbidity, such as communicable diseases, and the added risk of patient waiting time. This finding is likely to represent a lack of respect for the recommendations relating to the sectorization of care rooms for the prevention of HCAIs (*3,4,14,15,19*).

Table 1 Hygiene practices, expectations and proposals of the surveyed GPs

Studied concepts (n = 108)		n (%)	95% CI
Exercise in group practice		8 (7.4)	2.2–11.8
HBV vaccination status up to date		82 (75.9)	67.9–84.1
NHIF covers work accidents (especially BEA)		81 (75)	66.8–83.2
Use of hydroalcoholic solution for hand hygiene		56 (51.3)	42.4–61.3
Hand drying: multiple-use linen		27 (25)	16.8–33.2
Use of reusable care equipment		66 (61.1)	51.8–70.2
Wearing gloves for invasive procedures		106 (98.1)	95.4–100
Stream sterilization (autoclaving)		13 (12)	5.9–18.2
Regular cleaning of care equipment		62 (57.4)	48.1–66.7
GPs victims of BEAs		38 (35.2)	26.4–44.2
Medical-office structure and equipment	Separate toilets (caregiver/patient)	56 (51.9)	42.4–61.3
	Has a sterilization space	42 (38.9)	29.7–48.1
	Equipped with an individualized treatment room	59 (54.6)	45.2–64
Declared circumstances of hand hygiene	Leaving work	79 (73.1)	64.6–81.4
	Upon arrival at work	67 (62)	52.8–71.2
	Between patients	71(65.7)	56.8–74.7
	Between 2 treatments for the same patient	23(21.3)	13.6–29
Management of WCARI	Sorting by GPs themselves	32 (29.6)	21.4–38.6
	Lidded pedal bin	65 (60.2)	50.8–69.2
	Primary packaging in 2 types of bags (WCARI/WADT)	16 (14.8)	8.3–21.7
	Use of SEO collectors	79 (73.1)	64.6–81.4
	WCARI classified with WADT	65 (60.2)	50.8–69.2
	WCARIs entrusted to the service provider (authorized for transport and processing)	10 (9.2)	3.8–14.7
Characteristics of BEAs (n = 38)	Occurred during stitching	33(86.8)	76.1–97.6
	Immediate antiseptic application	29 (76.3)	62.8–89.8
	Wound bleeding	16 (42.1)	26.4–57.8
	Declaration of BEAs	10 (26.3)	12.3–40.3

BEA = blood exposure accident; CI = confidence interval; GPs = general practitioners; HBV = hepatitis B virus; NHIF = National Health Insurance Fund; SEO = sharp-edged object; WADT = waste assimilated to domestic trash; WCARI = waste from care activities that pose a risk of infection.

It is recommended that practices should be equipped with at least 2 handwashing stations (treatment room and sanitation area) (*20*). In our study, 51.9% of physicians reported meeting these conditions, which is fewer than previously reported (*21*,*22*). Hand hygiene is the mainstay of hygiene rules; a gesture that is simple and easy to observe and whose effectiveness has been widely proven in reducing HCAIs (*3*,*8*,*18*,*22*,*23*). Our study showed that 65.7% of doctors practiced hand hygiene between seeing patients. These results agree with previous studies emphasizing the importance of hand hygiene (*6*,*24*,26). The method used is chosen according to the specificity of the care and the nature of the performed procedures. In ambulatory care, rubbing hands with hydroalcoholic solution seems to be the method of choice and of proven effectiveness (*1*,*24*,*25*). We reported the use of hydroalcoholic solution for hand hygiene by 53.7% of the respondents, which is low compared with other studies (*20*, *21*). In addition, the adoption of hydroalcoholic solutions offers the advantages of improved compliance with hand hygiene and product tolerance, associated with financial gain and environmental friendliness (*24*).

There are improvements to be made with regard to the abandonment of multiple-use laundry as a means of hand drying (*19*,*21*,*25*). For the same quality and safety of care, it is recommended to opt for the use of single-use equipment; however, multiple-use equipment is common (*27*). We found that 61.1% of our respondents had used reusable equipment, which is comparable with previous studies (*15*,*19*,*20*,*28*).

In our study, 38.9% of the practices were equipped with a sterilization room, which is much less than 63% reported by Varnoux (*19*). We found that 12.1% of users of reusable equipment used autoclaving for sterilization. There are still reports of frequent adoption of dry heat sterilization (*20*,*21*,*25*) despite recommendations to abandon it (*18*). Thus, the adoption of autoclaving still needs to be improved. The limits to its use are financial constraints, lack of knowledge and low perceptions of its effectiveness. The means to overcome these constraints

Table 2 GPs' perceptions of their training, expectations and proposals according to priority training areas

Studied concepts (*n* = 108)		*n* (%)	95% CI
Perceptions of the adequacy of basic training	To the application of GHPs	79 (73.1)	64.6–81.4
	To conduct in order to prevent BEA	65 (60.2)	50.8–69.2
Training in the application of GHP	Desire to see change in learning methods	85 (78.7)	71.3–86.7
	Perception of its necessity	99 (91.7)	86.9–97.1
	Previous participation in continuing education	14 (13)	6.6–19.3
Perceived barriers to the application of GHP	High product cost	64 (59.4)	49.7–68.3
	Lack of motivation	50 (46.2)	36.6–55.4
	Inadequacy of training	41 (37.7)	28.8–47.2
Training areas identified as priorities to be planned (n = 83)	Waste management	61 (73.5)	59.5–87.5
	Conduct in response to BEA	35 (42.2)	26.5–57.9
	Application of GHP	24 (28.9)	14.5–43.3
	Disinfection of equipment	14 (16.9)	5–28.8
	Management of expired medications	10 (12)	1.7–22.4
	Hand hygiene	10 (12)	1.7–22.4

BEA = blood exposure accident; CI = confidence interval; GHP = good hygiene practice.

are improved information and amortization of economic costs (e.g., acquisition of a common autoclave) (*24*). Among our respondents, 57.4% reported regular cleaning of their equipment (stethoscopes/tensiometers), although this is unsatisfactory compared with previous studies (*15*,*25*). The contribution of equipment maintenance to reducing cross-transmission is widely described in the literature (*29*–*31*). In this regard, Smith et al. (*32*) evaluated the bacterial and fungal colonization of 200 stethoscopes/tensiometers and showed that 80% were colonized. Furthermore, doctors' stethoscopes were significantly more contaminated than those of other HCWs. Parmar et al. showed that daily disinfection with alcohol significantly reduced cross-transmission from stethoscopes (*29*).

We found that almost all (98.1%) practitioners reported wearing gloves to perform invasive procedures, which is in line with results reported in the literature (*14*,*21*,*25*). Mouzamil reported 40 cases of arthritis following infiltrations performed on an outpatient basis between 2006 and 2009, despite practitioners wearing gloves (*25*).

The WHO has reported that, in 22 developing countries, 18–64% of health facilities do not properly dispose of healthcare waste, in addition to the globally inappropriate disposal of needles and syringes from 12

Table 3 Comparison of respondents by age of 50 years with respect to organization and specifics of care, occurrence of BEAs, and training characteristics

Compared concepts	Age ≤ 50 years *n* (%) (N = 71)	Age > 50 years *n* (%) (N = 37)	*P*
HBV vaccination status up to date	59 (83.1)	23 (62.2)	0.016
Victims of BE	15 (21.1)	23 (62.2)	$< 10^{-4}$
Coverage of work accidents (BEA) through affiliation to NHIF	52 (73.2)	29 (78.4)	0.558
Wearing gloves during invasive procedures	70 (98.6)	36 (97.3)	0.636
Use of autoclave sterilization	6 (8.4)	2 (5.4)	0.566
Sorting of waste by the caregivers themselves	26 (36.6)	6 (16.2)	0.027
Use of SEO collectors	62 (87.3)	17 (45.6)	$< 10^{-4}$
Use of hydroalcoholic solution	41 (57.8)	17 (45.9)	0.243
Use of reusable care material	44 (62)	22 (59.4)	0.799
Perception of adequacy of basic training for GHP applications	51 (71.8)	28 (75.7)	0.669
Perception of adequacy of basic training in management and prevention of BEAs	40 (56.3)	25 (67.6)	0.258
Perception of need for GHP training	66 (92.9)	33 (89.2)	0.501
Wish to take a GHP training course	65 (91.5)	20 (54)	$< 10^{-4}$
Previous participation in GHP training	63 (88.7)	31 (83.8)	0.467

BEA = blood exposure accidents; GHP = good hygiene practice; HAS = hydroalcoholic solution; HBV = hepatitis B virus; NHIF = National Health Insurance Fund; SEO = sharp-edged object; WA = work accident.

Table 4 Comparison of respondents according to occurrence of BEAs in relation to specificities of care, coverage of BEAs by NHIF, and specificities of training (*n* = 108)

Compared concepts	BEA victims (*n* = 38)	Non-BEA victims (*n* = 70)	*P*
Coverage of work accidents (BEA) by affiliation to NHIF	25 (65.8)	56 (80)	0.103
Wearing of gloves during invasive medical procedures	37 (97.4)	69 (98.6)	0.658
Sorting of waste by doctors themselves	5 (13.1)	27 (38.6)	0.006
Use of SEO containers	18 (47.4)	61 (87.1)	$< 10^{-4}$
Use of reusable material	36 (94.7)	30 (42.9)	$< 10^{-4}$
Perception of adequacy of basic GHP training	24 (63.1)	55 (78.6)	0.084
Perception of adequacy of basic training to prevent BEAs	21 (55.3)	44 (62.8)	0.441
Perception of need for GHP training	35 (92.1)	64 (91.4)	0.903
Desire to take a GHP training course	30 (78.9)	55 (78.6)	0.964
Previous participation in GHP training	26 (68.4)	68 (97.1)	$< 10^{-4}$

BEA = blood exposure accidents; GHP = good hygiene practice; NHIF = National Health Insurance Fund; SEO = sharp-edged object; WA = work accident.

billion injections/year (*8*). Tunisia has strict regulations for healthcare waste. Nevertheless, this problem is imminent, due to increased production, insufficient awareness of the harmfulness and risks associated with healthcare waste, and lack of knowledge of existing regulations (*33*). We found that 29.6% of respondents were sorting out healthcare waste on their own, which is in line with Guignon (*31*) but different from Wagenheim et al. (*14*), which can be explained by the workload as well as lack of knowledge and low perception of risks. In our study, 9.2% of the respondents reported elimination of waste from care activities that pose a risk of infection by a subcontracted service provider. This differs from other studies (*15*,*20*,*21*,*31*,*34*) and can be explained by the lack of information and accountability regarding the use of services by subcontracted providers, and by the difficulty in accessing them.

BEAs are a measurable and avoidable occupational risk. The nature and extent of the incurred risks vary according to the care activity (*8*). Epidemiological data for healthcare facilities are probably underestimated and under-reported (*24*). Outside healthcare facilities, data are scarce. An American study (548 home care providers and 33 606 visits) reported 3.6 BEA/1000 procedure-visits (*34*). In the United Kingdom of Great Britain and Northern Ireland, BEAs involved 7% of community HCWs (*35*). In our study, 35.2% of respondents reported being BEA victims, which is similar to previous studies (*15*,*19*). Comparison of physicians in terms of the frequency of BEAs showed a significant difference in favour of younger practitioners. This can be explained by a better perception of risk. Regarding the circumstances of BEA, our respondents attributed them mainly to needle-stick injuries, which is similar to previous studies (*14*,*28*). Among respondents who were victims of BEAs, 42.1% reported bleeding, which indicates a lack of knowledge, and only 26.3% declared their BEA. Although these results are unsatisfactory, they are still better than those of Wagenheim et al., who also specified that the lack of declaration related to underestimation of the risk, the time involved and the complexities of the procedures (*14*).

Academic medical training in GHP is still insufficient and must be reinforced according to the mode of practice and the nature of the care activity, with adaptation of skills to the requirements of the job profile. In Tunisia, continuing medical training has little interest in the specificities of the private sector and in improving the quality and safety of care in this domain. Respondents' perceptions of the adequacy of their training in BEAs and the application of GHPs differed from those reported previously, who perceived it as adequate (*14*).

Regarding the obstacles to the application of GHPs, our respondents reported the high cost, which differs from Guily, who reported lack of training (*15*). We note the role of professional associations, learned societies and trade unions in the organization of compensation and the loss of income during continuing education, along with the contributions of pharmaceutical companies.

In Tunisia, there is no structured and formal quality control system for health care. In fact, there are no regulations governing the acquisition of equipment to support this important part of medical practice. In addition, no companies that subcontract complementary healthcare services (hospital waste treatment or vector control companies) do not enter into agreements with medical practices, but rather use their services for healthcare structures for reasons of financial profitability, among others.

The main limitation of our study was the choice of study series, which may have incurred selection bias. The degree of representativeness hinders the extrapolation of our findings to all GPs in Sousse Governorate or at national level. Qualitative evaluation using a self-administered questionnaire may have had the problem of reporting bias in the physicians' responses (noncompliance for reasons of mistrust or reluctance related to their medical practice considering GHPs). Constraints in the field have been encountered, such as the scattered distribution of physicians' offices or group practices and the lack of interest and motivation of some, due to ignorance, misunderstanding or negligence of the subject matter.

Moreover, several visits were sometimes necessary to retrieve completed questionnaires or the requirement to wait until the end of the medical consultation to be able to meet the doctor.

Conclusion

We revealed alarming results relating to some areas of GHP in private practice, especially concerning hand hygiene, use of reusable equipment, equipment sterilization and cleaning procedures, management of HCWs, and maintenance of healthcare equipment. Thus, knowledge of the specificities of professional practices and the organization of care in medical practices, with identification of the obstacles hindering compliance with the application of GHPs, makes it possible to adapt the precautions to be taken and organize structured control and prevention. In addition, it is essential to commit to the observance of a minimum package of GHP recommendations that can be adopted as a basis for establishing a threshold of requirements for office hygiene, to be able to practice in the private sector. This requires willingness and a culture of improving the quality and safety of care in this domain and the concrete involvement of several actors at different levels. We recommend conducting a larger study covering different Tunisian Governorates in order to have a more representative observations at a national level to support planning of priority and appropriate actions to be implemented in the private sector for the best quality and safety of care.

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Application des bonnes pratiques d'hygiène dans le secteur libéral en Tunisie

Résumé

Contexte : Les infections associées aux soins (IAS) survenant en dehors des établissements de santé sont sous-estimées en raison de l'absence d'organisation structurée de la prévention et de l'inexistence de la surveillance épidémiologique. Leur prévalence est susceptible d'augmenter avec l'accroissement des prises en charge des patients à l'extérieur des institutions sanitaires.

Objectifs : Dresser un état des lieux des bonnes pratiques d'hygiène auprès des omnipraticiens libéraux pour mieux organiser la prévention des IAS dans ce secteur.

Méthodes : Il s'agit d'une étude descriptive transversale, menée en 2017 (novembre)-2018 (mars), à l'aide d'un questionnaire auto-administré auprès de tous les omnipraticiens du gouvernorat de Sousse-Ville (Tunisie).

Résultats : Le taux de participation était de 93,1 %. Une prédominance des omnipraticiens de sexe masculin (63 %) a été notée (sex-ratio=1,7 : 1). Un statut vaccinal à jour a été rapporté par 82 omnipraticiens (75,9 %). Cinquante-six omnipraticiens 53,7 % optaient pour l'usage des solutions hydro-alcooliques, 13 (12,1 %) avaient adopté l'autoclavage et 106 (98,1 %) déclaraient porter des gants d'omnipraticiens lors des soins invasifs ; 38 (35,2 %) notifiaient être victimes d'accidents exposant au sang (AES) (déclarés dans 26,3 % des cas) ; ce type d'accident était plus prévalent dans le groupe des plus de 50 ans, lequel semble utiliser statistiquement davantage le matériel réutilisable. Les AES sont dus surtout aux piqûres (86,8 %).

Conclusion : Nous avons identifié les axes prioritaires à considérer en organisant la prévention des IAS en secteur libéral, ce qui permet d'orienter les omnipraticiens, d'éviter leur isolement et de combler les manques de formation et d'information. Ceci nécessite une volonté et une culture pour l'amélioration de la qualité et de sécurité des soins dans ce secteur et l'implication engageante et concrète de plusieurs intervenants à différents niveaux de décisions en santé.

تطبيق ممارسات النظافة الجيدة في القطاع الحر في تونس

محمد محجوب، ألفى عزي، أسماء عمار، نهال العمري، حسن أشاش، منصور نجاح

الخلاصة

الخلفية : يصعب تقدير مدى خطورة التّعفنات المتّصلة بالرّعاية الصّحية الواقع الكشف عنها خارج المرافق الصحية العمومية بسبب عدم وجود قواعد وقائية منظّمة ومهيكلة إضافة إلى غياب المراقبة الوبائية ومن المرجّح أن يزداد انتشارها مع زيادة رعاية المرضى خارج المرافق الصحية.

الأهداف: هدفت هذه الدراسة الى تقييم مستوى تطبيق قواعد حفظ الصحة وسلامة الخدمات الصحية وجودتها لدى أطباء القطاع الخاص من أجل تنظيم أفضل للوقاية من التعفنات المتّصلة بالرّعاية الصحية.

طرق البحث: دراسة تحليلية على ضوء استبيان شخصي أجريت خلال السنوات 2017 (نوفمبر/ تشرين الثاني) و2018 (مارس/ اذار) مع جميع أطباء القطاع الخاص في ولاية سوسة (الجمهورية التونسية).

النّتائج: بلغ معدّل المشاركة 91.1٪. ولقد كان أغلب المشاركين من الذّكور 62.96٪ (نسبة الجنس 1.7 :1). تمّ التّصريح عن حالات التحصينات المحينة من 75.9 ٪ من الأطباء المستجوبين. كما ذكر 53.7٪ أنهم يختارون المواد المائية الكحولية لغسل الأيدي. وذكر 12.1٪ أنهم يعتمدون التّعقيم للمعدّات الطبية المتعدّدة الاستعمال. كما أبلغ 98.1٪ عن استخدامهم القفّازات أثناء الرّعاية الصحية العنيفة. وأشار 35.2 ٪ إلى وقوعهم ضحايا حوادث التعرض للدّم (حوادث معلنة في 26.3٪) وهي حوادث أكثر انتشارا بين أطباء القطاع الخاص الذين تفوق أعمارهم 50 سنة إضافة إلى أنهم يستخدمون إحصائيا أكثر المعدات الطبية المتعددة الاستعمال.

الاستنتاجات : تمّ تحديد المحاور ذات الأولوية التي يتعين تنظيمها للحدّ والوقاية من التعفنات الجرثومية المتصلة بالرعاية الصحية في القطاع الخاص لتجنّب الوضع الحالي المتمثل في ضعف إدماجهم في البرامج المهيكلة ويحد من افتقارهم للمعلومات والتدريب. يستدعي تحسين جودة و سلامة الرعاية الصحية في القطاع الخاص ثقافة مستفيضة وإرادة لدى كل المتداخلين على جميع مستويات القرار في مجال الصحة.

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Unmet health and social care needs and associated factors among older people aged ≥ 80 years in Izmir, Turkey

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Abstract

Background: The health and social care needs of people aged ≥ 80 years are a neglected topic.

Aims: To determine the prevalence of unmet health and social care needs and associated factors in community-dwelling individuals aged ≥ 80 years in Izmir District of Balçova, Turkey.

Methods: There were 1075 participants aged ≥ 80 years. The dependent variables were unmet health and social care needs. Independent variables were sociodemographic, socioeconomic and lifestyle characteristics. The data were collected in face-to-face interviews conducted at the homes and analysed by multiple logistic regression model. Ethical approval was obtained from the Non-Invasive Research Ethics Board of Dokuz Eylul University Medical Faculty (2017/26-24).

Results: The mean age was 84.1 (3.7) years and 61.0% were female. Healthcare needs were expressed by 88.2% of the participants and 78.9% claimed that they had social care needs. Prevalence of unmet health and social care needs was 32.5% and 46.6%, respectively. Approximately 90.0% of their needs were covered by families. Perceived low-income status was a risk factor for unmet healthcare needs, and lack of social support was a risk factor for unmet social care needs. Additionally, not receiving formal education was a protective factor in unmet social care needs.

Conclusion: Public health policy should be developed to enable better access to care, especially for the oldest people, considering that nearly one third of the participants in this study had unmet healthcare needs and almost half had unmet social care needs.

Keywords: aged, unmet needs, healthcare needs, social care needs, Turkey

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Introduction

In Turkey, the proportion of people aged ≥ 65 years is 8.8% (*1*) and this is projected to reach 22.6% by 2060 (*2*). In the Turkish elderly population, 21.3% comprises individuals aged ≥ 80 years, and by 2050, it is expected that 25% of elderly people will be aged ≥ 80 years (*3*). Along with ageing, the health and social care needs of the elderly population have become more apparent, and especially among people aged ≥ 80 years, cognitive and functional limitations and the need for care have increased (*4–7*). Despite the increasing number of people aged ≥ 80 years worldwide, this group has often been neglected in previous research. Unmet health care is defined as no visit from or to a physician within a defined time period despite having specified conditions (*8*). Unmet social care need is defined as lack of support for individuals or institutions despite having needs in daily activities (*9*). Both definitions have been found to be associated with mortality among older people (*8*,*10*). There is a necessity to develop strategies to meet the health and social care requirements of elderly people as unmet care needs affect quality of life and increase severity of illness, complications, hospital admission and mortality (*8*,*9*,*11*,*12*).

In Turkey, most of the elderly population has health coverage. Even if this facilitates access to health care, there are difficulties in fulfilling the health and social needs resulting from the loss of income due to retirement, ageing and socioeconomic inequalities. The needs of elderly people are generally provided by their families. Factors such as changes in family dynamics and women joining the workforce have increased the risk of encountering difficulties in meeting the needs of elderly people. Therefore, there is a clear necessity to establish political strategies to fulfil the health and social care needs of older people. When discussing and developing policies for the elderly population, it is critical to incorporate both health and social care needs (*13*). In situations in which policies are restricted due to financial constraints, it is important to target individuals aged ≥ 80 years. There have been no studies in Turkey to pinpoint the unmet health and social care needs of the elderly population. Additionally, although the needs of people aged ≥ 80 years are higher, they have often been ignored in studies of ageing.

The aims of this study were to determine: (1) the prevalence of unmet health needs; (2) the prevalence of unmet social care needs; and (3) the associated factors with unmet health and/or social care needs in community-

dwelling individuals aged ≥ 80 years, residing in the Balçova District of Izmir, Turkey.

Methods

Study design

This study was carried out using data from the Balçova Older People Health and Social Care Project in 2018. The project was carried out through a protocol between Balçova Municipality and Dokuz Eylul University Medical Faculty Public Health Department. The municipality financed the data collection process to find individuals aged ≥ 80 years in need in Balçova District. The authors of the paper designed the study, planned and monitored the data collection process, and analysed data without receiving any fee from the Municipality. This was a population-based cross-sectional study. The study group comprised 1603 community-dwelling individuals aged ≥ 80 years living in Balçova District. Information on those individuals were obtained from Balçova Municipality List-Based Address-Based Population Registration System. We aimed to reach all residents in the relevant age-group without sample selection. In total, 1075 elderly participants were evaluated (response rate 67.1%). The data on falls, fear of falls and associated risks have been published from this database elsewhere (*14*).

Ethical approval

Ethical approval for the study was obtained from the Non-Invasive Research Ethics Board of Dokuz Eylul University Medical Faculty (2017/26-24).

Variables

The dependent variables were unmet health and social care needs and independent variables were defined as gender, age groups, educational status (latest school graduation), marital status, cohabitation, number of children, house ownership, self-perceived income and expenditure, health insurance and social support (with the question "Is there anybody that you could call and get support from if you needed it?").

Unmet healthcare needs

Unmet healthcare needs were defined as situations in which a participant needed health care but did not receive it (*15*). Initially, 3 items were used to determine healthcare needs. (1) The presence of chronic disease: for chronic diseases such as diabetes mellitus, hypertension, cardiovascular disease, or chronic obstructive pulmonary disease, a physician's diagnosis was requested, and participants' own statements were evaluated. Even if 1 of the conditions existed, this was considered relevant. (2) The presence of dependence: dependence status was defined according to the Barthel Activities of Daily Living (ADL) Index (*16*) (Supplementary Table 1) at the time of the interview. Validity and reliability of the index have been studied by Kucukdeveci et al. (*17*). For this scaling approach, any participant who had severe (21–61 points) or full (0–20 points) dependency according to the Barthel Index was considered as having a need. (3) Poor self-perceived health: individuals perceiving themselves as being worse than their peers at the time of the interview, were considered as having a need.

Later, we asked participants who had unmet needs whether they had received any health care at home or

Supplementary Table 1 Barthel Activities of Daily Living Index

Area	Point
Feeding	
Independent	10
Needs help	5
Unable	0
Bathing	
Independent	5
Unable	0
Grooming	
Independent	5
Unable	0
Dressing	
Independent	10
Needs help	5
Unable	0
Bowel control	
Continent	10
Occasional accident	5
Incontinent (or needs to be given enemas)	0
Bladder control	
Continent	10
Occasional accident	5
Incontinent (catheterized, unable to manage alone)	0
Toilet use	
Independent	10
Needs help	5
Unable	0
Transfers (bed to chair and back)	
Independent	15
Needs minor help (verbal or physical)	10
Needs major help (1 or 2 people, physical), can sit	5
Unable	0
Mobility on level surfaces	
Independent (but may use any aid, e.g., stick) > 50 yards	15
Walks with help of one person (verbal or physical) >50 yards	10
Wheelchair independent, including corners, >50 yards	5
Immobile or <50 yards	0
Stairs	
Independent	10
Needs help (verbal, physical, carrying aid)	5
Unable	0

at a medical facility in the last 6 months. If they had not received any health care this was considered as having unmet healthcare needs.

Unmet social care needs

Unmet social care needs were determined with the Barthel ADL Index and Lawton–Brody Instrumental ADL (IADL) Index (*16*,*18*) (Supplementary Table 2). Participants who were unable to perform at least 1 of those activities at the time of the interview, were considered as having a social care need. These people were asked if they received help from any individuals or institutions. If the answer was negative, this was considered an unmet social care need. The data were collected by face-to-face interviews at participants' homes between February and May 2018 by trained interviewers who were medical and nursing students. A standard training programme was provided for the interviewers by researchers. For testing purposes, the questionnaire was administered to community members of another district who were aged ≥ 80 years. The participants who could or did not complete the interviews during 3 visits were excluded from the study.

Statistical analysis

The data were analysed using SPSS version 15.0 (SPSS, Chicago, IL, USA). The continuous data were presented as mean (standard deviation), and the categorical variables were presented as percentages. The multiple logistic regression model was used to determine the associated factors with unmet health and social care needs. The model included all of the initially selected independent variables. $P < 0.05$ was considered statistically significant.

Results

The mean age of the participants was 84.1 (3.7) years (range 80–101 years). A total of 701 (65.2%) of the respondents were between 80 and 84 years old, and 656 (61.0%) were female (Table 1). Among the elderly, 1012 (94.9%) had social support, and 1014 (94.9%) had health insurance.

The most common activities for which elderly people had severe or full dependence on the ADL were: climbing stairs (46.1%), bladder control (32.7%), mobility on level surfaces (27.7%), bathing (27.2%); and on IADL: shopping (57.6%), preparing food (56.1%), doing laundry (47.9%), and housekeeping (46.2%).

Prevalence of health and social care needs were determined as 88.2% and 78.9%, respectively. The health and social care needs and the degree to which these needs were met are shown in Figure 1. These needs were not fulfilled in 32.5% of individuals who required health care, and 46.6% of those who needed social services. According to the individuals' own declarations, the frequency of their need for care was 40.9%. According to their needs on the ADL, 88.5% were covered by their families, 111.2% by their caregivers and only 0.3% had care by the Municipality. There were similar observations for IADL needs (90.0%, 9.8% and 0.2%, respectively.

Supplementary Table 2 Lawton–Brody Instrumental Activities of Daily Living Index

Ability to use telephone	
Operates telephone on own initiative – looks up and dials numbers, etc.	**1**
Dials a few well-known numbers	1
Answers telephone but does not dial	1
Does not use telephone at all	0
Shopping	
Takes care of all shopping needs independently	1
Shops independently for small purchases	0
Needs to be accompanied on any shopping trip	0
Completely unable to shop	0
Food preparation	
Plans, prepares and serves adequate meals independently	1
Prepares adequate meals if supplied with ingredients	0
Heats, serves and prepares meals, or prepares meals, or prepares meals but does not maintain adequate diet	0
Needs to have meals prepared and served	0
Housekeeping	
Maintains house alone or with occasional assistance (e.g., heavy work domestic help)	1
Performs light daily tasks such as dish washing, bed making	1
Performs light daily tasks but cannot maintain acceptable level of cleanliness	1
Needs help with all home maintenance tasks	1
Does not participate in any housekeeping tasks	0
Laundry	
Does personal laundry completely	1
Launders small items – rinses stockings, etc.	1
All laundry must be done by others	0
Mode of transportation	
Travels independently on public transportation or drives own car	1
Arranges own travel via taxi, but does not otherwise use public transportation	1
Travels on public transportation when accompanied by another	1
Travel limited to taxi or automobile with assistance of another	0
Does not travel at all	0
Responsibility for own medication	
Is responsible for taking medication in correct dose at correct time	1
Takes responsibility if medication is prepared in advance in separate dosage	0
Is not capable of dispensing own medication	0
Ability to handle finances	
Manages financial matters independently (budgets, writes checks, pays rent, bills, goes to bank), collects and keeps track of income	1
Manages day-to-day purchases, but needs help with banking, major purchases, etc.	1
Incapable of handling money	0

Table 1 Descriptive characteristics of the participants

Characteristics	n (%)
Gender (n = 1075)	
Male	419 (39.0)
Female	656 (61.0)
Age group (n = 1075)	
80–84 yr	701 (65.2)
85+ yr	374 (35.8)
Educational status (n = 1069)	
Illiterate	206 (19.3)
Literate	127 (11.9)
Primary school	403 (37.7)
Secondary school	88 (8.2)
High school	164 (15.3)
University	81 (7.6)
Marital status (n=1075)	
Widowed	584 (54.3)
Married	473 (44.0)
Divorced	11 (1.0)
Never married	7 (0.7)
Cohabitation (n = 1071)	
Alone	259 (24.2)
Spouse	375 (35.0)
Spouse and children	106 (9.9)
Children	298 (27.8)
Relatives	33 (3.1)
Self-perceived income and expenditure (n = 1055)	
More income than expenditures	157 (14.9)
Equal income and expenditures	639 (60.6)
Less income than expenditures	259 (24.5)
House ownership (n = 1071)	
Belongs to himself	646 (60.3)
Belongs to spouse	127 (11.8)
Belongs to children/relatives	188 (17.6)
Rent	110 (10.3)
Health insurance (n = 1059)	
Yes	1014 (94.9)
No	55 (5.1)
Social support (n = 1066)	
Yes	1012 (94.9)
No	54 (5.1)
Presence of chronic disease (n = 1070)	
Hypertension	729 (68.1)
Cardiovascular disease	411 (38.4)
Diabetes mellitus	319 (29.8)
Chronic obstructive pulmonary disease	158 (14.8)
Having at least one	889 (83.1)
ADL (n = 1070)	
Independency	436 (40.7)
Mild dependency	164 (15.3)
Moderate dependency	264 (24.7)
Severe dependency	107 (10.0)
Full dependency	99 (9.3)
Self-perceived health compared to peers (n = 1062)	
Better than	375 (35.3)
Similar to	372 (35.0)
Worse than	315 (29.7)
Health care use in the last 6 months (n = 1070)	
No	376 (35.1)

Among all participants, the prevalence of unmet health care needs was 28.4% overall, and 25.6% based on the presence of chronic disease, 6.2% based on dependency on the ADL, and 8.9% according to perceived health. Among all participants, the prevalence of unmet social care needs was 36.9% in total, 23.3% according to ADL, and 31.5% according to IADL.

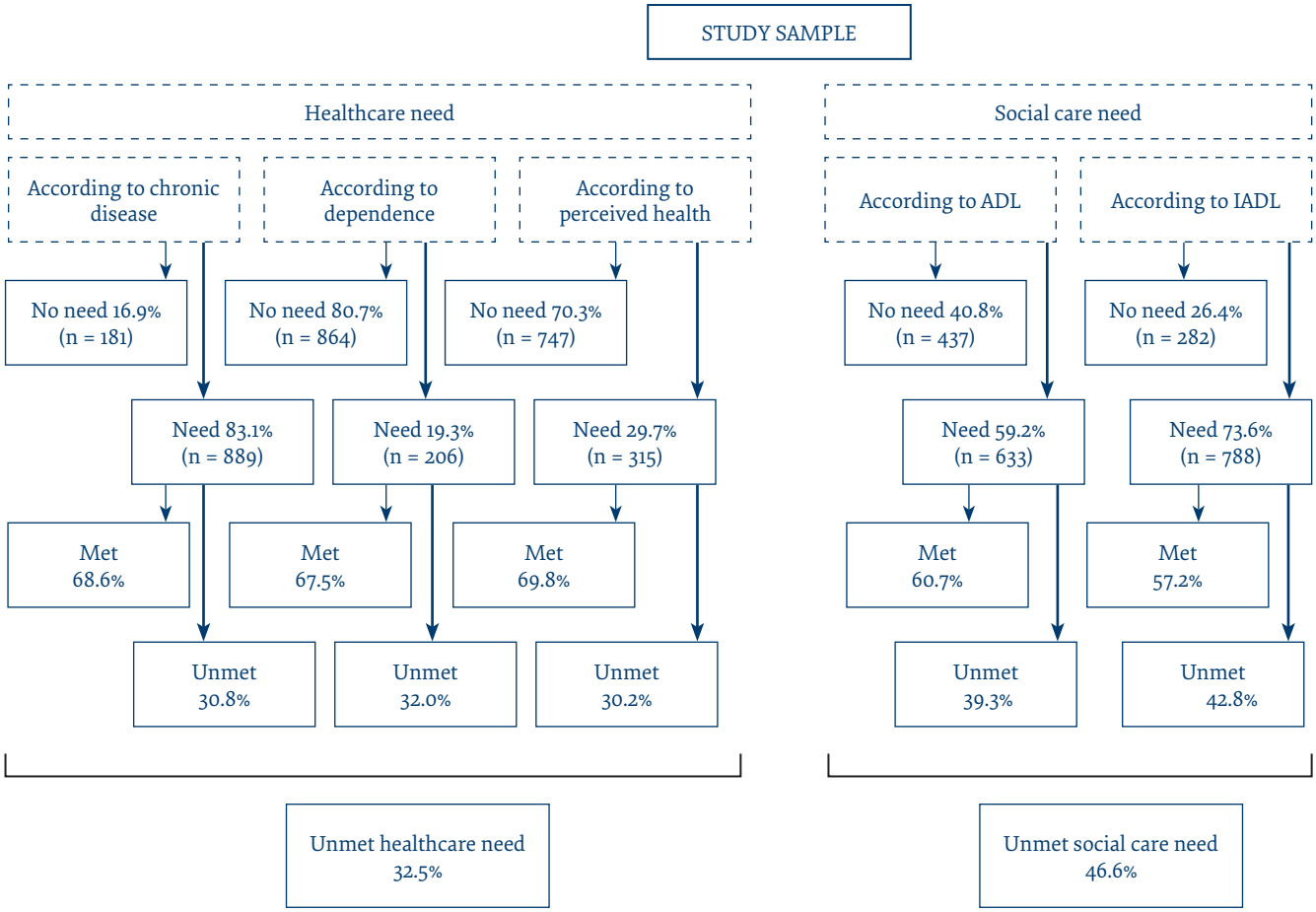
The main predictor in determining unmet health care needs was the participants' self-perceived income and expenditures (Table 2). When compared to situations where income surpassed expenditure, there was a higher risk of unmet healthcare needs in situations where income was less than or equal to expenditure. Also, when determining unmet needs according to dependence, it appeared that while not being married increased risk, being alone was a protective factor [odds ratio (OR) = 0.4, 95% CI: 0.2–0.8] Based on self-perceived health, not being married and not having health insurance were risks leading to unmet needs.

The presence of social support was associated with unmet social care needs in all models (i.e. for total, OR = 2.2, 95% CI: 1.2–4.0); in other words, the risk of these unmet needs was higher among people who did not have social support. In total, and according to IADL, not receiving formal education was a protective factor in unmet social needs (Table 3). According to ADL, being female was a risk factor in unmet needs.

Discussion

In this study, we evaluated the unmet health and social care needs and associated factors in community-dwelling individuals aged ≥ 80 years residing in Balçova District, İzmir, Turkey. We determined that 88.2% of the elderly people had healthcare needs, and approximately one third of these individuals and 28.4% of all the elderly people had unmet needs. The main factor in determining unmet health care was that income was lower than expenditure. Additionally, according to dependence and self-perceived health, not being married increased the risks while being alone was found to be a protective factor in unmet needs according to dependence.

Figure 1 Unmet health and social care needs



Unmet healthcare needs vary worldwide. In Spain, for chronic illnesses among people aged ≥ 65 years, the proportion was 3.7%, 6.6% among those with poor health perception, and 1.4% among those with dependency on at least 1 activity of the ADL (*8*). In France, it was 23% in people aged ≥ 70 years (*15*). The prevalence of perceived unmet healthcare needs of people aged ≥ 65 years was between 7.1% and 26.3% (*12,19–21*). In research conducted in 6 European countries, 36.6% of people aged ≥ 65 years had unmet healthcare needs based on ADL. The nation with the highest prevalence was Greece (61.5%) and the lowest was Sweden (3.6%) (*22*). The large variations in prevalence are due to the use and implementation of different methods to determine unmet healthcare needs. There are also differences among countries due to the various health and social care policies and approaches. It is known that as age increases, there is an overall increase in unmet healthcare needs (*15,23*). The fact that different age groups were studied also might have contributed to the variations in prevalence.

In our study and many others, the main determinant in unmet healthcare needs was low income (*15,21,24*), although there are also a few, rare studies in which income status was not significant (*20*). Although most elderly people in Turkey state that they have health insurance, the fact that there is a significant relationship between self-perceived income and unmet healthcare indicates the presence of other barriers preventing access to health care. This group comprises very old people who clearly need to rely on an able companion when seeking health care. Among older people with low income, their health coverage is not sufficient to meet all their needs. It may be that poorer individuals are not be able to cover the transport costs for access to health care, or other medical fees paid out of pocket, and therefore their access to medical services may be restricted. A World Health Organization report supports this suggestion. In low- and low-to-middle-income countries, the greatest barriers to access to health care are costs related to healthcare visits and transportation (*25*). Like ours, some previous studies have indicated that being married or living with a partner is a protective factor against unmet healthcare needs (*15, 20*). Even if they are of advanced age, without relying on others, married couples may aid one another when seeking health care.

In this study, we determined that 78.9% of the elderly people had social care needs, and for approximately half of them, and 36.9% of the total population of the elderly, social needs were unmet. In 90% of cases involving older people, needs were covered and provided by their families. In our study, the main risk of unmet social care was the lack of social support. While being female (for ADL), and (for IADL) an equivalency between income and

Table 2 Factors associated with unmet health care needs (multiple logistic regression analysis)

	Presence of unmet health care need							
	Total		According to dependence		According to chronic disease		According to self-perceived health	
Variables (reference group)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)
Gender (male)								
Female	0.774	1.056 (0.726–1.537)	0.365	1.422 (0.664–3.045)	0.603	1.108 (0.753–1.628)	0.738	1.115 (0.589–2.109)
Age group (80–84 yr)								
≥ 85 yr	0.425	0.885 (0.657–1.194)	0.224	1.399 (0.815–2.403)	0.241	0.831 (0.609–1.133)	0.802	1.062 (0.663–1.700)
No. of children		0.931 (0.850–1.020)	0.649	1.037 (0.888–1.211)	0.250	0.946 (0.861–1.040)	0.609	0.964 (0.838–1.109)
Marital status (married)								
Not married	0.108	1.386 (0.931–2.065)	0.018	2.490 (1.168–5.308)	0.525	1.143 (0.758–1.723)	0.013	2.297 (1.188–4.442)
Educational status (secondary school and above)								
Primary school	0.505	0.886 (0.620–1.265)	0.479	1.350 (0.588–3.103)	0.478	0.876 (0.609–1.262)	0.229	1.498 (0.776–2.890)
No formal education	0.882	0.969 (0.641–1.464)	0.145	1.898 (0.802–4.493)	0.703	0.921 (0.602–1.408)	0.247	1.527 (0.745–3.127)
Self-perceived income and expenditure (more income than expenditure)								
Equal income and expenditure	0.015	1.738 (1.114–2.709)	0.657	1.252 (0.465–3.368)	0.012	1.812 (1.141–2.876)	0.319	1.524 (0.665–3.493)
Less income than expenditure	0.001	2.322 (1.408–3.830)	0.005	4.152 (1.529–9.273)	0.003	2.201 (1.307–3.706)	0.005	3.433 (1.455–8.102)
Health insurance (yes)								
No	0.136	1.587 (0.864–2.915)	0.344	1.594 (0.607–4.187)	0.167	1.554 (0.832–2.904)	0.048	2.271 (1.006–5.125)
House ownership (himself/spouse)								
Children/relatives	0.743	0.938 (0.642–1.372)	0.112	0.559 (0.273–1.146)	0.779	0.945 (0.638–1.402)	0.464	0.799 (0.438–1.457)
Rent	0.777	0.935 (0.586–1.494)	0.181	0.557 (0.236–1.314)	0.904	1.030 (0.640–1.656)	0.535	0.793 (0.382–1.648)
Social support (yes)								
No	0.644	0.858 (0.448–1.644)	0.122	2.112 (0.819–5.450)	0.318	0.699 (0.347–1.410)	0.314	1.562 (0.656–3.720)
Cohabitation (not alone)								
Alone	0.398	1.167 (0.816–1.669)	0.007	0.374 (0.183–0.764)	0.058	1.427 (0.988–2.062)	0.307	0.749 (0.429–1.305)

CI = confidence interval; OR = odds ratio.

Table 3 Factors associated with unmet social care needs (multiple logistic regression analysis)

	Presence of unmet social care need					
	Total		According to ADL		According to IADL	
Variables (reference group)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)
Gender (male)						
Female	0.303	1.199 (0.849–1.695)	0.019	1.629 (1.085–2.445)	0.166	1.290 (0.900–1.850)
Age group (80–84 yr)						
≥ 85 yr	0.388	0.884 (0.667–1.171)	0.949	0.990 (0.721–1.359)	0.881	1.022 (0.764–1.368)
No. of children	0.944	1.003 (0.920–1.093)	0.705	1.019 (0.925–1.122)	0.818	1.011 (0.924–1.106)
Marital status (married)						
Not married	0.367	0.843 (0.581–1.222)	0.332	1.233 (0.807–1.885)	0.353	0.833 (0.566–1.225)
Educational status (secondary school and above)						
Primary school	0.168	0.796 (0.575–1.102)	0.823	1.045 (0.711–1.535)	0.198	0.801 (0.572–1.122)
No formal education	0.020	0.629 (0.426–0.929)	0.762	0.934 (0.598–1.457)	0.012	0.594 (0.395–0.893)
Self-perceived income and expenditure (more income than expenditure)						
Equal income and expenditure	0.307	1.215 (0.836–1.765)	0.721	0.926 (0.607–1.413)	0.032	1.553 (1.039–2.322)
Less income than expenditure	0.947	0.985 (0.631–1.536)	0.912	0.973 (0.594–1.591)	0.513	1.173 (0.728–1.888)
Health insurance (yes)						
No	0.092	1.668 (0.919–3.028)	0.905	1.042 (0.528–2.059)	0.121	1.618 (0.881–2.972)
House ownership (himself/spouse)						
Children/relatives	0.746	0.942 (0.655–1.355)	0.335	0.817 (0.542–1.232)	0.824	1.044 (0.717–1.519)
Rent	0.540	0.868 (0.553–1.964)	0.700	0.906 (0.549–1.496)	0.489	0.845 (0.525–1.361)
Social support (yes)						
No	0.007	2.226 (1.240–3.998)	0.040	1.906 (1.029–3.529)	0.005	2.330 (1.294–4.195)
Cohabitation (not alone)						
Alone	0.211	1.247 (0.882–1.764)	0.295	1.221 (0.840–1.773)	0.867	1.032 (0.717–1.484)
Chronic disease (no)						
Yes	0.318	1.95 (0.842–1.697)	0.178	1.338 (0.875–2.046)	0.996	0.999 (0.698–1.430)

CI = confidence interval; OR = odds ratio.

expenditures were risk factors, lower educational status was protective.

Generally, most research conducted to determine unmet social care needs uses the ADL and/or IADL. These studies indicate unmet social needs frequencies to be 32.8% in people aged ≥ 60 years (*26*); 0.2–61.2% in those aged ≥ 65 years (*22,27–29*); and 50–67.5% in those aged ≥ 75 years (*13,30*). The main reasons for the variations in prevalence of unmet needs are the differences in the criteria used in identifying the needs, approaches to collecting data, the characteristics of the aged being studied and cultural differences.

As in our study, others have shown that the main providers of care are spouses and other family members, or friends, or in other words, informal caregivers (*13,27, 28,30*). When considering the prevalence of unmet social needs, it is obvious that families cannot fulfil all the needs. Therefore, social support needs should be compensated. Among many other variables, social support has been found to have a major protective influence in the ageing population (*21,31*). Similar to our study, being female is generally a risk factor for unmet social needs (*13,27, 30,32,33*). The most important reason for this is that with individuals aged ≥ 80 years, women are generally widowed while men's needs are met by their wives. Surprisingly, lower educational status was determined to be a protective factor in terms of unmet needs. However, in a population aged ≥ 80 years, Hoogendijk et. al obtained a result similar to ours (*33*). This might be due to the fact that in the region we studied, people with lower educational backgrounds retained a relatively traditional lifestyle. This might be the reason why they had more social support, especially in IADL.

The main limitation of our study was the cross-sectional nature of the collected data, which prevents any determination of causality in the relationships revealed in our analyses. Additionally, it is difficult to compare estimates across studies because of differences in study methods and age groups. Another limitation of this study was the low participation rate. However, nowadays response rates of cross-sectional studies are more or less close to our participation rate. We do not know if there is a systematic difference between the participants and nonparticipants. Despite the low participation rate, we

interviewed > 1000 individuals. To our knowledge there is no general consensus on the definition of unmet health and/or social care needs. The varying definitions lead to varying levels of unmet needs. Thus, our results are based on the merits of our definition of unmet health and/or social care needs.

One of the strengths of our study was that it focused on people in the community and those aged ≥ 80 years; a group often ignored in other studies of the elderly and who are most in need of care. Most research tends to evaluate either health or social needs. However, as in our study, it is important to focus on both the health and social needs of elderly people. Another of our study's strengths was that data were collected within the homes of the participants and by trained medical and nursing students. Consequently, after the data were collected and preliminary analyses completed, the Municipality of Balçova initiated services providing the identified needs.

Conclusion

We determined that among people aged ≥ 80 years residing in Balçova District, approximately one third had unmet healthcare needs and almost half had unmet social needs. Perceived low income status and not being married were risk factors for unmet health needs, and lack of social support and being female were risk factors for unmet social needs. Policies that alleviate the negative financial barriers preventing the fulfilment of needs and bring them to a minimum level need to be developed and implemented. For example, it is critical to improve and increase the rights of public retirees, discontinue out-of-pocket payments, provide transport services, and establish social support programmes. Additionally, in the health and social services, proactive action should be taken for disadvantaged groups, which would help alleviate the inequalities arising from the unmet needs based on personal characteristics. The first step should be to set up a home follow-up programme incorporating health and social care to enable the identification of needs and provide residential care. In Turkey, it is clear that home healthcare services, which are only offered upon request, are inadequate in meeting healthcare needs and will continue so to be.

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Besoins non satisfaits en matière de soins de santé et de soins sociaux et facteurs associés chez les personnes âgées de 80 ans et plus à Izmir (Turquie)

Résumé

Contexte : Les besoins en matière de soins de santé et de soins sociaux des personnes âgées de 80 ans et plus constituent un sujet négligé.

Objectifs : Déterminer la prévalence des besoins non satisfaits en matière de soins de santé et de soins sociaux ainsi que les facteurs associés chez les personnes âgées de 80 ans et plus qui vivent au sein de la communauté dans le district d'Izmir de Balçova, en Turquie.

Méthodes : Ont participé à cette étude 1075 personnes âgées de plus de 80 ans. Les besoins non satisfaits en matière de soins de santé et de soins sociaux constituaient les variables dépendantes. Les caractéristiques socio-démographiques, socio-économiques et relatives au mode de vie constituaient les variables indépendantes. Les données ont été recueillies lors d'entretiens en présentiel menés dans les foyers et analysées par un modèle de régression logistique multiple. L'approbation éthique a été obtenue auprès du Comité éthique de la recherche pour les procédures non invasives au sein de la Faculté de Médecine de l'Université de Dokuz Eylul (2017/26-24).

Résultats : L'âge moyen était de 84,1 ans (3,7) et 61,0 % des participants étaient des femmes ; 88,2 % des participants ont exprimé qu'ils avaient des besoins en matière de soins de santé et 78,9 % des participants ont déclaré qu'ils avaient des besoins en matière de soins sociaux. La prévalence des besoins en matière de soins de santé et de soins sociaux non satisfaits était de 32,5 % et de 46,6 %, respectivement. Près de 90,0 % de leurs besoins étaient couverts par les familles. La perception du statut de faible revenu était un facteur de risque pour les besoins en soins de santé non satisfaits, et le manque de soutien social était un facteur de risque pour les besoins en soins sociaux non satisfaits. De plus, le fait de ne pas avoir reçu d'éducation formelle était un facteur de protection pour les besoins non satisfaits en matière de soins sociaux.

Conclusion : Une politique de santé publique devrait être mise en place pour permettre un meilleur accès aux soins, notamment pour les personnes âgées, considérant que près d'un tiers des participants à cette étude avaient des besoins non satisfaits en matière de soins de santé et que près de la moitié avaient des besoins non satisfaits en matière de soins sociaux.

احتياجات الرعاية الصحية والاجتماعية غير المُلباة والعوامل المرتبطة بها لدى المسنين البالغ أعمارهم 80 عامًا أو أكثر في منطقة بالكوفا، مدينة إزمير، تركيا

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الخلاصة

الخلفية: من الموضوعات المهملة تناول احتياجات الرعاية الصحية والاجتماعية للأشخاص البالغ أعمارهم 80 عامًا أو أكثر.

الأهداف: هدفت هذه الدراسة الى تحديد مدى انتشار احتياجات الرعاية الصحية والاجتماعية غير المُلباة والعوامل المرتبطة بها بين الأفراد الذين يعيشون في مساكن مجتمعية وتبلغ أعمارهم 80 عامًا أو أكثر في منطقة بالكوفا، مدينة إزمير، تركيا.

طرق البحث: شارك في هذه الدراسة 1075 مشاركًا تبلغ أعمارهم 80 عامًا أو أكثر. وكانت المتغيرات التابعة هي احتياجات الرعاية الصحية والاجتماعية غير المُلباة. بينما كانت المتغيرات المستقلة هي الخصائص الاجتماعية السكانية والاجتماعية الاقتصادية وخصائص نمط الحياة. وجُمعت البيانات في مقابلات مباشرة أجريت في المنازل، وتم تحليلها باستخدام نموذج الانحدار اللوجستي المتعدد. وتم الحصول على الموافقة الأخلاقية من مجلس أخلاقيات البحوث غير التداخلية، التابع لكلية الطب بجامعة دوكوز إيليول (24-26/ 2017).

النتائج: بلغ متوسط العمر 84.1 (3.7) عامًا، وكان 61.0٪ منهم من النساء. وعبَّر 88.2٪ من المشاركين عن احتياجاتهم للرعاية الصحية، وزعم 78.9٪ أن لديهم احتياجات للرعاية الاجتماعية. وبلغ معدل انتشار احتياجات الرعاية الصحية والاجتماعية غير المُلباة 32.5٪ و46.6٪ على التوالي. وكانت الأسر تغطي نحو 90.0٪ من احتياجاتهم. وكانت الحالة المتصورة لذوي الدخل المنخفض عامل خطر بالنسبة لاحتياجات الرعاية الصحية غير المُلباة، بينما كان نقص الدعم الاجتماعي عامل خطر بالنسبة لاحتياجات الرعاية الاجتماعية غير المُلباة. وبالإضافة إلى ذلك، كان عدم الحصول على تعليم رسمي عامل خطر بالنسبة لاحتياجات الرعاية الاجتماعية غير المُلباة.

الاستنتاج: يجب وضع سياسة صحية عامة للتمكين من الحصول على الرعاية بصورة أفضل، لا سيَّما للمسنين، مع الأخذ في الاعتبار أن ما يقرب من ثلث المشاركين في هذه الدراسة لديهم احتياجات رعاية صحية غير مُلباة ونصفهم تقريبًا لديهم احتياجات رعاية اجتماعية غير مُلباة.

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WhatsApp-based intervention for promoting physical activity among female college students, Saudi Arabia: a randomized controlled trial

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Abstract

Background: Social media are increasingly being used by young adults worldwide. The question is whether they can be successfully incorporated into health programmes to promote physical activity.

Aims: To measure the effect of a WhatsApp-based intervention for promoting physical activity among female college students in Abha, Saudi Arabia.

Methods: This randomized controlled trial from November 2019 to January 2020 included 110 students. The intervention group received a brief orientation on exercise and up to 4 physical activity promotion messages per week via WhatsApp for 10 weeks. The messages were obtained from the websites of the US Centers for Disease Control and World Health Organization (WHO). Physical activity was assessed at baseline and at 10-weeks' follow-up using the WHO Global Physical Activity Questionnaire.

Results: The 2 groups were similar in sociodemographic and baseline physical activity levels. Postintervention data analysis revealed significant improvement in the proportion of participants with moderate-intensity physical activity in the work and recreation domains. Compared with the control group, mean metabolic equivalents/week of the intervention group improved significantly. The mean difference in total physical activity before and after intervention was significant in all domains and in all categories of activity. The proportion of participants who met the WHO criteria for minimum physical activity per week increased from 69.8% to 90.5% after intervention.

Conclusion: Social-network-based interventions improve physical activity and may be incorporated into youth-targeted health programmes.

Keywords: health promotion, mobile applications, physical activity, social media, WhatsApp

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Introduction

Physical activity is a well-established element of the public health agenda (*1*). A recent World Health Organization (WHO) report states that around 23% of adults aged ≥ 18 years are not physically active enough (*2*). Absence of physical activity is among the main risk factors for noncommunicable diseases and overall mortality (*2,3*). It is estimated that inactivity is globally responsible for 9% of premature mortality, or > 5.3 million deaths annually (*3*). Physical activity is recognized to significantly decrease cardiovascular risks, improve lipid profile, control type 2 diabetes, prevent some types of cancer, raise bone density, improve psychological health and reduce overall mortality (*4*).

During the past few decades, Saudi Arabia has witnessed enormous economic growth and prosperity, accompanied by a technological transformation that has led to major negative changes in lifestyle. The transition to university frequently occurs among students aged 18–24 years. This is a critical time for substantial and rapid weight gain as a result of poor dietary habits. Healthy behaviour, such as physical activity, is often compromised among college students. As these years play an essential role in the development of health behaviour that continues into adulthood, it is important to develop programmes to encourage healthy weight-related behaviour for university students (*5*).

Although limited, studies have used social media and self-monitoring apps to improve weight-related behaviours and have found positive results in college students and women. Miller et al. conducted a survey on the effectiveness of a health promotion smartphone app for college students. The students believed that the app was beneficial and helpful in that it promoted healthy behaviour and raised awareness (*6*). A study in Saudi Arabia reported that social media are effective in reducing body weight among college students and are a promising way of increasing physical activity (*7*). Fukuoka et al.

investigated the use of a mobile-phone-based intervention to improve physical activity in sedentary women. They concluded that the intervention motivated inactive women to improve their physical activity (*8*). Another study reported that mobile-phone-based interventions are cost-effective for promotion of physical activity as compared with face-to-face interventions (*9*).

Saudi Arabia has one of the highest mobile penetration rates in the world, at a level of 72.8%. Social networking applications such as WhatsApp, Facebook and Twitter have become popular means of communication, especially among young adults (*10*). In Saudi Arabia, WhatsApp is one of the most popular mobile social networking platforms and is used by 56–72% of the population (*11*). WhatsApp has been widely used in health care (*12*). The aim of this study was to test the effectiveness of a WhatsApp-based physical activity promotion intervention to improve physical activity levels among Saudi female college students.

Methods

Study design

The current study had a pretest/post-test randomized controlled open label experimental design. The study setting was faculties of medicine, dentistry, pharmacy, nursing, applied medical science, and information systems.

Study population and sampling technique

All female students at King Khalid University, aged 18–28 years, who owned a smartphone with internet access and WhatsApp and were willing to complete all study requirements were invited to participate. Those who could not exercise [physical disability, morbid obesity (body mass index > 45 kg/m^2)] or were pregnant were excluded. A total of 110 participants (55 per group) was required to estimate expected difference in adherence to physical activity (17% vs 4%) for the intervention and control groups, respectively (*13*), with 10% more to avoid attrition effects. This difference provided an effective size for intervention of 0.76 (large) at 95% confidence level with study power of 80%.

A total of 120 participants were assessed for eligibility by convenience sampling. The study objectives and expected benefits were explained and 110 agreed to participate. After obtaining participants' consent and performing baseline assessment of their characteristics and study measures, participants were randomly allocated using computer-generated random numbers by Microsoft Excel and 55 participants were assigned to the intervention and control groups.

The WhatsApp free messenger application was used as the intervention tool. The participants used their own phones and had experience using the WhatsApp mobile social application. WhatsApp groups were formed within each study group. The control participants had the alternative group only for communications between them and the main investigator; they kept their usual activity for 10 weeks. The intervention participants had a WhatsApp group that received a 15-minute orientation on exercise, and the benefits of keeping a healthy life pattern. They also received 3 or 4 health-promotional (physical activity) messages from the literature review recommendation per week via WhatsApp for 10 weeks. Average physical activity was assessed in all participants at baseline and at 10-weeks' follow-up using the World Health Organization (WHO) Global Physical Activity Questionnaire (GPAQ) (*14*). After the study ended and the utility of the programme was established, the same material given to the intervention group was sent to the control group. Two participants withdrew from the intervention group leaving 53 participants, and 5 left the control group, leaving 50 participants.

Outcome measures

Outcome measures were to: compare baseline physical activity in the intervention and control groups according to three domains; compare baseline and postintervention physical activity in the intervention and control groups; and compare postintervention physical activity in the intervention and control groups.

Statistical analysis

After data were extracted, they were coded and entered into IBM SPSS version 23 statistical software. Data were cleaned and analysed according to the guide for GPAQ (*15*). There were 3 main domains of physical activity: 1, activity at work; 2, travel to and from places; and 3, recreational activities. Domains 1 and 3 had 2 subdomains of moderate and vigorous physical activity, giving a total of 5 groups of physical activity.

Other calculations for physical activity were done. (1) Metabolic equivalents (METs): the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour. (2) Total physical activity: MET (minutes/week = sum of the total MET minutes of activity calculated for each setting).

Equation: total physical activity MET minutes/week = (P2 ´ P3 ´ 8) + (P5 ´ P6 ´ 4) + (P8 ´ P9 ´ 4) + (P11 ´ P12 ´ 8) + (P14 ´ P15 ´ 4)

Sum of all activity per week divided by 7 to obtain average daily minutes if activity = (P2 ´ P3) + (P5 ´ P6) + (P8 ´ P9) + (P11 ´ P12) + (P14 ´ P15) / 7

Data were then analysed using descriptive statistics – frequency and percentage distribution for categorical data, and mean and standard deviation for continuous data. A paired *t* test was conducted to compare changes in physical activity before and after the intervention within each group. An independent *t* test was conducted to compare the physical activity between the intervention and control groups. McNemar's χ^2 test was used to study the percentage difference in activity before and after intervention. To study the association between sociodemographic factors and physical activity, a c^2 test

was performed. All statistical analysis was done using 2-tailed tests and a error of 0.05. P ≤ 0.05 was considered to be statistically significant.

Results

Table 1 presents information on the basic sociodemographic characteristics of 103 participants. In the intervention group, 71.7% were aged ≥ 20 years, compared with 68% in the control group. More than 90% were single in both groups. Three quarters of the students in both groups reported a family monthly income of > 10 000 SR. None of the sociodemographic factors were significantly different between the intervention and control groups.

A significant difference was observed in the pre- and post-MET when the groups were compared after intervention [4053.21 (3601.33) and 2010.8 (2277.2); $P < 0.001$] and when the intervention group was compared before and after intervention [2492.45 (2291.45) and 4053.21 (3601.33); $P < 0.001$] (Table 2). In the control group there was a nonsignificant decrease in the MET minutes per week. Before intervention, MET minutes per week did not differ significantly between the groups. The difference in analysis of difference revealed a value of 1925.9 [95% confidence interval (CI) = 1101–2750].

In the intervention group, 37 participants (69.8%) met the criteria before intervention, which increased significantly to 48 participants (90.5%) after intervention, a percentage difference of 20.7% (95% CI = 3.78–37.6%) (Table 3). Within the control group, before and after intervention revealed a difference of -6.0%. The difference in analysis of difference showed 26.7% (95% CI = 18.1–35.3%). In the postintervention phase, in the control group, 35 (70%) participants met the WHO criteria, compared with 90.5% in the intervention group, a percentage difference of 20.5% (95% CI = 3.60–37.4%).

The mean difference in total physical activity before and after intervention was significant in all domains and all categories of activity (Table 4). The mean difference in work-related moderate physical activity was 168.67 minutes ($P < 0.001$). The mean difference in travel-re-

Table 1 Distribution of personal characteristics in the intervention and control groups

Personal data	Group				*P*
	Intervention		Control		
	No.	%	No.	%	
Age, year					
< 20	15	28.3%	16	32.0%	0.683
≥ 20	38	71.7%	34	68.0%	
Marital status[a]					
Single	48	90.6%	46	92.0%	0.797
Married	5	9.4%	4	8.0%	
Specialty					
Health	21	39.6%	22	44.0%	0.884
Computers	18	34.0%	15	30.0%	
Medicine	14	26.4%	13	26.0%	
Father's education					
Up to high school	16	30.2%	16	32.0%	0.843
University and postgraduate	37	69.8%	34	68.0%	
Mother's education					
Up to high school	31	58.5%	29	58.0%	0.960
University and postgraduate	22	41.5%	21	42.0%	
Father's work					
Working	40	75.5%	38	76.0%	0.950
Retired/not working	13	24.5%	12	24.0%	
Mother's work					
Housewife	32	60.4%	29	58.0%	0.806
Working	21	39.6%	21	42.0%	
Monthly income[a]					
< 2000 SR	1	1.9%	1	2.0%	0.999
2000–5000 SR	3	5.7%	3	6.0%	
5000–10 000 SR	9	17.0%	9	18.0%	
> 10 000 SR	40	75.5%	37	74.0%	

[a]*Exact probability test for marital status and monthly income.*

Table 2 Comparison of mean MET in the intervention and control groups before and after intervention

Group	MET per week Mean (SD)	Mean difference	SE	Difference in difference (95% CI)
Within intervention group (n = 53)				
Preintervention phase	2492.45 (2291.45)	1560.75	362.4	
Postintervention phase	4053.21 (3601.33)			1925.9 (1101–2750.9)
Within control group (n = 50)				
Preintervention phase	2376.0 (2275)	–365.2	201.4	
Postintervention phase	2010.8 (2277.2)			

CI = confidence interval; MET = metabolic equivalents; SD = standard deviation; SE = standard error.

lated total physical activity per week was 62.73 minutes ($P < 0.001$).The mean difference in moderate recreational activity was 58.60 minutes ($P = 0.006$). The mean difference in total physical activity per day was 48.01 minutes ($P < 0.001$).

The mean MET per minute differed significantly before and after intervention in the domain of moderate work-related activity ($P = 0.006$), travel-related activity ($P = 0.007$), and moderate recreational activity ($P = 0.049$) (Table 5). The total MET per week also showed a significant improvement with a mean difference of 625.8 MET/min ($P = 0.008$).

Discussion

The results of the current study revealed that there were no significant differences between the intervention and control groups regarding sociodemographic characteristics and baseline physical activity in any of the domains in female college students in Saudi Arabia. A comparison of total physical activity in all 3 domains in the preintervention phase did not show any significant difference. The average daily physical activity also did not show any difference between the groups. Analysis of the share of physical activity by domain revealed that recreational activity was the most common, with about half of the share of all activity. These findings are similar to earlier reports (*16*, *17*). One in 10 of our participants did not report any physical activity before the intervention.

The effect of the intervention was demonstrated by a change in the proportion of students before and after the intervention who reported physical activity in all domains. There was an increase in the proportion of students reporting physical activity in all 3 domains and all categories of physical activity. It is interesting to note that out of 6 inactive participants in the intervention group, 4 reported activities in postintervention analysis, while 1 in 5 in the control group showed the shift. This is an important finding that highlights the effectiveness of the WhatsApp-based physical activity intervention. The increase in the proportion of students reporting moderate activity in the domain of work-related activity was significant, and it was the same for recreation-related activity. These findings suggest that for young women, improvement in levels of moderate activity is achievable. Considering the social limitations in the young female population of Saudi Arabia, it is often impractical and challenging to have live interactive sessions and community exercise programmes. Thus, social media can play an essential role in reaching individually to this group. Considering the specific degrees of activity in various domains, the proportion of participants who met the WHO criteria increased in the intervention group from 69.8% to 90%. These findings accord with other studies from different regions of the world. A study from the United States of America on perceptions and experiences of women participating in a digital-technology-based physical activity intervention reported that a greater proportion of participants in the intervention group, compared with the control group, engaged in brisk walking (*18*). A study of American university students also reported similar results to the current study, concluding that web-based physical activity intervention promoted short-term adoption of routine walking in female students (*19*). In a study from Nepal, about 85% of young adults met the WHO

Table 3 Comparison of meeting WHO criteria for minimum physical activity among intervention and control groups before and after intervention

Pre- and postintervention comparison	Meeting WHO criteria, n (%)	Percentage difference	Difference in difference (95% CI)
Intervention group			
Postintervention Preintervention	48 (90.5) 37 (69.8)	20.7%	*26.7% (18.1–35.3%)*
Control group			
Postintervention Preintervention	38 (76.0) 35 (70.0)	–6.0%	

CI = confidence interval; WHO = World Health Organization.

Table 4 Pre- and postintervention change in total physical activity per week in the intervention group in different domains

Domains	Pre- and postintervention total activity	Mean, min	Mean difference, min	95% CI	*P*
Work	Moderate work-related PA/week		168.67	68.65–298.71	< 0.001
	Preintervention	120.56			
	Postintervention	289.24			
Travel	Travel-related PA/week		62.73	17.91–132.27	< 0.001
	Preintervention	66.60			
	Postintervention	129.33			
Recreational	Vigorous-recreation-related PA/ week		32.16	27.1–127.2	0.002
	Preintervention	92.54			
	Postintervention	124.71			
	Moderate-recreation-related PA/week		58.60	20.0–197.5	0.006
	Preintervention	133.11			
	Postintervention	191.69			
Total	Total daily PA		48.01	28.0–68.1	< 0.001
	Preintervention	67.95			
	Postintervention	115.97			

CI = confidence interval; PA = physical activity.

recommendations for physical activity (*17*). A community-based cross-sectional study using GPAQ in India reported comparable findings as regards vigorous activity, with a low proportion of people engaged in vigorous activities, at work or for recreation, although walking and cycling were more common when compared with the current study (*20*). This difference is explained by the peculiar social circumstances in Saudi Arabia; most of the students are driven by car to the university and have to walk within the campus. Cycling is not common among men or women and has little relevance to our study population.

Similar results were reported in a recent study from the Islamic Republic of Iran that assessed the impact of digital-media-based intervention and education on physical activity in Muslim women. There was a significant increase in physical activity of women who used educational multimedia and websites and received daily text messages, compared with those in the control group, indicating a positive impact of media as educational interventions on health promotion (*21*). In our study, we noted that after intervention, there was a significant difference in the MET minutes per week within the intervention group and between the intervention and control groups. These findings are similar to previous reports (*21*).

The preintervention analysis showed that ~70% from both groups met the minimum WHO criteria, which improved to 90% in the intervention group but remained the same in the control group after intervention. The baseline levels of physical activity by WHO criteria were similar in other studies. In a multinational European population study, 87% of participants met the criteria (*22*), and 72% of young adult women met the criteria in a study in Nepal (*17*).

This study did not find any significant association between marital status and physical activity. Several recent studies have indicated that being single, divorced or widowed carries a risk of adverse health outcomes, which suggests that the presence of a spouse is key for helping individuals adopt a more active lifestyle (*22*, *23*). A prospective study in Japan reported that adherence to walking exercise was twice as high in couples as in noncouples (*24*). In another study, higher physical activity

Table 5 Pre- and postintervention change in total MET per week in the intervention group

Domain of PA	Preintervention mean, MET/min	Postintervention mean, MET/min	Mean difference MET/min	95% CI	*P*
Work					
Vigorous	438.1 (113.4)	325.4 (102.4)	112.62	115.8–341.1	0.334
Moderate	527.2 (77.2)	838.8 (129.2)	311.65	93.31–529.9	0.006
Travel					
Walking/cycle	255.9 (57.2)	388.2 (69.7)	132.23	36.6–227.8	0.007
Recreation					
Vigorous	685.1 (101.1)	870.6 (118.1)	185.63	29.1–400.4	0.089
Moderate	529.7 (68.4)	638.6 (74.1)	108.93	0.41–218.3	0.049
Total PA in MET/min	2435.9 (219.2)	3061.7 (312.1)	625.8	169.2–1082.4	0.008

CI = confidence interval; MET = metabolic equivalents; PA = physical activity.

was reported among married pairs than among formerly married singles (25). The lack of such an association in the current study may be explained by the choice of sample, in which only a small proportion was married. Significant improvement in physical activity was noted in older participants and those with a higher level of education.

The current study had some limitations. Although the effect of the intervention was large enough to detect significant differences between our study groups, the results cannot be generalized because of the small sample size and the study was conducted in only 1 city. All of the information was self-reported which increased the potential recall bias. However, the study had some strengths. This was a randomized controlled trial with comparable participants in both the intervention and control groups and successfully demonstrated the effectiveness of the intervention.

Conclusion

This study is a pioneering work on the successful implementation of social media for promoting physical activity among young women in Aseer Region. The results are encouraging and reveal increased levels of activity in the intervention group in all domains of physical activity. This indicates that technological advancements can be effectively used as a tool for health promotion. It is recommended that multicentre, longer follow-up studies with larger samples should be conducted. This would enable sustained improvement in physical activity and help inform policy for positive health behaviour change in this population group.

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Intervention basée sur WhatsApp pour la promotion de l'activité physique chez les étudiantes des universités d'Arabie saoudite : un essai contrôlé randomisé

Résumé

Contexte : Les jeunes adultes du monde entier utilisent de plus en plus les médias sociaux. La question est de savoir si ces réseaux peuvent être intégrés avec succès dans les programmes de santé visant à promouvoir l'activité physique.

Objectifs : La présente étude vise à mesurer l'effet d'une intervention basée sur WhatsApp pour la promotion de l'activité physique chez les étudiantes des universités à Abha, en Arabie saoudite.

Méthodes : Le présent essai contrôlé randomisé, réalisé de novembre 2019 à janvier 2020, a inclus 110 étudiantes. Le groupe d'intervention a reçu une brève orientation sur l'exercice et quatre messages de promotion sur l'activité physique par semaine via WhatsApp pendant 10 semaines. Les messages ont été obtenus à partir des sites Web des *Centers for Disease Control* américains et de l'Organisation mondiale de la Santé (OMS). L'activité physique a été évaluée au départ et après 10 semaines de suivi à l'aide du questionnaire mondiale sur la pratique d'activités physiques de l'OMS.

Résultats : Les deux groupes étaient similaires en matière de caractéristiques socio-démographiques et de niveaux d'activité physique de départ. L'analyse des données post-intervention a révélé une amélioration significative dans la proportion de participants ayant une activité physique d'intensité modérée dans les domaines du travail et des loisirs. Par rapport au groupe témoin, les équivalents métaboliques moyens/semaine du groupe d'intervention se sont améliorés de manière importante. La différence moyenne d'activité physique totale avant et après l'intervention était significative dans tous les domaines et dans toutes les catégories d'activité. La proportion de participants qui répondaient aux critères de l'OMS pour une activité physique minimale par semaine est passée de 69,8 % à 90,5 % après l'intervention.

Conclusion : Les interventions basées sur les réseaux sociaux améliorent l'activité physique et peuvent être intégrées dans des programmes de santé ciblant les jeunes.

التدخل القائم على تطبيق الواتساب لتعزيز النشاط البدني بين الطالبات الجامعيات في المملكة العربية السعودية: تجربة عشوائية مضبوطة

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الخلاصة

الخلفية: يتزايد استخدام صغار الشباب في جميع أنحاء العالم لوسائل التواصل الاجتماعي. والمسألة قيد البحث هي ما إذا كان يمكن دمجها بنجاح في البرامج الصحية لتعزيز النشاط البدني.

الأهداف: هدفت هذه الدراسة الى قياس تأثير التدخل القائم على تطبيق الواتساب لتعزيز النشاط البدني بين الطالبات الجامعيات في مدينة أبها، المملكة العربية السعودية.

طرق البحث: شملت هذه التجربة العشوائية المضبوطة، التي أُجريت في الفترة من نوفمبر/ تشرين الثاني 2019 إلى يناير/ كانون الثاني 2020، 110 طالبات. وتلقت مجموعة التدخل توجيهًا موجزًا حول ممارسة الرياضة وما يصل إلى 4 رسائل لتعزيز النشاط البدني أسبوعيًا عبر تطبيق "الواتساب" ولمدة 10 أسابيع. وتم الحصول على الرسائل من المواقع الإلكترونية للمراكز الأمريكية لمكافحة الأمراض ومنظمة الصحة العالمية. وقُيِّم النشاط البدني عند خط الأساس وبعد المتابعة لمدة 10 أسابيع باستخدام الاستبيان العالمي للنشاط البدني لمنظمة الصحة العالمية.

النتائج: كانت المجموعتان متشابهتين في مستويات النشاط البدني عند خط الأساس ومن حيث البُعد الاجتماعي والسكاني. وكشف تحليل البيانات ما بعد التدخل عن تحسن كبير في نسبة المشاركات اللواتي يمارسن نشاطًا بدنيًا متوسط الشدة في مجالي العمل والترفيه. وبالمقارنة مع المجموعة الشاهدة، تحسَّن إلى حد كبير متوسط المكافئ الأيضي/ أسبوعيًا في مجموعة التدخل. وكان متوسط الفرق في إجمالي النشاط البدني قبل التدخل وبعده كبيرًا في جميع المجالات وفي جميع فئات النشاط. وازدادت نسبة المشاركات اللواتي استوفين معايير منظمة الصحة العالمية المعنية بالحد الأدنى من النشاط البدني أسبوعيًا من 69.8٪ إلى 90.5٪ بعد التدخل.

الاستنتاج: تؤدي التدخلات القائمة على الشبكات الاجتماعية إلى تحسين النشاط البدني، ويمكن دمجها في البرامج الصحية التي تستهدف الشباب.

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Congenital anomalies in neonates in Fayoum Governorate, Egypt

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Abstract

Background: The worldwide incidence of congenital anomalies (CAs) is estimated at 3–7%, but actual numbers vary widely among countries. Birth defects are the most common causes of infantile mortality, accounting for ~25% of all neonatal deaths.

Aims: To determine the prevalence of congenital anomalies in neonates in Fayoum Governorate; to classify malformations; and to clarify the association between congenital anomalies and possible risk factors.

Methods: A cross-sectional study was conducted on 1000 infants in the neonatal intensive care unit and outpatient clinics of Fayoum University Hospital and Fayoum General Hospital during August 2017 to April 2018. Detailed history, clinical examination and relevant investigations were performed.

Results: The prevalence of CAs was 7.4%. Major malformations accounted for 78.4% and minor malformations 21.6%. The most common CAs involved the cardiovascular system (32.4%), followed by musculoskeletal anomalies (18.9%), chromosomal anomalies (10.8%), anomalies of the central nervous system (9.5%), gastrointestinal tract (6.8%), genital system (5.4%), eyes, head and neck (5.4%), respiratory system (4.1%), multisystems (2 or more) (4.1%), and renal and urinary systems (2.7%). 82.4% of cases were from rural areas, 62.1% were male, 36.5% were female and 1.4% were ambiguous. 85.1% of neonates with malformations were full term.

Conclusion: Cardiovascular, musculoskeletal and chromosomal anomalies were the most common CAs in our study. Positive consanguinity, poor attendance at antenatal clinics, rural residence and multiparty were the most common risk factors associated with CAs.

Keywords: birth defects, congenital anomalies, Egypt, prevalence, risk factors.

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Introduction

Congenital anomalies (CAs), are functional or structural anomalies that can be identified prenatally, at birth, or may only be diagnosed later in life as in cases with hearing defects (*1,2*). Many researchers have reported that the musculoskeletal system, central nervous system (CNS), gastrointestinal tract (GIT) and genitourinary system are the most frequently affected (*3*). The etiology of up to 60% of CAs is still unknown and multifactorial causes account for 20–25% of cases. There is a complex interaction between environmental and genetic risk factors. Around 10–13% of CAs have a well-recognized environmental cause (e.g., infections, illness or maternal drug abuse) (*2–4*), and 12–25% of CAs have a purely genetic cause. Chromosomal anomalies are responsible for most malformations that occur due to genetic factors. The reported risk factors include consanguinity, advanced parental age, nutritional deficiency, and teratogens, such as drugs and infectious agents (*5*).

The importance of CAs lies not only in their contribution to neonatal and perinatal mortality, but also that they lead to disability in infants and children (*6*). CAs have a major impact on patients, families, healthcare systems and society (*7*), and they also lead to emotional upset and social stigma in parents (*8*).

According to the World Health Organization, there were 270 000 deaths during the first 28 days of life caused by CAs worldwide in 2010 (*2*). According to the March of Dimes global report on birth defects, 6% occur annually with serious defects and 94% of these births occur in middle- and low-income countries (*1,2*).

There are insufficient reports regarding the epidemiology of CAs in developing countries (*9*). Many different surveys since the 1960s have tried to estimate the prevalence of CAs around the world (*10*), with 1% in Japan, 4.3% in Taiwan, 2% in England, 2–3% in the United States of America and 3.65% in India (*11*). These variations may be related to regional differences in maternal risk factors, environmental exposure, and economic, ecological and ethnic factors (*12*). In the Middle East where consanguinity is common, the prevalence of major CAs is 2–2.5%, but it can be as high as 7% from consanguineous marriage (*13*). The prevalence of CAs in Africa may be different from that in the developed world, due to differences in genetics and exposure to environmental risk factors. The available data on CAs in Africa underestimate their

prevalence. This is because of under-reporting, lack of reliable medical records, minimal diagnostic capabilities and poor postnatal follow-up for full clinical examination and accurate diagnosis of CAs (*14*). In Egypt, only a small number of studies from university and general hospitals have demonstrated the prevalence of CAs among live and still births (*15*).

The main objectives of this study were to identify and report different types of CAs in neonates in the 2 major referral hospitals in Fayoum Governorate, and to correlate between types of CAs and different possible risk factors.

Methods

This was a cross-sectional hospital-based study from August 2017 to April 2018 of 1000 neonates from birth to age 28 days at the neonatal intensive care unit (NICU) and outpatient clinics of Fayoum University Hospital and Fayoum General Hospital. The sample size was calculated by Epi info 2000 software based on a worldwide prevalence of CAs of ~3% of neonates (*16*) at 95% confidence interval and 80% study power. The sample was increased by 10% to overcome missing data.

This study was approved by the Faculty of Medicine Research Ethical Committee, Fayoum University. The researchers explained to parents of all participants the objectives of the study, as well as the examination and investigations to be done. Also, confidentiality of patient information and the right not to participate in the study were respected. Consent was obtained from the parents of all participants.

A full history was taken from the parents. We recorded rural or urban residence, maternal gravidity and parity, family history, birth defects, maternal history of abortion or stillbirth, maternal chronic illness, consanguinity, prenatal history, maternal age at conception, drug intake during pregnancy, and exposure to infection or radiation especially during the first trimester. Antenatal ultrasonography and number of visits were recorded, along with natal history, including gestational birth and mode of delivery. The newborns were examined thoroughly to look for any congenital anomaly or facial dysmorphism. Different body systems were examined, including cardiovascular, respiratory, skeletal, neurological and genitourinary systems. When indicated, karyotyping, abdominal ultrasonography, echocardiography and brain imaging were performed.

We classified the anomalies according to the European Surveillance of Congenital Anomalies (EUROCAT) coding system into major and minor anomaly groups (*17*): 5.8% had major anomalies and 1.6% had minor anomalies.

Microsoft Excel 2010 was used for data entry. IBM SPSS version 21 (SPSS Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics such as frequency distribution and comparisons were used. Qualitative data were displayed in cross tabulations and comparisons of proportions were performed using Fisher's exact and χ^2 tests. $P < 0.05$ was considered statistically significant. All tests were 2-tailed.

Results

CAs were found in 74/1000 (7.4%) neonates: 56/460 in NICU (12.17%) and 18/540 (3.33%) in outpatient clinics. CAs were more frequently diagnosed in rural (61/74; 82.4%) compared with urban (13/74; 17.6%) areas, which showed a significant association between residence and occurrence of CAs ($P = 0.018$) (Table 1). Forty-six (62.1%) cases were male, 17 (36.5%) were female and 1 (1.4%) had ambiguous genitalia. There was a male to female ratio of 1.7:1, but the difference was not significant ($P = 0.241$). Sixty-three (85.1%) births were full term and 11 (14.9%) were preterm, but the difference was not significant ($P = 0.203$). Seventy-one (95.9%) births were singletons and 3 (4.1%) were twins, and in all cases the second twin was normal.

Regarding maternal parity, 34 (45.9%) infants were born to women of fourth gravida or more, 17 (23%) were third gravida, 13 (17.6%) were second gravida and 10 (13.5%) were primigravida (Table 1). There was a significant association between multiparty and CAs ($P = 0.001$). Only 32 (43.2%) mothers received antenatal care (≥ 3 visits), and there was a significance difference between poor attendance to antenatal clinic and CAs ($P = 0.001$). Five cases (6.8%)were prenatally diagnosed (3 had CNS anomalies, 1 had renal anomalies and the other had multiple CAs). Consanguinity was positive in 41 (55.4%) cases with CAs, which was statistically significant ($P = 0.001$) (Table 1). History of maternal systemic illness was reported in 8 cases (10.8%) (anaemia, cardiac problem, thyrotoxicosis, hypertension and breast cancer). Thirteen (17.6%) cases with CAs had perinatal complications as pregnancy-induced hypertension (PIH), gestational diabetes, pre-eclampsia, polyhydramnios, oligohydramnios, exposure to magnetic resonance imaging radiation, and multiple pregnancies. Seventeen cases (23%) with CAs had a history of complications during previous pregnancies (birth defects, abortion and stillbirths).

Cardiovascular system anomalies were the most commonly reported (24/74; 32.4%) (Table 2). Among this group, the most frequent anomalies were anomalies of cardiac septa (10/74; 13.5%). The musculoskeletal system anomalies were the second most common (14/74; 18.9%); the most frequent anomalies were talipes equinovarus (9/74; 12.2%). Chromosomal anomalies were the third most common (8/74; 10.8%); the most frequent anomalies were Down's syndrome (7/74; 9.5%). Seven (9.5%) had CNS anomalies; the most frequent was congenital hydrocephalus (2/74; 2.7%). Other anomalies are listed in Table 2, and 3 (4.1%) had multisystem anomalies. The lowest frequency of CAs was related to the urinary system (2/74; 2.7%).

Table 1 Significance of congenital anomalies and consanguinity, residence, order of pregnancy, route of delivery and antenatal care among the study group

	Congenital anomalies			
	With	Without	Total	*P*
Consanguinity				
Positive	41 (12%)	300 (88%)	341 (100%)	0.001
Negative	33 (5%)	626 (95%)	659 (100%)	
Total				
Count (%)	74 (7.4%)	926 (92.6%)	1000 (100%)	
Residence				
Urban	13 (4.4%)	283 (95.6%)	296 (100%)	0.018
Rural	61 (8.7%)	643 (91.3%)	704 (100%)	
Total				
Count	74 (7.4%)	926 (92.6%)		
Order of pregnancy				
G1	10 (4.20%)	230 (95.80%)	240	0.001
G2	13 (5.30%)	234 (94.70%)	247	
G3	17 (6.90%)	229 (93.10%)	246	
G4 and more	34 (12.70%)	233 (87.30%)	267	
Route of delivery				
CS	61 (7.30%)	769 (92.70%)	830	0.893
NVD	13 (7.60%)	157 (92.40%)	170	
Antenatal care				
Yes	32 (5.00%)	608 (95.0%)	640	0.001
No	42 (11.70%)	318 (88.30%)	360	

Abbreviations: CS = caesarean section; G = gravida; NVD = normal vaginal delivery.

Discussion

We found 74 (7.4%) CAs among 1000 neonates in Fayoum Governate, Egypt. This is high when compared with studies in other governorates in Egypt: 3.17% in Giza (*18*), 2.75% in Cairo (*15*), 2.06% in Assiut (*19*) and 2.5% in Zagazig (*20*). Regional differences in percentage of CAs from 1 area to another may be attributed to many factors, such as different methods used for detection and reporting of CAs, and differences in environmental exposure, nutritional status and habits of pregnant women in a particular locality (*19*). Higher rates of consanguinity in Upper Egypt may have contributed to the increase in CAs. The high percentage of CAs in our study could have been because the study was conducted in 2 major referral hospitals in Fayoum Governorate, or it may indicate the presence of environmental teratogens (e.g., pesticides) or other risk factors within the Governorate that need to be investigated.

Other countries have shown variable rates of CAs: 2.46% in Oman (*21*), 1.25% in Kuwait (*22*), 2.4% in Lebanon (*16*), 3.76% in the Islamic Republic of Iran (*23*), 15% in Pakistan (*24*), 6.2% in Nigeria (*25*), 6.2% in Barbados (*26*), 2.89% in the United States of America (USA) (*27*), 8.39% in Nepal (*28*) and 6.2% in Bangladesh (*29*). These differences were probably due to differences in study design (data source and length of observation) (*26*). The incidence of CAs can be determined by several factors such as the population, duration, location and date of the study (*30*). Variable rates of CAs could also be related to different social, ethnic and racial factors (*31*).

According to the EUROCAT criteria for CAs, minor anomalies are those that have lesser medical, functional or cosmetic consequences. In our study, we considered as minor anomalies isolated hypospadias, talipes calcaneovalgus, congenital laryngiomalacia, isolated polydactyly, congenital palato-oesophogeal incoordination, benign undescended testicles and choledocal cyst. Out of 74 CAs, 16 were grouped as minor anomalies (21.6%) and 58 as major anomalies (78.4%). The latter was greater than in a study in Nigeria (*25*), where 59.6% had major anomalies.

In the current study, cardiovascular anomalies were the most commonly reported (32.4%) followed by musculoskeletal (18.9%), chromosomal (10.8%), CNS (9.5%), GIT (6.8%), genital (5.4%), eye, head and neck (5.4%), respiratory (4.1%), multisystem (2 or more) (4.1%), and renal and urinary (2.7%) anomalies. In Lebanon, the most common were cardiovascular and limb anomalies (both 16.6%) (*16*). In Barbados, the most common anomalies were cardiovascular (20.4%) followed by malformations of the musculoskeletal system (15.5%) and digestive system (13%) (*26*). In the USA, the most commonly affected area were the cardiovascular (35.5%) and genitourinary (27.7%) systems (*27*). In Bangladesh, the most common anomalies

Table 2 Distribution of congenital anomalies according to the involved system

Item	Frequency	%
Central nervous system	7	9.5
Congenital hydrocephalus	2	2.7
Thoracic spina bifida with hydrocephalus	1	1.4
Holoprosencephaly	1	1.4
Dandy–Walker syndrome	1	1.4
Agenesis of corpus callosum	1	1.4
Anencephaly	1	1.4
Chromosomal	8	10.8
Down syndrome	7	9.5
Pierre Robin sequence/syndrome	1	1.4
Cardiovascular system	24	32.4
Dextrocardia with situs inversus	1	1.4
Endocardial cushion defect	1	1.4
Congenital malformations of cardiac septa	10	13.5
Congenital malformations of the heart, unspecified	9	12.2
Congenital cardiomyopathy	1	1.4
Pulmonary valve atresia	1	1.4
Tetralogy of Fallot	1	1.4
Respiratory system	3	4.1
Congenital laryngomalacia	1	1.4
Congenital diaphragmatic hernia	1	1.4
Choanal atresia	1	1.4
Gastrointestinal system	5	6.8
Congenital hypertrophic pyloric stenosis	1	1.4
Congenital palato-oesophageal incoordination	1	1.4
Choledochal cyst	1	1.4
Duplication: biliary duct	1	1.4
Exomphalos	1	.4
Renal and urinary system	2	2.7
Congenital posterior urethral valves	1	1.4
Congenital hydronephrosis	1	1.4
Genital system	4	5.4
Hypospadias, penile	2	2.7
Ambiguous genitalia	1	1.4
Undescended testicle	1	1.4
Musculoskeletal system	14	18.9
Talipes equinovarus	9	12.2
Polydactyly	2	2.7
Polysyndactyly	1	1.4
Talipes calcaneovalgus	1	1.4
Congenital deformities of hip	1	1.4
Multisystem (2 or more)	3	4.1
Dysmorphic features + nervous + renal + urinary	1	1.4
Cardiac + renal + musculoskeletal	1	1.4
Cleft palate with cleft lip + congenital cataract	1	1.4
Eye, head and neck	4	5.4
Cleft palate with cleft lip	1	1.4
Anophthalmos	1	1.4
Media neck cyst	1	1.4
Dysmorphic face	1	1.4
Total	74	100

involved the cardiovascular system (59.04%), followed by club foot (8.57%) and Down syndrome (7.61%) (*29*). In Egypt, CNS anomalies were the most frequent, followed by chromosomal and genital]anomalies (*15*). Similarly, in Turkey, the most common anomalies were related to the CNS, followed by cleft palate and lip and musculoskeletal disorders (*32*). In Iraq, the most common CAs were CNS anomalies, cleft palate and lip and musculoskeletal anomalies (*33*). CNS anomalies were the most common in the Islamic Republic of Iran, followed by congenital heart disease and ear/eye defects (*34*). In the United Republic of Tanzania, the most affected region was the CNS, followed by the musculoskeletal and GIT systems (*35*). In other areas in Egypt, in Assiut, the most frequently involved area was the musculoskeletal system, followed by genitourinary system and CNS (*19*). In Zagazig, anomalies of the musculoskeletal system were the most commonly reported, followed by the CNS and GIT (*20*). In conclusion, CAs of the cardiovascular and musculoskeletal systems seem to be the most commonly reported in the literature.

In the current study, the rate of CAs was higher among male (62.1%) than female (36.5%) neonates, which was consistent with other studies in Egypt (*15,20*) and other countries (*5,32*), although the sex difference was not significant. The male preponderance for CAs is thought to be that male embryos are more vulnerable to oxidative stress (*19*).

In our study, 55.4% of neonates with CAs were born to consanguineous parents, which differed significantly from the number born to non-consanguineous parents. This shows that positive consanguinity is one of the risk factors for Cas. Several other studies have reported similar results (*15,20,16*). The Arab preference for consanguinity to maintain the family property and structure, easier marital arrangements, and financial advantages will always be a risk factor for CAs.

Most of the anomalies in our study were detected in infants born to mothers aged 21–29 years. A similar maternal age range was reported in a study of CAs in India (*31*), whereas El Koumi et al. reported a wider maternal age range between 20 and 35 years (20). Other studies in Entebbe (Uganda), Egypt and in Ebril (Kurdistan) have found that most infants with CAs were born to mothers aged > 35 years (*3,15,32*), who have an increased risk of

chromosomal aberrations (*15*). However, in Nepal, most of the CAs occur in mothers aged < 20 years (*28*).

In the current study, multiparity was significantly associated with CAs (45.9%). Other studies in the United Republic of Tanzania and Egypt were consistent with our findings (*15*,*19*,*35*). This is probably a consequence of higher maternal age (*19*) and the grand multipara is associated with higher risks of obstetric complications such as gestational diabetes, PIH, maternal anaemia and postpartum haemorrhage. In contrast, most CAs were found in primigravida women in Nepal and India (*25*,*28*).

In our study, 82.4% of neonates with CAs had a maternal history of rural residence. This may be related to the higher risk of exposure to insecticides and pesticides in rural areas. It may also be related to increased consanguinity rate, which is the cultural norm in rural areas. However, in Assuit, there was no significant difference between maternal residence and CAs (*19*).

Most neonates in our study were full term (85.1%) and 14.9% were preterm. Other studies in Zagazig and the USA have reported a high rate of birth defects among premature infants (*20*,*27*). In the present study, 75.7% of neonates had average birth weight 2.5–4.0 kg. Tenali et al. agree with our findings, and 57.5% of their cases in India had an average weight (30), while other studies showed an increased incidence of CAs in babies of low birth weight (*20*,*26*,*28*).

We consider that proper antenatal care is to fulfil at least 3 antenatal visits. CAs were significantly associated with history of poor attendance at the antenatal clinic (< 3 visits), and 56.8% of mothers in our study had poor antenatal care. Mothers were not informed about the importance of proper nutrition and multivitamins and folic acid administration during their pregnancies, which influenced fetal cell division and growth. Our findings were consistent with other studies in Cairo (*15*).

In the current study, 82.4% of cases with CAs were delivered by caesarean section. However, this was not significant and agrees with other studies in Egypt and Brazil (*5*,*15*). Other studies have shown a significant association between the mode of delivery and CAs (*19*). This was most probably related to obstetric complications or fear of fetal distress during normal vaginal delivery directing the obstetrician to recommend caesarean section.

Maternal medical disorder was present in 10.8% of cases: anaemia (4.1%), cardiac disease (1.4%), thyrotoxicosis (1.4%), hypertension (2.7%) and breast cancer (1.4%). Another study in Cairo reported 14% of cases with maternal medical disorders (*15*). Perinatal complications represented 17.6%: PIH in 5.4%, polyhydramnios in 1.4%, oligohydramnios in 1.4%, exposure to radiation in 1.4%, multiple pregnancies in 4.1%, gestational diabetes in 2.7% and pre-eclampsia in 1.4%. A previous study in Cairo reported that 11% of cases with CAs had a history of perinatal complications (*15*) while Tenali et al. found perinatal complications in 50% of cases in India (*30*). In our study, only 4 cases (5.4%) of CAs were diagnosed prenatally, indicating poor prenatal care among the population of Fayoum. Twenty-three percent of the mothers experienced complications during their previous pregnancies and 14.9% had a history of spontaneous abortion. A previous study of CAs in Egypt reported about 50% of mothers had complications during their previous pregnancies (*15*).

Our study had some limitations. This was a hospital-based study that may not reflect the overall situation with CAs in the wider community. To obtain a better picture, a community-based study should be conducted. We only targeted structural malformations, , functional anomalies were not included. Our study included only live births and stillbirths and pregnancy terminations were not included.

Conclusion

Cardiovascular, musculoskeletal and chromosomal anomalies were the most common type of CAs reported in the current study. Other anomalies involved the CNS, GIT, genital system, eyes, head and neck, respiratory system, or 2 or more systems. The least-frequent were renal and urinary anomalies. CAs were associated with risk factors such as consanguinity, poor attendance at the antenatal clinic, multiparity and rural residence. Other risk factors such as drug exposure, abnormal outcome of previous pregnancies and maternal illness were also reported. Unfortunately, poor antenatal care and lack of proper prenatal diagnosis were documented. Knowledge of the incidence and pattern of CAs is important to plan for proper preventive strategies at different levels by healthcare providers.

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Anomalies congénitales chez les nouveau-nés dans le gouvernorat de Fayoum, Égypte

Résumé

Contexte : L'incidence mondiale des anomalies congénitales est comprise entre 3 et 7 % selon les estimations, mais les chiffres réels varient considérablement selon les pays. Les malformations congénitales sont les premières causes de mortalité infantile, soit environ 25 % de l'ensemble des décès néonatals.

Objectifs : L'étude vise à déterminer la prévalence des anomalies congénitales chez les nouveau-nés dans le gouvernorat de Fayoum. Elle tend également à classifier les malformations et à clarifier l'association entre les anomalies congénitales et les différents facteurs de risque possibles.

Méthodes : Une étude transversale a été menée sur 1000 nourrissons dans l'unité de soins intensifs néonatals et les services de consultations externes de l'hôpital universitaire de Fayoum et de l'hôpital général de Fayoum entre août 2017 et avril 2018. Les antécédents détaillés ont été collectés, un examen clinique et des enquêtes pertinentes ont été réalisés.

Résultats : La prévalence des anomalies congénitales était de 7,4 %. Les malformations majeures représentaient 78,4 % de toutes les anomalies et les malformations mineures constituaient 21,6 %. Les anomalies congénitales les plus fréquentes concernaient le système cardio-vasculaire (32,4 %), suivi des anomalies musculosquelettiques (18,9 %), des anomalies chromosomiques (10,8 %), des anomalies du système nerveux central (9,5 %), des voies gastro-intestinales (6,8 %), de l'appareil génital (5,4 %), des yeux, de la tête et du cou (5,4 %), du système respiratoire (4,1 %), des systèmes multiples (deux ou plus) (4,1 %) et des systèmes rénal et urinaire (2,7 %). Sur l'ensemble des cas, 82,4 % venaient des zones rurales, 62,1 % étaient des hommes, 36,5 % des femmes et 1,4 % étaient ambigus ; 85,1 % des nouveau-nés souffrant de malformations étaient nés à terme.

Conclusion : Les anomalies cardiovasculaires, musculosquelettiques et chromosomiques étaient les anomalies congénitales les plus fréquentes dans notre étude. La consanguinité positive, la faible fréquentation des cliniques prénatales, la résidence rurale et la multiparité étaient les facteurs de risque les plus fréquemment associés aux anomalies congénitales.

التشوهات الخلقية لدى حديثي الولادة في محافظة الفيوم، مصر

هبة العوضي، القاسم الجميل، تامر رجب، ناصر حسن

الخلاصة

الخلفية: يُقدَّر حدوث التشوهات الخلقية على مستوى العالم بنسبة 3–7٪، ولكن تتباين الأرقام الفعلية على نطاق واسع بين البلدان. والعيوب الولادية هي السبب الأول في وفيات الرضع، فهي مسؤولة عما يقرب من 25٪ من جميع وفيات حديثي الولادة.

الأهداف: هدفت هذه الدراسة إلى تحديد مدى انتشار التشوهات الخلقية بين حديثي الولادة في محافظة الفيوم. كما هدفت إلى تصنيف التشوهات، وتوضيح العلاقة بين التشوهات الخلقية وعوامل الخطر المحتملة المختلفة.

طرق البحث: أُجريت دراسة مقطعية على 1000 رضيع في وحدة الرعاية المركزة لحديثي الولادة والعيادات الخارجية في مستشفى الفيوم الجامعي ومستشفى الفيوم العام، في الفترة من أغسطس/آب 2017 حتى أبريل/ نيسان 2018. وأُخِذَ تاريخ مرضي تفصيلي وأُجري فحص سريري وعمليات استقصاء ذات صلة بالموضوع.

النتائج: بلغ معدل انتشار التشوهات الخلقية 7.4٪. وبلغت نسبة التشوهات الكبرى 78.4٪ والتشوهات الصغرى 21.6٪. وشملت التشوهات الخلقية الأكثر شيوعًا: الجهاز القلبي الوعائي (32.4٪)، والشذوذات العضلية الهيكلية (18.9٪)، وشذوذ الكروموسومات (10.8٪)، وشذوذات في الجهاز العصبي المركزي (9.5٪)، والجهاز الهضمي (6.8٪)، والجهاز التناسلي (5.4٪)، والعينين والرأس والرقبة (5.4٪)، والجهاز التنفسي (4.1٪)، والأجهزة المتعددة (جهازين أو أكثر) (4.1٪)، والجهازين الكلوي والبولي (2.7٪). وكان 82.4٪ من الحالات من مناطق ريفية، وكان 62.1٪ من الذكور، و36.5٪ من الإناث، وكان 1.4٪ من الحالات غامضة. و85.1٪ من حديثي الولادة المصابين بالتشوهات وُلِدوا بعد فترة حمل مكتملة.

الاستنتاج: كانت الشذوذات في القلب والأوعية الدموية والعضلات الهيكلية والكروموسومات أكثر أنواع التشوهات الخلقية شيوعًا في دراستنا. ويعد زواج الأقارب، وقلة الزيارات لعيادات الرعاية السابقة للولادة، والإقامة في الريف، وتعدد الأطراف من عوامل الخطر الأكثر شيوعًا المرتبطة بالتشوهات الخلقية.

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Balancing science and public policy in Pakistan's COVID-19 response

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Abstract

Background: Coronavirus disease 2019 (COVID-19) has affected the world in an unprecedented manner and South Asian countries were among the first to experience imported cases. Pakistan's response to COVID-19 has been under scrutiny for its granularity, reach and impact.

Aims: to evaluate objectively the chronology and depth of the response to COVID-19 in Pakistan.

Methods: We evaluated available national and subnational epidemiological and burden information on COVID-19 cases and deaths in Pakistan, including projection models available to the Government at an early stage of the pandemic.

Results: Pakistan, with a population of 215 million and considerable geographic diversity, experienced case introduction from pilgrims returning from the Islamic Republic of Iran, followed by widespread community transmission. The National Command and Operations Centre, established through civilian and military partnership, was critical in fast tracking logistics, information gathering, real-time reporting and smart lockdowns, coupled with a massive cash support programme targeting the poorest sections of society. Cases peaked in June 2020 but the health system was able to cope with the excess workload. Since then, although testing rates remain low (> 300 000 cases confirmed to date), case fatality rates have stabilized, and with 6300 deaths, Pakistan seems to have flattened the COVID-19 curve.

Conclusion: Despite notable successes in controlling the pandemic, several weaknesses remain and there are risks of rebound as the economy and educational systems reopen. There is continued need for strong technical and programmatic oversight, linked to civic society engagement and working with religious scholars to ensure nonpharmacological intervention compliance.

Keywords: COVID-19, disease surveillance, mitigation strategies, nonpharmacological interventions, Pakistan

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Introduction

The world has witnessed an 18 month period like no other. From the early reports of a new disease caused by a possible coronavirus, subsequently confirmed to be severe acute respiratory syndrome coronavirus (SARS-CoV)-2, the outbreak became an epidemic with clear global risks. The resultant infection, called coronavirus disease 2019 (COVID-19), was declared a global pandemic on 11 March 2020 (*1*). Over the last 18 months, COVID-19 has spread across the globe and led to > 196 million infections and 4.2 million deaths (*2*). The disease continues to baffle epidemiologists and public health professionals across much of the developed world, with huge impacts on the economic, trade, commercial and public health outcomes. Low- and middle-income countries (LMICs) are no exception, and many have also suffered outbreaks with huge loss of life and economic disruptions.

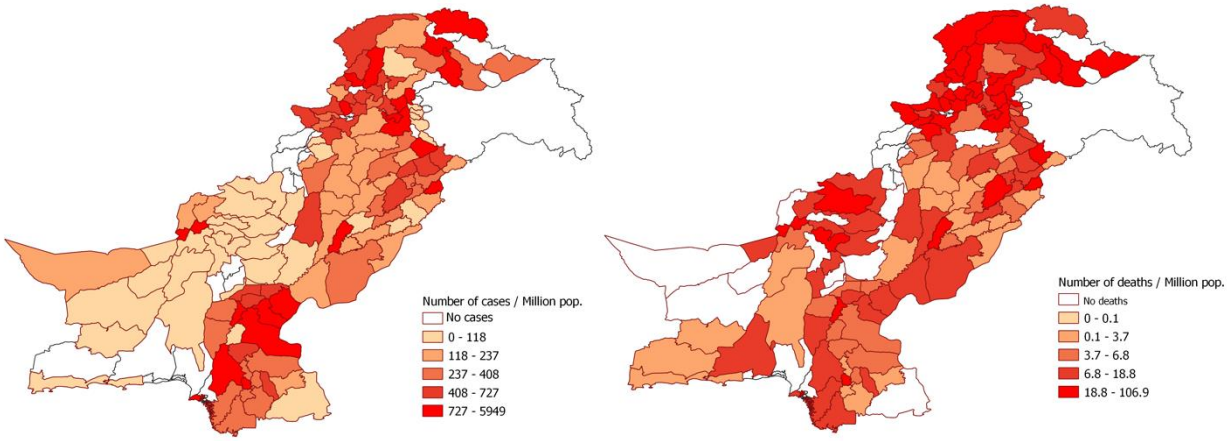
Early disease introduction and epidemiology in Pakistan

Pakistan experienced early introduction of COVID-19 in February 2020. This was not surprising given its proximity to China, where the outbreak originated, and the Islamic Republic of Iran, one of the first major outbreak epicentres outside Europe. While the initial focus was on inbound travellers from China, this was rapidly readjusted towards suspected cases among pilgrims returning by road from holy sites in the Islamic Republic of Iran. Unlike structured airport entries, the Iranian border crossing in the remote location of Taftan in Balochistan Province meant that initial arrangements were inadequate and makeshift facilities for screening and quarantine had to be established. The disease quickly spread to all metropolitan centres and districts of Pakistan, although several rural districts of Balochistan and Southern Khyber Pakhtunkhwa Province had comparatively lower reported numbers of cases and negligible reported deaths. However, this was likely related to limited testing at population level (Figure 1).

What guided national policy and early multisectoral responses?

Health sector limitations in developing a comprehensive strategy for response became evident soon after identifi-

Figure 1 Coronavirus disease 2019 (COVID-19) morbidity and mortality distribution in Pakistan in March–September 2020

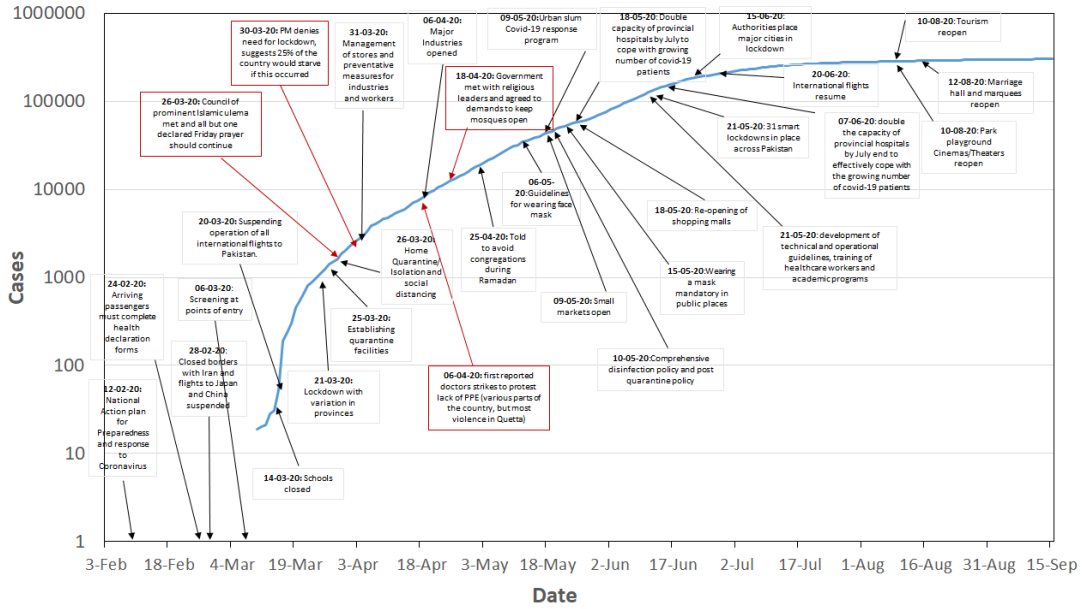


cation of the first group of cases in Sindh among returning pilgrims from holy sites in the Islamic Republic of Iran on 26 February 2020, as there were negligible public health laboratories with the capacity and standardized protocols for real-time polymerase chain reaction (PCR) diagnosis of SARS-CoV-2 infections. These needed to be established including a mobile testing laboratory at remote Taftan, alongside quarantine facilities.

As the pandemic and its attendant challenges expanded into nonhealth domains, the initial response, mainly centred within the Federal Ministry of National Health Services, Regulation & Coordination (MoNHSRC), had to be completely redesigned. Formation of the National Coordinating Council (NCC) on 13 March 2020, headed by the Prime Minister with representatives from all key ministries including health, was a key early step, followed soon by the establishment of a National Command and Operations Center (NCOC) on 27 March 2020. The NCOC was the implementation arm of the NCC for coordination across multiple provinces and jurisdictions, as well as between entities of the Federal Government (3). Other notable actions, despite limited resources, were the inclusion of the National Disaster Management Authority (NDMA) for emergency procurement and deployment of a wide range of resources by the Federal and Provincial Governments.

There was little to guide the national response in the initial stages, beyond the broad early guidance of the World Health Organization and the response emerging from countries in the extreme grip of the pandemic (January to February 2020). These included China, which after an initial period of confusion and limited information, imposed a strict lockdown despite the Chinese New Year, to restrict movement of its population (4). With the rapidly changing initial responses from European and North American countries, the Pakistan Government imposed a series of early nonpharmacological interventions (NPIs), including closure of educational

Figure 2 Epidemiological curve and nonpharmacological interventions in Pakistan (February–September 2020)



institutions, bans on large gatherings like weddings, and closure of some nonessential businesses. Extension to a full lockdown in the largest city of Karachi followed on 23 March 2020, and a day later in other major metropolitan areas. These were met by various challenges at different stages, given planned religious mass gatherings and traditional practices in the month of Ramadhan (Figure 2). Notwithstanding these considerations, strict implementation of movement restrictions and business closures played a major role in flattening the incidence curve, and preparing the health sector for the predictable surge of cases.

Capacity and equipment for molecular diagnostics in public sector laboratories in Pakistan were limited. From the initial 4 laboratory testing sites in the public sector with a maximum daily capacity of 400 PCR tests, stemmed several testing sites across the country, established by the Federal Government under the supervision of Pakistan's National Institute of Health (NIH) by the end of February. The Federal and Provincial Governments established expert committees to address COVID response, guidelines and regulations. The foci of these oversight groups were development of standard operating procedures for case detection (establishing testing systems and staff training), and guideline development for infection control in various settings as well as clinical care of patients with COVID-19. A small think tank was set up at the federal level for coordinating efforts and streamlining procurements, imports and distribution of testing kits and equipment, staff training and personal protective equipment (PPE). As Figure 3 indicates, notwithstanding considerable regional differences in rates of testing, overall numbers of confirmed cases per day climbed to a maximum of around 6000–7000 by mid-June and decreased to the current daily average of < 500. The number of COVID-19 related deaths, which is based on a standardized reporting system from > 500 hospitals across the country, has decreased consistently and steadily.

Local epidemiology and policy guidance

Lack of capacity and paucity of national and provincial public health institutions have affected the rapidity of obtaining relevant population-based information from research. The COVID-19 oversight committees established at the federal and provincial level focused initially on logistics, and only began investing in data systems by the end of March 2020, reporting directly to the NCOC and publishing situational analyses on a daily basis on a public MoNHSRC COVID-19 information portal (5). This became a vital link for monitoring and trend analysis.

A crucial element was enabling systematic inflow of testing data from a constantly increasing number of laboratories across the provinces and from public, private and nonprofit sectors. In a remarkable redeployment of resources, the existing reporting network and database for polio surveillance was used to fast track the process, and electronic interfaces were created to ensure rapid and accurate data flow. It was quickly recognized that there was little capacity within the existing health system infrastructure, even in large provincial capitals, to cope with the anticipated rise in critically ill patients. Hence, an essential objective of the initial rapid response strategy was to flatten the epidemiological disease curve to allow enough time to build systems' capacity. While there were around 2000 intensive care beds in the country initially, few had the capacity to take care of COVID patients (Table 1). Several health facilities had to be revamped and equipped for functionality. The NCOC and NDMA played a crucial role in fast tracking procurement and local production of key commodities such as PPE and hand sanitizers. Local manufacturing of ventilators was initiated and by June 2020, Pakistan became largely self-reliant on the COVID-19 supply chain and logistics.

Data for decision making

Establishing a central, accurate data repository was key to evidence-informed decision-making, which was facil-

Figure 3 Trends in confirmed cases and coronavirus disease 2019 (COVID-19) deaths in Pakistan

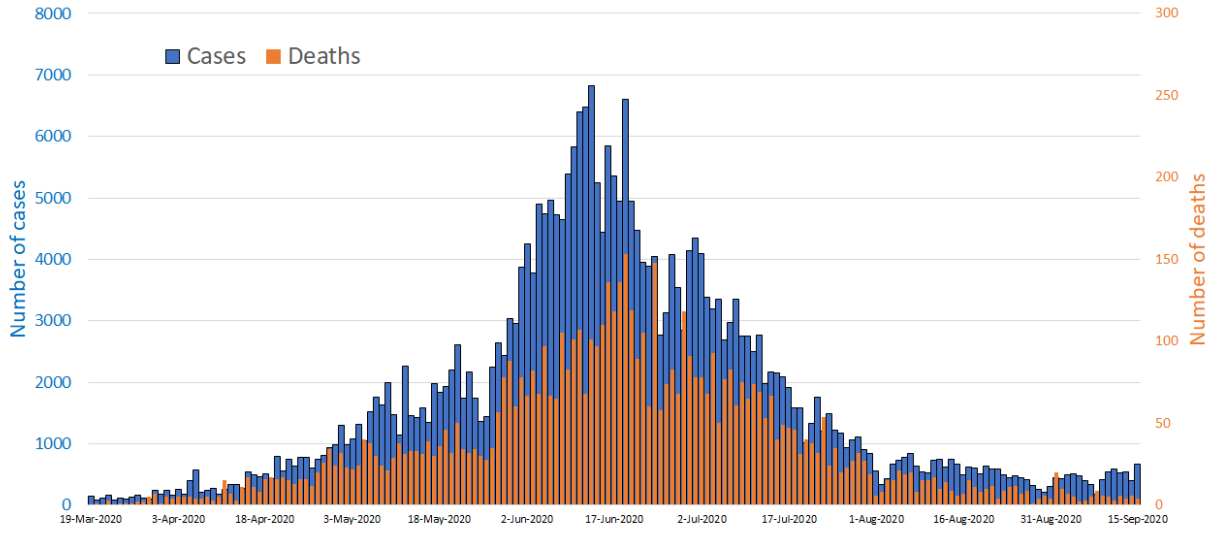


Table 1 Chronology of health systems response to COVID-19 in Pakistan

Aspect	Timeline, 2020										
	March 1	March 15	March 30	April 15	April 30	May 15	May 30	June 15	July 15	July 31	August 31	September 15
Testing centres or laboratories for PCR	09	14	19	41	59	71	81	83	99	107	110	112
Testing capacity per day (public sector)	1920	3585	6584	11 140	14 186	19 016	30 190	30 362	43 726	46 730	46 616	47 336
Actual tests performed per day	–	149	935	3280	8249	14 017	12 020	29 085	21 749	22 930	24 246	33 509
No. of ICU beds	2290	2290	2441	2468	2636	2660	2290	3090	3389	3389	3389	3389
Functional ventilators	2267	2283	2320	2420	2511	2558	2267	2934	3061	3090	3157	3157
Trained staff in critical care	9106	9459	9619	9968	10 217	10 666	9106	28 946	35 695	44 000	50 000	
Hospitals with COVID case management facilities	–	–	449	588	717	735	742	820	733	735	735	735
Total no. of beds allocated for COVID patients	–	–	7295	11 520	14 404	21 085	22 589	25 610	29 700	30 048	30 048	27 706

Abbreviations: COVID-19 = coronavirus disease 2019; ICU = intensive care unit; PCR = polymerase chain reaction.

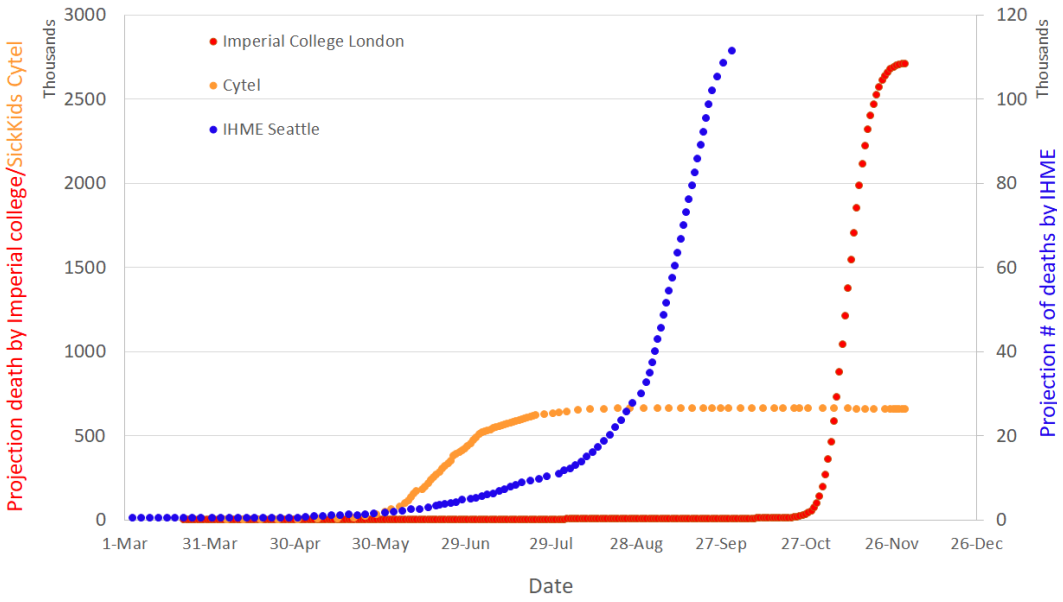
itated by the Digital Pakistan initiative with a data synthesis system, and the launch of the Pak Nigehban App (*6*) to track and localize resources, especially the availability of intensive care unit (ICU) beds and ventilators.

The Government used 3 different forecasting models for short- and medium-term decision making but these were not put in the public space. Alternative models, including those indicating dynamic disease projection profiles and duration, were produced by groups at the University of Toronto (*7*), Imperial College London (*8*) and the Institute of Health Metrics & Evaluation in Seattle (*9*), and were disparate in their predicted trends (Figure 4). The modelling exercise collectively guided the planning and decision-making at the federal and provincial level despite a gap in quality data collection systems; however, a learning curve was observed on both the demand and supply side of such information. It is unclear if any of these models drove policy as none were put up for public debate and scrutiny by the national scientific community. In fact, given limited testing and rudimentary data on response systems, many of these projections were met with scepticism or largely ignored in favour of real-time reporting of admissions and deaths. Given widespread scepticism at different stages as to the exact direction and severity of the pandemic in Pakistan, and widespread disagreements among various sections of society, especially the electronic and print media, medical professional bodies, mainstream political parties and religious scholars, it took time to develop a national consensus on approaches and solutions. In hindsight a national conference and consultative process with civic society could have avoided much acrimony and led to a common nonpartisan strategy (*10*).

What went well?

Notwithstanding the above and resource constraints, the Pakistan Government moved with alacrity once the scale of the disaster in other countries became apparent. Despite the limited role that the federal MoNHSRC has following the devolution of health services to the provinces in 2011 (*11*), the multi-stakeholder response that it had was able to spearhead and support the national COVID-19 response. It played a key role in the NCOC which was chaired by the Federal Minister for Planning & Development. The NIH rose to the task of training technicians, procuring testing equipment and boosting capacities across Pakistan, and daily testing capacity was enhanced from < 2000 tests daily to a capacity of > 50 000 across the public sector testing sites by August 2020. The NCOC resolved the issues of logistics, supplies and procurements as a national emergency through the NDMA ranging from vital PPE, oxygen supply systems and establishment of COVID-19 care and treatment centres across the country. Pakistan faced a critical shortage of human resources with < 9500 trained professionals in critical care at the outset of the pandemic. Virtual training and skills development programmes for staff were launched by the Aga Khan University, Health Services

Figure 4 Projections of coronavirus disease 2019 (COVID-19) deaths in Pakistan (various models as of June 2020)



Academy and NIH partnership (12), which has trained > 50 000 staff members to-date.

A remarkable achievement was the establishment of a central reporting system for data at national and provincial levels with the ability to provide district-level estimates. This was real-time reporting and publicly available, in contrast with many other governments in South Asia. The establishment of a data flow system made both central and provincial level response planning possible. This was supported in due course by the innovative approach to contact tracing and identification of hotspots with local response; the so-called smart lockdowns (13). Deliberate efforts were also made to inform the public about the virus and to reinforce necessary precautions. All mobile phones in the country replayed short messages related to COVID-19 prevention strategies prior to connecting any phone call as a public service, and numerous social media campaigns were conducted at a variety of public and private levels.

To spur private sector investments, the State Bank of Pakistan Refinance Facility for Combating COVID-19 (SBP-RFCC) provided loans at < 3% interest to hospitals and medical centres. Funds were meant for COVID-related expenses, from expanding/upgrading facilities to purchasing equipment such as ventilators or enhanced PPE. More than 6 billion Pakistani rupees (PKR) were disbursed to 35 hospitals, adding 13 brand new wards, 1112 additional beds and > 350 ventilators.

Pakistan also launched a robust response to the secondary effects of the sudden lockdown and loss of income for daily wage earners. A key intervention was the launch of cash disbursement through an existing social safety net Ehsaas (which means percipience). The programme targets female heads of households with disbursal of PKR 12 000 (US$ 75) allocated for each of the 12 million potential beneficiaries at risk of extreme financial hardship and food insecurity (14). The rapid institution of these response strategies as well as considerable private philanthropy and charitable support were some of the main reasons that Pakistan did not witness the tragic exodus of migrant workers and slum dwellers from the megacities seen elsewhere.

Only time will tell the exact impact on education systems and learning across the large network of public sector schools that were forced to close by the end of March. While private schools and universities were able to initiate on-line teaching, the same was not possible for > 200 000 primary, middle and secondary schools in Pakistan, supporting some 25 million students (15). The Government launched a television channel (TeleSchool) dedicated to education on 13 April 2020.

The role of the Prime Minister was notable. Early on, when restrictions and lockdowns were the mainstay of response, he spearheaded the Ehsaas programme for cash assistance, and thereafter took the decision, criticised by many as a financially risky, to reopen the economy and move to a strategy of contact tracing and smart lockdowns. This was brave and saved Pakistan from the tragic consequences of an abrupt and prolonged closure of the economy. The same decision, after much deliberation, to reopen schools and educational institutions by 15 September 2020 is reflective of actions by NCOC and the political leadership on firm risk–benefit analysis.

What did not work?

Despite the achievements listed above, there were several levels of COVID-19 response in Pakistan that could have gone better (16). The numbers of tests achieved at population level remained a fraction of the desirable numbers, with considerable diversity across the country. The numbers tested in Islamabad Capital Territories were higher (124 888 tests per million population) than those

achieved in the provinces, especially Baluchistan (5955 tests per million population) and Khyber Pakhtunkhwa (7271 tests per million population), and the latter numbers appear to have gone down further in recent weeks. As of 30 July 2021, documented COVID-19 deaths in Pakistan are around 23 209 overall (~1 021 000 confirmed cases), these likely underestimate the true picture given the testing level. However, it is unlikely that large-scale excess population mortality has been missed, given that burials are universal and with the limited numbers of burial sites across the country, any excess would have been evident. This was also queried in the larger cities with no evidence of excess deaths in comparable time periods.

With some disagreements on the nature of response and strictness of the lockdown, mixed messages led to unnecessary acrimony and discord, and polarization of opinions between political parties. This compounded confusion at the level of civic society with large-scale breakdown of physical distancing by the end of Ramadhan (late May 2020), a judicial order to reopen businesses (*18*), and the predictable upsurge in cases across the board in June.

Lack of consensus among religious scholars on the nature of restrictions and measures needed for Friday communal prayers forced some local governments to impose lockdowns covering Friday prayer times. Over time, this discord has settled and the most recent festival of Eid-ul-Adha and religious congregations during the month of Moharram did not see widespread flaunting of rules and crowding of public places. However, communication strategies and community buy-in for preventive measures such as use of face masks and physical distancing remain an issue, compounded by stigmatization of some households once identified by the smart-lockdown process. This risks engagement, reporting and hence tracking of hot spots or clusters. Premature celebration of the "victory" over COVID-19 and reduced compliance of mask use and physical distancing are major risk factors for resurgence of COVID-19, as was seen in the national Independence Day celebrations on 14 August or in some schools after reopening on 15 September 2020.

What lies ahead?

Compared with many, including neighbouring countries, Pakistan appears to have "dodged the bullet" and blunted the feared effects of COVID-19. The overall cases and fatalities are significantly lower than in its eastern and western neighbours, although within the predicted range suggested by mitigation strategies in April 2020 (*7*). Apart from the contribution of the Government's response detailed above, a range of factors have been cited. These include a young population (almost half are aged < 20 years); cultural practices that restrict social networking for families outside their immediate families; and possible innate immunity with prior exposure to other coronaviruses (*19*). Two recent population-based serological surveys in Islamabad and Karachi suggested that between 14% and 28% of the population has antibodies to SARS-CoV-2 (AI and ZAB, personal communication 2020). However, given the unpredictability of the virus and the dreaded resurgence anticipated later this year, it is important to maintain strict compliance with preventive strategies. As has been seen in other better-resourced countries, such as the United States of America and Australia, periods of low circulation and disease burden can be followed by rapid upsurges and spread. The future in a COVID-19 era could depend on the objective analysis of the past experience and identification of possible trigger points for imposition/withdrawing of NPIs while the new cases continue to rise and fall in a population. Pakistan utilized the polio surveillance programme to monitor and track COVID-19. This must be replaced by a robust surveillance and disease warning system.

Pakistan has now reopened some of its schools, given the need to address the emerging learning gap (*20*). This re-entry of 53.4 million students and staff into group educational activities must be done in a careful, measured manner, with potential innovations to reduce exposure, such as shift systems for classes and almost universal use of face masks and hand hygiene. The interruption of primary healthcare services for women, children and elderly people has been massive. By most accounts, immunization rates among vulnerable children dropped precipitously as did most preventive services such as nutritional support programmes. These are being reinstituted rapidly and safely. Pakistan was able to relaunch its polio immunization campaign successfully in late July 2020 without any reports of health risks or COVID-19 exposure among vaccinators. The primary care programme with community-based lady health workers is beginning to restart its work in community education and identification of at-risk families, contributing to routine surveillance and nutritional support programmes (*21*).

As in any emergency response, after the "adrenaline surge" comes a period of exhaustion and the COVID-19 response has been no different. Frontline workers, managers and support staff have been working on an emergency footing for almost 18 months and by now predictable battle fatigue is setting in. Health workers have borne a disproportionate burden of exposure, infections and deaths in Pakistan but morale remains high.

It is imperative, however, that all learn to live with the virus and its unpredictability. That means a gradual reopening of the economy and learning the "new normal"; the latter could be that the virus might continue to coexist for several years and have periodic upsurges. The vaccine pipeline for COVID-19 is busy and apart from effectiveness, many questions remain as to its eventual equitable distribution and availability in LMICs. Cash and Patel (*22*) rightly emphasize the need for contextual responses and strategies that are fit for resource-constrained LMICs. Pakistan is an example where the national public health response was based on a blend of global guidance but with pragmatic local

adaptation. While the Government may have taken risks in its response, the evidence to date suggests that it has worked, and with the right follow-up and care, the response could serve as an example for others to follow. For a country of 215 million people, to achieve the current stable status for an investment of under $0.5 billion (*23*), is a remarkable feat but not happenstance.

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Trouver le bon équilibre entre science et politique publique dans la riposte à la COVID-19 au Pakistan

Résumé

Contexte : La maladie à coronavirus 2019 (COVID-19) a touché le monde d'une manière sans précédent et les pays d'Asie du Sud ont été parmi les premiers à connaître des cas importés. La riposte à la COVID-19 au Pakistan a été examinée de près en raison de sa granularité, de sa portée et de son impact.

Objectifs : La présente étude vise à évaluer d'une manière objective la chronologie et la profondeur de la riposte à la COVID-19 au Pakistan.

Méthodes : Nous avons évalué les informations épidémiologiques et relatives à la charge de morbidité disponibles aux niveaux national et infranational sur les cas et les décès liés à la COVID-19 au Pakistan, y compris les modèles de projection disponibles pour le gouvernement à un stade précoce de la pandémie.

Résultats : Avec une population de 215 millions d'habitants et une diversité géographique considérable, le Pakistan a connu une introduction de cas à partir de pèlerins revenant de la République islamique d'Iran, suivie d'une large transmission communautaire. *Le National Command and Operations Centre*, établi par un partenariat civil et militaire, a joué un rôle crucial dans le suivi logistique rapide, la collecte des informations, l'établissement de rapports en temps réel ainsi que la mise en place des confinements efficaces, avec un programme de soutien financier ciblant les endroits les plus pauvres de la société. Le nombre de cas a atteint un niveau record en juin 2020, mais le système de santé a pu faire face à la surcharge de travail. Depuis lors, bien que les taux de dépistage restent faibles (plus de 300 000 cas confirmés à ce jour), le taux de létalité s'est stabilisé et, avec 6300 décès, le Pakistan semble avoir connu un aplatissement de la courbe des cas de COVID-19.

Conclusion : Malgré les progrès notables réalisés dans la lutte contre la pandémie, plusieurs faiblesses demeurent et il existe des risques de rebond avec la réouverture de l'économie et des systèmes éducatifs. Il est toujours nécessaire d'assurer une supervision technique et programmatique solide, liée à l'engagement de la société civile et à la collaboration avec les personnalités religieuses pour garantir le respect des interventions non pharmacologiques.

التوازن بين العلم والسياسة العامة في إطار الاستجابة لكوفيد-19 في باكستان

ذو الفقار بهوتا، فيصل سلطان، عامر إكرام، عادل حيدر، أسعد حفيظ، محمد إسلام

الخلاصة

الخلفية: ضربت جائحة فيروس كورونا 2019 (كوفيد-19) مختلف أنحاء العالم على نحو غير مسبوق، وكانت بلدان جنوب آسيا من أوائل البلدان التي شهدت حالات وافدة. وأجرينا دراسة تدقيقية لاستجابة باكستان لكوفيد-19 للوقوف على تفاصيل تلك الاستجابة ونطاقها وتأثيرها.

الأهداف: هدفت هذه الدراسة الى إجراء تقييم موضوعي للتسلسل الزمني للاستجابة لمرض كوفيد-19 وعمق تلك الاستجابة في باكستان.

طُرق البحث: أجرينا تقييماً للمعلومات الوبائية والمعلومات المتعلقة بعبء المرض المتاحة على المستويَيْن الوطني ودون الوطني بشأن حالات كوفيد-19 والوفيات الناجمة عن المرض في باكستان، ومن بينها نماذج التوقُّع المتاحة للحكومة في مرحلة مبكرة من الجائحة.

النتائج: شهدت باكستان، التي يبلغ عدد سكانها 215 مليون نسمة وتتمتع بتنوع جغرافي كبير، وفادة حالات كوفيد-19 من الحجاج العائدين من جمهورية إيران الإسلامية، وأعقب ذلك سراية مجتمعية واسعة النطاق. واضطلع المركز الوطني للقيادة والعمليات، الذي أُنشئ من خلال شراكة مدنية وعسكرية، بدور بالغ الأهمية في لوجستيات التعقُّب السريع، وجمع المعلومات، والإبلاغ الآني، وحظر الخروج الذكي، إلى جانب تنفيذ برنامج دعم نقدي واسع النطاق يستهدف أفقر شرائح المجتمع. وبلغت الحالات ذروتها في يونيو / حزيران 2020، ولكن النظام الصحي تمكّن من مواجهة عبء العمل الزائد. ومنذ ذلك الحين، ورغم أن معدلات الاختبار لا تزال منخفضة (أكثر من 300000 حالة مؤكّدة حتى الآن)، استقرت معدلات الوفيات بين الحالات، ويبدو أن باكستان سطّحت منحنى كوفيد-19، إذ بلغ عدد حالات الوفاة 6300 حالة.

الاستنتاجات: على الرغم من النجاحات الملحوظة في مكافحة الجائحة، لا تزال هناك عدة مواطن ضعف، وهناك مخاطر بحدوث ارتداد مع إعادة فتح الاقتصاد والنُّظُم التعليمية. وثَمَّة حاجة مستمرة إلى مراقبة تقنية وبرمجية قوية، مع ربط ذلك بمشاركة المجتمع المدني، والعمل مع علماء الدين لضمان الامتثال للتدخل غير الدوائي.

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Measuring universal health coverage to ensure continuing care for older people: a scoping review with specific implications for the Iranian context

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Abstract

Background: To measure progress towards universal health coverage (UHC) in the context of ageing, it is necessary to develop suitable monitoring frameworks. The global UHC monitoring framework is focused on priorities for younger populations and does not adequately address issues relevant to ageing populations.

Aims: This study aims to propose a framework to measure UHC in a way that is relevant to health systems responding to population ageing.

Methods: Based on a search strategy focusing on measures of UHC in relation to older people's care, we searched electronic databases and screened the records to qualitatively analyse the data. We also conducted 2 rounds of expert panel consultations to discuss the findings and examine the feasibility of the recommended indicators using the case of the Islamic Republic of Iran as an example.

Results: We identified main themes and classified core indicators under each theme. Besides 25 indicators for quality of care, there were 22 indicators for financial protection. Ten indicators were retrieved measuring coverage and access to long-term care. Some indicators were excluded owing to limited data availability or absence of related programmes and some alternate indicators were proposed.

Conclusions: We identified several indicators which could be used to measure progress toward UHC in the context of population ageing. However, not all of these indicators are feasible in context of low- and middle-income countries. This study could offer useful general guidance on how to define the exact set of measures in a specific country context.

Keywords: population ageing, long-term care, monitoring frameworks, Iran

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Introduction

Universal health coverage (UHC) has been defined as the desired outcome of health system performance whereby all people who need health services receive them, without financial hardship. There are 2 interrelated components to UHC: the full spectrum of good-quality, essential health services according to need, and protection from financial hardship (1).

On the journey towards UHC, significant efforts have been made to target specific vulnerable populations, including the poor, women, and children. However, older adults have been often overlooked (2).

Population ageing is a public health concern in both developed and developing countries which dramatically increase the proportion and number of people needing long-term care in countries at all levels of development (3). From 2015 to 2050, the proportion of the world's population aged 60 and over will nearly double, with profound consequences for health care systems (4).

A transformation is needed in the way that health systems are designed in order to ensure affordable access to integrated services that are centred on the needs and rights of older people. In most care contexts, this will require fundamental changes in the way care is organized, funded, and delivered across health and social sectors (5).

With increasing demand for more and different kinds of services, it is imperative to shift resources towards primary care for the preventative and comprehensive care of people with chronic conditions, and establishing linkages with community support (6) as well as allocating the resources efficiently within the primary care sector to meet the healthcare needs of older population. Ensuring an appropriate combination of settings for long-term care that includes both formal and informal care is crucial for this goal. The impact of increases in the older population with disabilities will fall predominantly on the long-term care sector rather than the acute health sector (7). It is noteworthy that providing this segment of population

with essential long-term care services in terms of health promotion and social care could help them live independently and stay productive for a longer period of time which in turn might has a positive impact on the overall social and economic development. Moreover, to "ensure healthy lives and promote wellbeing for all, at all ages, as stated in the SDGs, health policies will need to be realigned significantly to meet the healthcare needs of older population. The WHO global strategy and action plan on ageing suggests that implementing comprehensive systems of long-term care could accelerate improving UHC for older persons in low- and middle-income countries (LMICs) (*8*).

The most comprehensive global UHC monitoring framework was published by WHO in 2017 (*9*); this framework is mostly dominated by maternal and child health and does not cover healthy ageing or the health system capacities and access needed for the care of older persons.

Population ageing has a great impact on achieving UHC. Without considering the needs of older people in terms of social and health services in a country's agenda, achieving UHC is impossible. To evaluate related policies and monitor the progress towards UHC in the context of population ageing, it is necessary to develop suitable frameworks which include measures to assess actions aimed at covering the needs of older people.

Because of the knowledge gap which exists on UHC monitoring approaches and frameworks in the context of population ageing, and regarding the necessity of adapting new health policies to meet the needs of ageing populations, this study aims to review the existing literature on older person's care and UHC measuring frameworks in order to propose a new framework to measure UHC progress in a way that is more relevant to health systems responding to population ageing.

Methods

Design

We followed the methodology of Arksey and O'Malley (*10*) to conduct this scoping review in order to identify and classify themes and indicators to be proposed for monitoring health system responses to population ageing in LMICs to achieve UHC.

Eligibility criteria

We included all relevant studies at any stage of development, evaluation, or implementation of metrics or measurement frameworks. Any type of study design was included in this review, and we did not filter for date or language of the publications.

We excluded studies which solely focused on concepts and did not provide metrics or measurement frameworks. We also excluded news articles, abstracts, and those studies for which full texts were not available.

Search strategy and information sources

We searched the following databases to identify relevant studies: Scopus, ISI Web of Knowledge, PubMed, Ovid (including Cochrane Database of Systematic Reviews), and Science Direct.

An electronic search strategy was developed using MeSH (medical subject headings) terms in consultation with our research team and experts including an experienced research librarian. The search strategy was revised during the review based on the knowledge gathered.

Table 1 PubMed search strategies: search strategy 1 (more general in order to include the existing UHC measurement frameworks

Set	Strategy
1	Search ((("Universal healthcare coverage"[Title/Abstract]) OR "Universal health care coverage"[Title/Abstract]) OR "Universal health coverage"[Title/Abstract]) OR "UHC"[Title/Abstract]
2	Search ((((((("elderly care"[Title/Abstract]) OR "Ageing care"[Title/Abstract]) OR "long-term care"[Title/Abstract]) OR "Integrated care"[Title/Abstract]) OR "person centred care"[Title/Abstract]) OR "Patient focused care"[Title/Abstract]) OR "elderly friendly UHC"[Title/Abstract]
3	Search ((("financial protection"[Title/Abstract]) OR "long-term care insurance"[Title/Abstract]) OR "affordability"[Title/Abstract]) OR "catastrophic costs"[Title/Abstract]
4	Search ("Essential service"[Title/Abstract]) OR "benefit package"[Title/Abstract]
5	Search ((((("indicator"[Title/Abstract]) OR "measuring"[Title/Abstract]) OR "measuring indicator"[Title/Abstract]) OR "Monitoring"[Title/Abstract]) OR "measuring framework"[Title/Abstract]
6	1 AND 2 AND 3 AND 4 AND 5
7	1 AND 2
8	1 AND 5
9	5 AND 2
10	1 AND 4
11	1 AND 3
12	3 AND 2
13	4 AND 2

The first search strategy was more general in order to include the existing UHC measurement frameworks and retrieve as many relevant documents as possible (Table 1). The second search strategy was more specifically focused on the targets of UHC, including quality, equity, service coverage/access, and financial protection (Table 2).

We used hand searching to check all reference lists of included studies to identify additional studies of relevance. We also conducted a targeted search of the grey literature in international organizations' websites and related health or scientific organizations, including the WHO, World Bank, Organisation for Economic Co-operation and Development (OECD), United Nations Development Programme (UNDP), United Nation Children's Fund (UNICEF), UHC2030, and the European Union.

Data collection and analysis

We used a reference management system (*EndNote X8*) to manage electronic searches and remove duplicates. The review process comprised 2 levels of screening: a title and abstract review and a full-text review.

All the titles and abstracts were screened by 2 reviewers. Any articles that were identified as relevant by either or both of the reviewers were included for the second step. Full-text articles were then retrieved for articles that met the review criteria or when information in the title and abstract was insufficient to determine eligibility. In the second step, the 2 investigators assessed the full-text articles to determine if they met the inclusion criteria. Any disagreement about study eligibility at the full-text review stage was resolved through discussion with a third investigator until full consensus was obtained.

Data extraction and analysis

Based on our research objectives, the best choice for analysing data was an informing review, which uses evidence from qualitative research to help define and refine the question and provides descriptive/mapping analysis with limited synthesis.

A standardized data extraction form was developed by the review team. Data abstraction was conducted by 2 of the authors (SHJ and AR) independently extracting data from all included studies. To ensure accurate data collection, each reviewer's abstracted data was compared, and any discrepancies were discussed to reach a final decision.

Expert panel consultation

As recommended by Arksey and O'Malley (*10*), we conducted a panel consultation to review the results. The first panel was focused on quality assurance in long-term care of older persons. In the second panel, we focused on the financial/social protection mechanisms and coverage of services for long-term care. In each panel, the facilitator explained about the confidentiality process, and reminded the panel that the session would be audio recorded and that their participation would be acknowledged in the final report.

Discussion guides

We developed discussion guides to cover gaps which we had identified in the literature review and to examine the feasibility of using the retrieved indicators in the context of the Iranian health system. All the guides were prepared in English, and the panels were conducted in Farsi.

Participants

We first prepared a long list of potential experts and policy-makers and contacted them by phone. After their approval for the dates and time of the panel, an official invitation letter along with a research brief were sent to them. In total, 9 experts participated in the panels in addition to the research team and a qualitative research expert.

Results

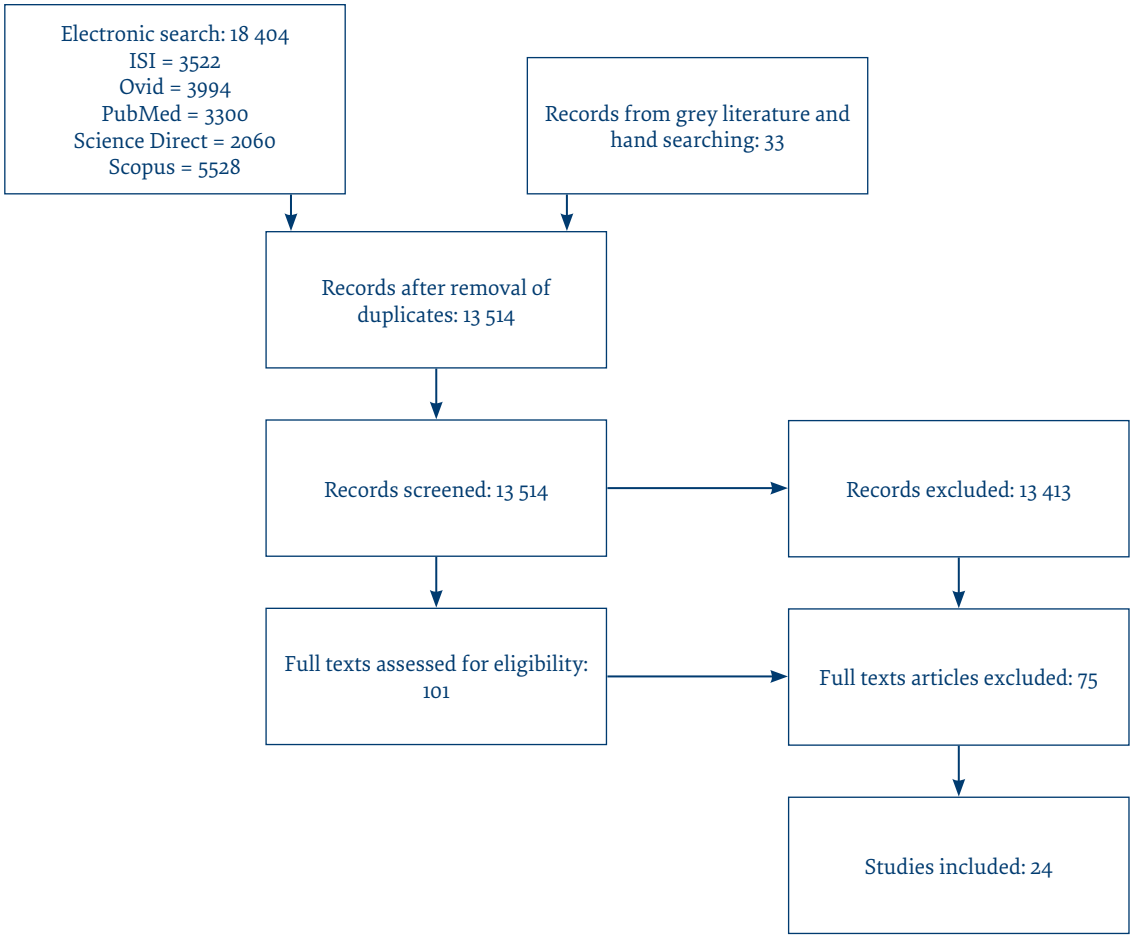
Study retrieval

Our search retrieved 18 437 studies. After removal of duplicates, 13 514 titles/abstracts of records were screened; 101 full-text articles were retrieved for further appraisal, of which 24 documents were eligible (Figure 1).

Table 2 Search strategy 2 (specifically focused on the targets of UHC)

Set	Strategy
1	Search ((((((("elderly care"[Title/Abstract]) OR "Ageing care"[Title/Abstract]) OR "long-term care"[Title/Abstract]) OR "Integrated care"[Title/Abstract]) OR "person centred care"[Title/Abstract]) OR "Patient focused care"[Title/Abstract])
2	Search ("Quality"[Title/Abstract]) OR "equity"[Title/Abstract]) OR "access" [Title/Abstract]
3	Search ("social protection"[Title/Abstract]) OR "financial equity"[Title/Abstract]
4	Search ((((("indicator"[Title/Abstract]) OR "measuring"[Title/Abstract]) OR "measuring indicator"[Title/Abstract]) OR "Monitoring"[Title/Abstract]) OR "measuring framework"[Title/Abstract]
5	1 AND 2 AND 3 AND 4
6	1 AND 2 AND 4
7	1 AND 3 AND 4
8	1 AND 2
9	1 AND 3

Figure 1 PRISMA flow diagram; PubMed search strategies



As portrayed in Table 3, we considered 24 documents for this review. By thematic classification, there were 12 documents concerning quality of long-term care and 10 documents on financial and social protection mechanisms. We did not find any specific document measuring coverage or access to long-term care, therefore we included 2 relevant documents containing some single indicators measuring coverage or access level (*33*,*34*).

We identified 8 main themes to measure the quality of older person's care in different settings, including long-term care, community care and nursing homes (Table 4). The themes and core indicators were selected based on their frequency in the literature. In total, we identified 25 core indicators to measure the quality of long-term care provided for older people.

Total expenditure, financial protection and social protection were the main themes identified in this study in relation to financial and social arrangements for older person's care that should be measured in the context of UHC (see Table 5). In total we presented 22 indicators in this section.

Table 6 summarizes the themes and indicators that measure the coverage level of and access to long-term care, health centres, and community-based health care. Based on our review, 10 useful indicators were identified to measure service access.

Results of the panel reviews

Through the panel reviews, the national background of laws and regulations relating to ageing in the Islamic Republic of Iran were discussed. The most comprehensive and updated document is the National Document of Older Persons announced by the secretary of the National Council of Older Persons in 2017; from this document, the ageing population in Islamic Republic of Iran is defined as the population aged 60 years and over. We used this definition to pursue further discussions on indicators and measurement issues.

Long-term care in the Islamic Republic of Iran

In the Islamic Republic of Iran, long-term care for older persons in terms of both health and social care is provided through different settings, including nursing homes and day care centres, which are authorized by the National Welfare Organization, community-based care facilitated by Tehran municipality (*35*) as well as home-based services and home care, which cover the largest proportion of older people who need long-term care.

Table 3 **Study characteristics**

Reference	Theme	Aim	Country/ region	Type	Year published
Joling et al. 2018 (*11*)	Quality	Provides a comprehensive overview of existing quality indicators developed or applied to assess the quality of community care provided to older people	–	Paper-systematic review	2018
Chao et al. 2005 (*12*)	Quality	Determine residents' perceptions of quality of care in nursing homes in Taiwan	Taiwan	Paper	2005
Berg et al. 2002 (*13*)	Quality	Assess existing quality indicators and to determine which of them, if any, could be recommended to CMS (Centers for Medicare and Medicade services) for immediate use	USA	Paper	2002
Grant et al. 1996 (*14*)	Quality	Identify indicators of quality of nursing care as perceived by residents, significant others, and nursing staff in long-term care facilities	Canada	Paper	1996
Huang et al. 2011 (*15*)	Quality	Develop a web based quality monitoring system for long-term care	Taiwan	Paper	2011
Schols et al. 2014 (*16*)	Quality	Describe the regulatory structure and the monitoring of quality of long-term care in The Netherlands	Netherlands	Book chapter	2014
Kim et al. 2015 (*17*)	Quality	Examine the reliability of interRAI Long Term Care Facilities (interRAI LTCF) and interRAI Home Care (interRAI HC); provide a comprehensive and integrated assessment of instruments with common core items in Korea	Korea	Paper	2015
Hjaltadóttir et al. 2012 (*18*)	Quality	Investigate trends in quality of care from 2003–2009 as reflected in the Minimum Data Set quality indicator outcome in Icelandic nursing homes	Iceland	Paper	2012
Carpenter et al. 2013 (*19*)	Quality	Describe the background of the formation of the interRAI collaboration and the development, design, distribution, and potential contribution of the interRAI approach to assess care and systematic embedding of a quality driven assessment system in care delivery. Examine 3 aspects generally accepted as critical to quality care: effectiveness and care safety, patient-centredness and responsiveness, and care co-ordination	OECD	OECD health policy studies	2013
Smith 2002 (*20*)	Quality	Examine progress and challenges in the effective measurement and application of performance indicators to improve health systems	OECD	Book chapter	2002
Huber et al. 2005 (*21*)	Quality	Explore key issues in improving the performance of health and long-term care systems	OECD	Book chapter	2005
Dandi et al. 2012 (*22*)	Quality	Classify quality assurance indicators in different European countries according to 3 dimensions: organization type, quality dimensions and system dimensions	Europe	ENEPRI research report	2012
Hsu et al. 2018 (*23*)	Financial protection	Examine the impact of varying 2 methodological choices by analysing household expenditure data from a sample of 47 countries	47 countries	Paper	2011
Campbell et al. 2010 (*24*)	Financial protection	Explore differences between Germany and Japan in programme goals, eligibility process, scope, size, and sustainability for possible applications in the United States of America	Japan and Germany	Paper	2010
Islam et al. 2017 (*25*)	Financial protection	Investigating progress towards UHC financial risk indicators and assessed variability of inequalities in financial risk protection indicators by wealth quintile	Bangladesh	Paper	2017
Saksena et al. 2014 (*26*)	Financial protection	Examine existing measures of financial risk protection	–	Paper	2014
Colombo et al. 2011 (*27*)	Financial protection	Examining key polices and strategies that can help address future demand for care, and respond to the implications this will have for long-term care workforce and financing	OECD	OECD health policy studies	2011
Lloyd-Sherlock 2002 (*28*)	Social protection	Examine social protection for older people in 3 middle-income countries: Argentina, Thailand and South Africa	Argentina, Thailand, and South Africa	Paper	2002
Scheil□Adlung et al. 2013 (*29*)	Social protection	Examine the financial impacts on the elderly of private out-of-pocket expenditure on health care and long-term care in selected European countries	Europe	Policy report	2013

Table 3 Study characteristics *(concluded)*

Reference	Theme	Aim	Country/ region	Type	Year published
Knaul et al. 2012 (30)	Social protection	Analyse the road to universal coverage along 3 dimensions of protection: against health risks, for quality assurance of health care, and against the financial consequences of disease and injury	Mexico	Paper	2012
Muir 2017 (31)	Social protection	Present the first international quantification and comparison of levels of social protection for long-term care in 14 OECD and European Union countries	OECD	Working paper	2017
Ramírez et al. 2010 (32)	Social protection	A Draft Social Policy Note prepared on request by the Ministry of Social Affairs and Housing – SoZaVo of Surinam at the outset of a new elected government for the period 2010– 2015	Suriname and South America	Policy document	2015
OECD 2011 (33)	Coverage	Present the latest comparable data and trends on key indicators of health outcomes and health systems across the 35 OECD member countries	OECD	Report	2017
Gonzalez et al. 2018 (34)	Coverage	The overall purpose of this review is improving development results particularly for most vulnerable and disadvantaged groups through evidence-based learning	Vietnam	Paper	2014

Table 4 Quality themes measured: ordered by frequency of reporting

Setting	Subtheme	Core indicators	References
Community care (includes home care & primary care) Nursing homes	Cognition/mental health	• Incidence of depression • Prevalence of antipsychotic drug use • Prevalence of dementia	11, 12, 13, 14, 17, 18, 19, 21
	Clinical issues	• Number of falls • Incidence of nosocomial infections • Unplanned weight gains or loss • Prevalence of pressure ulcers • Incidence of over medication and medication errors. • Faecal incontinence • Prevalence of malnutrition • Residents with poorly managed pain	11, 19, 17, 18, 20, 13
	Functional performance/status	• Incidence of use of physical restraint • Preventable decline of ADL and IADL functioning	17, 18, 11, 13, 19, 20
	Psychosocial aspects: Social interaction Social engagement Social life Psychosocial function	• Social engagement and privacy protection	11, 12, 18, 19, 20
	Structure of care: Nature of facility Quality of care organization	• Quality and safety of buildings (e.g. fire hazards, sanitation) • Amenity of housing environment • Size of rooms • Staff ratios; mix of staff qualification	11, 14, 16, 21
	Patient-centeredness: Responsiveness Caring attitude	• Mechanisms to protect resident rights • Procedures of resident assessments used for care planning	12, 22
	Continuity and coordination of care	• Well-functioning transfer and discharge management • Requirements for clinical records and process of care documentation • Maintaining a quality assurance committee • Well-balanced diet • Patient safety	11, 22, 19
	End of life care	• None identified	11

Table 5 Financial/social protection measures

Measure/theme	Core indicators	References
Expenditure patterns	Public LTC spending for older persons (% of health budget) Public expenditure on health care and LTC (% of GDP) Percentage of private LTC expenditure Percentage of older persons covered by LTC insurance Population aged 50+ utilizing LTC by per capita household income quintiles (%) LTC expenditure (health & social components) by government and compulsory insurance schemes (share of GDP) Government and compulsory insurance spending on LTC (health) by mode of provision Annual growth rate in expenditure on LTC (health & social) by government and compulsory insurance schemes, in real terms	24, 27, 28, 33
Financial protection: OOP payment Catastrophic expenditure Impoverishment Distress financing (borrowing or selling assets)	OOP health expenditure by households as a proportion of total income OOP health expenditure by households as a proportion of disposable income % of aged households with OOP expenditure on health care Health-related OOP expenditure as a percentage of older people's household gross income (by various items) Incidence of catastrophic health expenditure: proportion of households in a population who face catastrophic health expenditure Mean positive catastrophic overshoot: percentage points by which household spending on health exceeds the threshold for catastrophic health expenditure Incidence of impoverishment: proportion of households in a population who fell into poverty due to health spending Compensating for the opportunity cost of providing informal care: informal care compensation rate	26, 25,30, 31, 28
Social protection: Adequate social care Income support Independent living arrangements	Proportional amount of cash transfers to every poor household to meet the equivalent poverty line % of public benefits to the population aged 65+ years Coverage of family counselling on older person's home care provided through social workers and health care specialists Geographic coverage of day care centres for older persons Counselling and advisory services within day-care institutions specialized for older persons living independently Coverage of social housing programmes among older people: % of independent older persons benefiting from home improvements or social housing programmes	32, 34

LTC = long-term care.
GDP = gross domestic product.
OOP = out-of-pocket.

Coverage of care

To discuss the indicator "proportion of people aged 60 years and over receiving long-term care", all types of long-term care in the Islamic Republic of Iran were elaborated in the panel discussions. For nursing homes and day care centres, the data on the numbers of older people are retrievable from the National Welfare Organization, however there are no specific data that can be used to estimate the proportion of older people who receive informal care in their homes by family members.

Estimates for long-term care beds in institutions and their trend can only be retrieved for nursing homes, being the only residential setting providing long-term care for older people.

Proposed indicators include:

- proportion of older persons (aged 60 years and over) who are receiving care in nursing homes at the national and provincial level (by sex),
- proportion of older persons (aged 60 and over) who are receiving care at day-care centres at the national and provincial level (by sex),
- ratio of day-care and nursing homes in each province to population aged 60 years and over,
- number of beds and their trend in nursing homes at the national and provincial level.

Quality of care

According to the information from the panel, there is no specific organization or office that monitors the quality of long-term care provided to older persons via nursing homes, day-care centres, or home-based services. The main quality themes (including functional performance of older people, structure of care and continuity and coordination of care) which are retrieved from the literature are observed in the regulation of establishing nursing homes and day-care centres in the Islamic Republic of Iran.

Financing of long-term care

The results from the review on financing issues of long-term care were categorized into 3 main themes: financial protection, social protection mechanisms, and expenditure patterns.

Expenditure pattern

As indicated above, in the Islamic Republic of Iran long-term care is mostly provided in nursing homes, which are supervised by the National Welfare Organization; there

Table 6 Themes and indicators for coverage and access for long-term care, health centres and community-based health care (12,33)

Theme	Indicator
Recipients of long-term care	Proportion of people aged 65+ years receiving long-term care Share of long-term care recipients, by age Share of long-term care recipients aged 65+ years receiving care at home
Informal caregivers	Share of informal caregivers among population aged 50+ years
Long-term care work	Long-term care workers per 100 people aged 65+ years Long-term care workers and population aged 80+ years
Long-term care beds in institutions and hospitals	Long-term care beds in institutions and hospitals Trends in long-term care beds in institutions and hospitals
Community-based and district health centres	Increase in the number of district health care centres for older people (percentage) Older persons having access to community-based health care (percentage)

are no long-term care beds in hospitals. Additionally, the informal care of older persons at home is not recognized.

Based on the *System of Health Accounts 1.0* (SHA1) (https://www.who.int/health-accounts/documentation/SHA1.0/en/), the data on health expenditure is not age-specific and does not provide information on the share of older persons from total health expenditure. The new version of the accounting software, *System of Health Accounts 2011* (SHA2011) (https://www.who.int/health-accounts/documentation/SHA1.0/en/), is in its pilot phase in Tabriz city and provides age-specific expenditure on health. In regard to insurance coverage for long-term care, the panel observed that there is no specific scheme, fund, safety net, or co-payment mechanism specific for long-term care or older person's care.

The proposed indicator is:

- Share of the budget going to nursing homes from the whole government budget.

Financial protection

Out-of-pocket expenditure on health is reported in national health accounts using the SHA1 accounting system, but there is no information on older persons who are spending on health out-of-pocket. The incidence of catastrophic expenditure and impoverishment due to health spending is also observed using information from the National Statistical Centre, but is not specifically retrievable for older people.

Social protection

Cash transfers to households comprise government subsidies to all Iranian citizens living within the boundaries of the country, including older persons. For poor older persons, there is some financial support from different organizations, including a programme called "Empowering older people" by the Welfare Organization, and the Shahid Rajaei programme, which supports older people in rural areas.

The proposed indicators are:

- proportion of poor older persons who are admitted to nursing homes free of charge;
- proportion of older persons who are registered and supported by the Welfare Organization at the national and provincial level.

Discussion

Key themes and indicators

During this study, we identified key UHC measurement themes and indicators which could be applied to measuring UHC in the context of population ageing in LMICs. We also found that healthy ageing indicators are not included among the WHO's 100 core health indicators (*36*). Despite the growing numbers of older people around the world, these findings show how neglected healthy ageing is in comparison to other areas like maternal and child care or noncommunicable diseases.

Quality of care

With nations committed to achieving UHC by 2030, there is a growing acknowledgement that access to services is not enough. Improvement in health care delivery requires a deliberate focus on the quality of health services (*37*).

While the tendency to measure care performance is shifting from process to (patient-reported) outcome measures, valid outcome indicators for the quality of care for older people are still relatively limited (*11*). Major outcome indicators, such as falls and fracture rates, prevalence of dementia, and incidence of depression among older persons, could be presented in a UHC measurement framework to monitor the quality of care for older people.

Based on the panel discussions, there is no specific procedure or framework to monitor the quality of care provided in nursing homes and day-care centres in the Islamic Republic of Iran. As the need for long-term care is growing and more families are interested to use such services for the care of their older members, it is necessary to implement official procedures for quality assurance.

Financial protection

Out-of-pocket costs, catastrophic expenditures, and impoverishing expenses are major indicators for measuring financial protection in varied settings. Key is measuring

these indicators in different age groups, including households with older members. To calculate catastrophic expenses for older persons, selecting a suitable threshold is important to best represent the financial considerations for this vulnerable group both within and outside of the health sector.

Gaps in European social protection systems for health care and long-term care covering frail older persons frequently result in high levels of out-of-pocket expenditure for the poorest, inequities in access to needed services, and, for some of the most vulnerable, financial ruin (*29*). Our findings show that in the Islamic Republic of Iran, there is no specific insurance scheme, fund, safety net, or co-payment mechanism to protect older people against the financial risks of health expenditures.

Moreover, older people are a vulnerable group of the population who are mostly retired or are unable to work due to health problems and chronic conditions. At the same time, they require special health care, which imposes costs on the persons or their families. Thus, supporting them in terms of any kind of income support, subsidy, or safety net seems necessary to avoid catastrophic costs.

Coverage level

Since the need for long-term care services can be broadly interpreted, governments should first focus on developing entitlement standards that determine access to services that are partly or totally publicly funded. As with health care, fair access should be regarded as the first criterion for measuring quality in long-term care (*20*).

In this study, we focused on long-term care as an essential setting to provide older people with care and services designed for chronic conditions such as dementia and functional disabilities as well as social care.

The long-term care services for older persons in the Islamic Republic of Iran are provided at the home, community and institutional levels. At the home level, there are no data available for the quality of care, which is provided as informal care, indicating the importance of conducting national and provincial surveys to estimate the volume of such care for strategic planning in future years.

Conclusions

While the population is rapidly ageing around the world, to ensure high quality services are available for older persons as well as equity-oriented financing and delivery mechanisms, the identification of key indicators of healthy ageing and older person's care based on UHC targets should be included in future UHC measurement frameworks. Because most of the indicators have their own challenges in measurement and data requirements, choosing suitable outcome indicators that are globally available, especially in LMICs, is of huge importance.

To best monitor UHC in ageing populations, it is crucial to develop health information systems and plan new national and regional surveys specific to older people's care to gather the necessary data on monitoring indicators. Including the proposed indicators in currently available surveys to be monitored on a regular basis is also another way to gain reliable sources of information.

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Competing interests: None declared.

Évaluation de la couverture sanitaire universelle pour assurer des soins continus aux personnes âgées : une étude exploratoire avec des implications spécifiques pour le contexte iranien

Résumé

Contexte : Pour mesurer les progrès réalisés sur la voie de la couverture sanitaire universelle dans le contexte du vieillissement, il est nécessaire de mettre au point des cadres de suivi appropriés. Le cadre mondial de suivi de la couverture sanitaire universelle se concentre sur les priorités des populations plus jeunes et n'aborde pas de manière adéquate les problèmes relatifs aux populations vieillissantes.

Objectifs : La présente étude vise à proposer un cadre pour évaluer la couverture sanitaire universelle d'une manière qui soit pertinente pour les systèmes de santé répondant au vieillissement de la population.

Méthodes : Sur la base d'une stratégie de recherche axée sur les mesures de la couverture sanitaire universelle en relation avec les soins aux personnes âgées, nous avons effectué des recherches dans des bases de données électroniques et passé en revue les registres pour analyser qualitativement les données. Nous avons également mené deux cycles de consultations avec un groupe d'experts afin de discuter des résultats et d'examiner la faisabilité des indicateurs recommandés en utilisant le cas de la République islamique d'Iran comme exemple.

Résultats : Nous avons identifié des thèmes principaux et avons classé les indicateurs de base sous chaque thème. Outre les 25 indicateurs pour la qualité des soins, il y avait 22 indicateurs pour la protection financière. Dix indicateurs ont été récupérés pour évaluer la couverture sanitaire universelle et l'accès aux soins de longue durée. Certains indicateurs ont été exclus du fait de la disponibilité limitée des données ou de l'absence de programmes connexes, et d'autres indicateurs ont été proposés.

Conclusions : Nous avons identifié plusieurs indicateurs qui peuvent être utilisés pour mesurer les progrès vers la couverture sanitaire universelle dans le contexte du vieillissement de la population. Cependant, ces indicateurs ne sont pas tous réalisables dans le contexte des pays à revenu faible ou intermédiaire. La présente étude pourrait offrir des orientations générales utiles sur la façon de définir l'ensemble exact de mesures dans le contexte spécifique d'un pays.

قياس التغطية الصحية الشاملة لضمان استمرار تقديم الرعاية للمسنين: استعراض استكشافي مع الآثار المترتبة المحددة على السياق الإيراني

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الخلاصة

الخلفية: لقياس التقدم المُحرز نحو التغطية الصحية الشاملة في سياق الشيخوخة، من الضروري وضع أُطُر رصد مناسبة. ويركز الإطار العالمي لرصد التغطية الصحية الشاملة على أولويات الفئات السكانية الأصغر سنًا ولا يتناول على نحو كافٍ القضايا ذات الصلة بالسكان المسنين.

الأهداف: هدفت هذه الدراسة إلى اقتراح إطار لقياس التغطية الصحية الشاملة على نحو يتناسب مع النُظُم الصحية التي تستجيب لشيخوخة السكان.

طرق البحث: بناءً على استراتيجية بحثية تركز على تدابير التغطية الصحية الشاملة فيما يتعلق برعاية المسنين، بحثنا في قواعد البيانات الإلكترونية وفحصنا السجلات لتحليل البيانات تحليلاً نوعيًا. كما أجرينا جولتين من المشاورات مع فريق الخبراء لمناقشة النتائج ودراسة جدوى المؤشرات المُوصى بها باستخدام حالة جمهورية إيران الإسلامية كمثال.

النتائج: حددنا الموضوعات الرئيسية وصنفنا المؤشرات الأساسية تحت كل موضوع. وإلى جانب 25 مؤشرًا لجودة الرعاية، كان هناك 22 مؤشرًا للحماية المالية. وتم استرجاع 10 مؤشرات لقياس التغطية والحصول على الرعاية الطويلة الأجل. وتم استبعاد بعض المؤشرات بسبب محدودية البيانات المتاحة أو عدم وجود البرامج ذات الصلة بالموضوع، وتم اقتراح بعض المؤشرات البديلة.

الاستنتاجات: حددنا عدة مؤشرات يمكن استخدامها في قياس التقدم المُحرز نحو التغطية الصحية الشاملة في سياق شيخوخة السكان. غير أن هذه المؤشرات ليست كلها قابلة للتحقيق في سياق البلدان المنخفضة والمتوسطة الدخل. ويمكن أن تقدم هذه الدراسة إرشادات عامة مفيدة بشأن كيفية تحديد المجموعة الصحيحة من التدابير في سياق قُطري محدد.

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Exploring barriers to family planning service utilization and uptake among women in Iraq

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Abstract

Background: Family planning helps to avoid unwanted pregnancy and reduce maternal mortality and morbidity. Contraceptive prevalence is still relatively low (58%) in Iraq compared with other countries in the Eastern Mediterranean Region, and the unmet need (12%) and total fertility (4.2 children per woman) rates are still high. Services are available free of charge or heavily subsidized in many public and private health facilities, yet many women may still not use them due to social, cultural, financial or health care services constraints.

Aims: This scoping review explores barriers to family planning services utilization and uptake among women in Iraq.

Methods: The review uses an adapted conceptual framework from quality of care and human rights-based frameworks to analyse published scientific studies.

Results: At policy level, the government has supported family planning but not enough resources were allocated. At the service level, low family planning promotion from health care providers (especially during antenatal care visits) along with provider bias for certain types of contraception, have contributed to inaccurate information and misconceptions. At the community and individual level, women's choice is still largely influenced by the husband's position on contraception as men are still considered the key decision-makers in regard to fertility. Valuing a large family is still a barrier to family planning services utilization and uptake whereas religion was found to support the use of family planning.

Conclusion: There is a need to provide promotional messages and encouraging mutual fertility decisions.

Keywords: family planning, barriers, health care services, Iraq

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Introduction

According to the World Health Organization (WHO), family planning (FP) is the planned use of contraception to decide the timing and the number of children that couples want to have (*1*). Use of FP helps to avoid unwanted pregnancy, reduce maternal morbidity and mortality by one-third and reduce poverty and hunger (*1*) by supporting women's economic empowerment and education and their ability to make decisions (*2*). Contraceptive prevalence is defined by WHO as the percentage of married or in-union women who are using any method (traditional or modern) of contraception (*1*).

In Iraq, prevalence of contraceptive use is 58% (44% modern, 14% traditional), which is lower than the global average (63%) and also lower than other countries in the Region such as Jordan (63%) and Tunisia (67%) (*3*). The unmet need and the demand satisfied for modern methods are estimated to be 12% and 63% respectively, and the total fertility rate is currently 4.2 children per woman compared with 2.5 globally (*3*). Furthermore, inequities still exist in FP utilization, with contraceptive prevalence being lower among women in rural areas, women from the poorest quintile or women who have primary or no education; prevalence is higher in women in the Kurdistan region (*4*).

Family planning services are intended to be offered free of charge or heavily subsidized in many primary health centres and FP centres in public hospitals (*5*). In addition, the private sector, such as pharmacies and private clinics, also plays a significant role, especially in providing FP commodities such as oral pills and intrauterine device (IUD) insertion and removal (*5*). The most commonly used FP method in Iraq is oral pills (50% of all modern methods) followed by IUDs (25%) and injectables (10%) (*6*).

However, even with the availability of FP services and methods, women may still not use them owing to social, cultural, financial or health care service constraints (*5*), yet research on these constraints is still very limited in Iraq. This scoping review aimed to examine policy, health system, cultural and social factors that hinder utilization and uptake of FP services among Iraqi women (from both supply and demand sides) to understand the current barriers. As far as is known, this is the first review of this kind in Iraq; it will help to inform policy and programme development.

Methods

This is a scoping review on the current barriers to family planning services utilization and uptake among women

in Iraq; it is based on secondary data captured from published scientific studies. We adjusted 2 existing frameworks to produce an adapted conceptual framework: the Human Rights-Based Family Planning Conceptual Framework (7) identifies the required input at the country context, policy, service, community and individual levels to ensure equitable access to services and people making informed choices and the Fundamental Elements of the Quality of Care (8) incorporates elements of quality of care into the service level to assess the role of FP services quality. The adapted conceptual framework guided the literature search and review (Figure 1); it offers a practical holistic and health system approach to planning and implementing FP programmes incorporating human rights and quality of care.

Different combinations of key terms were used divided into 3 groups to reflect the different terminologies of the topic and different programmatic interventions in Iraq or countries with a similar context (Figure 2). These key terms were used to capture as much data as possible about FP services and barriers in Iraq and in countries with similar socioeconomic and cultural context (to compare it with the context of Iraq).

Inclusion and exclusion criteria were used: literature relevant to Iraq and its context; published after 2005 (older literature has little relevance); in Arabic or English (so it can be read by the author) and free or accessible. The date filter was removed during the search for the conceptual framework (to find the most relevant) and during the search in policy level to assess the stance of different governments in Iraq on FP.

Databases such as PubMed, Popline, Google Scholar, Global Health, BMC Women's Health and the Iraqi Academic Scientific Journals database were searched between March 2019 and July 2019 as part of the Master of Public Health (MPH) thesis to capture all studies at the local level that were published on the topic. Also, grey literature from situation reports and national surveys from the Ministry of Health and Environment, WHO, the United Nations Population Fund and other organizations were used; these provided studies about FP programmes and services in Iraq.

An example from searches in PubMed, Popline and Global Health resulted in 157 records. After applying the exclusion criteria and removing duplicates, 82 abstracts were screened. Finally, 58 full-text studies were assessed for relevance and 34 were included in this review.

Results

Country context

Over the last few decades, the Iraqi population has continued to increase, with an average annual growth rate of 3% (3) which is considered among the highest in the Region along with Yemen and Palestine (9). Currently, 70% of the population live in urban areas (10) and women aged 15–49 years form about 20% of the total population (11). Poverty and unemployment remain high with 22% of the total population live below the national poverty line (12) and with a relatively high maternal mortality rate (50 deaths per 100 000 live births) (3). Inequalities exist: the poverty rate is double in rural areas, 22% of women are illiterate (5) and account for only 10% of the workforce (12).

Civil conflict and political instability had a detrimental effect on the health care system and have weakened its capacity to respond to the needs of people (Table 1) (13). The effects within the reproductive health services include lack of appropriate infrastructure, poor referral

Figure 1 Conceptual framework for the literature search on family planning (FP)

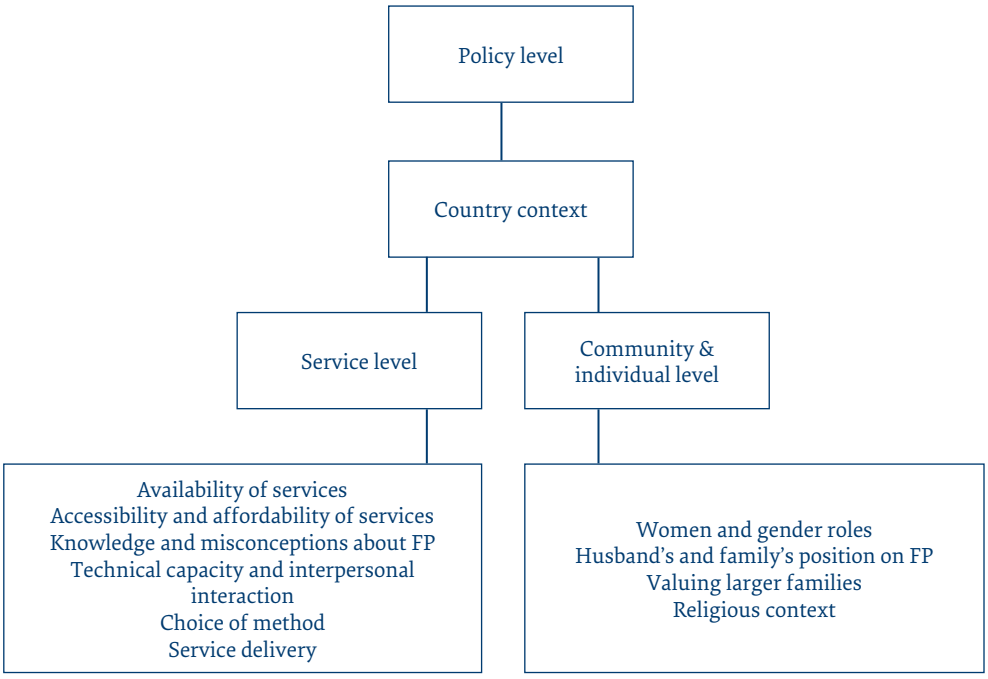
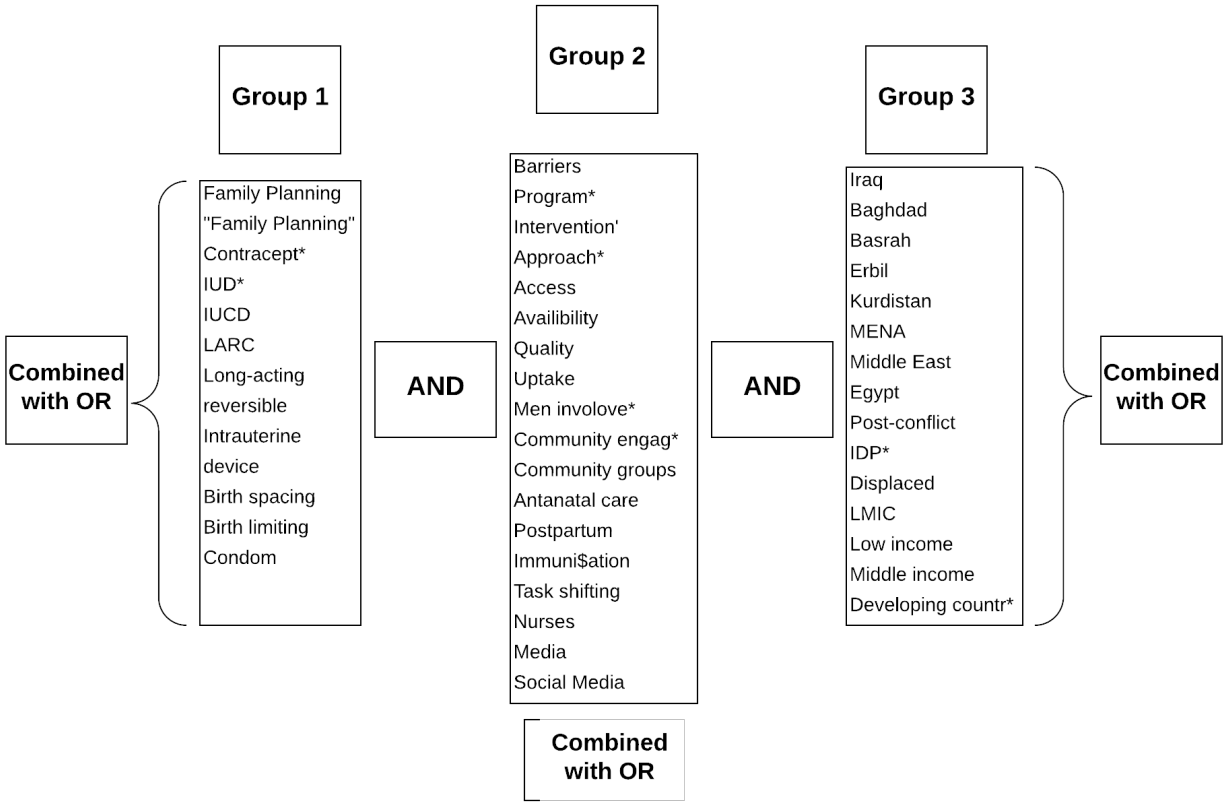


Figure 2 Summary of the key terms used for the literature search on family planning



systems, reduced quality of care and violent attacks targeting health care providers (*14*). Also, the recent humanitarian crisis (2014 and after) resulted in shortages in supplies and commodities and many health personnel and more than 3 million people fleeing their homes (*15*).

Policy level

Access to FP services had been restricted by previous policies before 2003 in which the previous administration emphasized the importance of reproduction and incentivized having more children as the country was going through wars (*16*). When the major political transition took place in 2003, the new government politically supported FP programmes (*16*) but little or no effort was made to support implementation (Table 1) (*5*). Currently, the Ministry of Health and Environment does not have a separate policy or strategy on FP in place but FP was addressed and included in the National Health Plan in 2010 (*12*) and the National Reproductive, Maternal, Neonatal, Child and Adolescent Health Strategy 2016–2020 (*17*). They both highlighted the importance of providing quality FP services, including ensuring the availability of contraception commodities, building the capacity of health care providers and improving monitoring and accountability.

Service level

Availability of services

Family planning services are supposed to be offered in primary health centres and public hospitals free of charge or heavily subsidized (*5*). However, FP commodities are sometimes unavailable or are misappropriated from the public to the private sector, and many women have to depend on private pharmacies and clinics to purchase contraception in most areas of the country (*5*), including the Kurdistan region (*18*). Currently, only 5% of women have reported public facilities as their source for contraception in I-WISH national survey (*19*).

Accessibility and affordability of family planning services

There are very few studies on the affordability of FP services and methods. The Central Statistical Organization in Iraq published a document in 2011 which reported that the affordability of commodities accounted for less than 5% of problems among women using contraception (*6*). From the search conducted for this report, no published information was found among women not using contraception on FP affordability and services accessibility, including in surveys and field assessments from the Ministry of Health and other organizations about the need among vulnerable groups (displaced women, those in rural areas) and accessibility for these groups.

Knowledge and education about family planning services and methods

Although knowledge about FP and its methods is generally good among women (*6*), this varies between different governorates (*5,20*) and from one method to another; oral pills and IUDs are more commonly known compared with condoms, injectables and other methods (*21*).

Table 1 Summary of barriers to family planning services utilization in Iraq

Level	Barriers
Country context	Unstable security, conflict and displacement Damage to health facilities
Policy level	Not enough resources allocated for implementation.
Service level	Misconceptions and lack of accurate information Lack of family planning promotion by health care providers
Community & individual level	Gender norms and valuing large families Women unable to make decisions about family size

Furthermore, there was a lack of promotional messages such as counselling, leaflets or other methods from health care providers. In the capital, Baghdad, most women said they had not received any information about FP during their visits to the primary health centres (*22*). Similar findings were reported in Basrah, where only 50% of participants cited health care providers as the source of their contraception information (other sources were family and friends) (*5*).

Education about correct use was also found to be suboptimal and still needs improvement: some women in Mosul stated that they did not know how to use contraception as the reason for their unmet need for FP (*23*). Furthermore, 20% of unwanted pregnancies were among women who failed to use contraception correctly in Duhok (*18*) and Mosul (*23*), which might also support the lack of accurate information about contraception and its correct use.

Misconceptions about family planning

Misconceptions about FP and contraception were identified as preventing women from seeking FP services (Table 1). About 50% of the non-users mentioned health reasons and side-effects such as cancer or infertility for not using any contraception in studies in Basrah (*5*) and Mosul (*23*).

Many women said they do not receive enough information about FP from health care providers. Women attending antenatal care in Erbil reported that they had specific questions about contraception but health care providers did not give them sufficient time to address their concerns (*14*).

Technical capacity and interaction of providers

From the search conducted for this report, no published studies were found looking into provider–client interaction or the technical knowledge and skills of health care professionals in providing FP services. However, one study in Erbil reported that the average consultation with a doctor took just 2 minutes in the primary health centres, during which the patient received treatment or was referred to hospitals (*24*).

Choice of method

Although FP services and supplies are meant to be offered in primary health centres, most of them fall short in providing contraception, which means women rely on private clinics and pharmacies to buy contraception commodities (*5*). The Multiple Indicator Cluster Survey shows that almost all the contraception methods are available in the private sector (*4*) but women in one study reported provider bias as they used a specific method due to the provider's preference for one method over the others (*20*).

Service delivery

Women can get FP consultation through health facilities but most would have to buy contraception commodities from private pharmacies and clinics due the lack of availability (*5*). On the other hand, many women in one study said that they preferred to go to private clinics for the consultation because of the shorter waiting time and better quality of services (*14*).

Promotion of FP was also included in antenatal and postpartum care visits to promote post-delivery contraception (*25*). It was reported that only 50% of women received FP counselling during antenatal care in Erbil (*25*) but no studies were found on FP counselling during postpartum visits. Furthermore, there are no published reports or information about any guidelines or in-service training for health care providers and no studies on FP counselling during postpartum visits.

Community and individual level

Women and gender roles

According to the social norms in Iraq, women are still viewed as responsible for raising children, staying at home and taking care of household affairs (*19*). Furthermore, half of the women in the Iraq Woman Integrated Social and Health (I-WISH) national survey said that men are the key decision-makers in the household (Table 1). Only 50% of men had discussed the number of children that they wanted to have with their wives (*19*), and usually the women preferred to have a fewer children (*6*).

Finally, recent conflict and security instability has resulted in more restrictions and has reinforced gender roles within the community, this situation deteriorated as unemployment and poverty became more prevalent and led to high rates of teenage marriage and pregnancy (*16*).

Husband's and family's position on family planning

The views of the husband on FP also play a vital role in decisions on the use of contraception: many of the women surveyed in one study said they could not use contraception owing to their husband's demand (*26*). Women's choice of method of contraception is also influenced by the husband's preference (*24*). In some instances, women might be denied the right to use contraception by the husband (*5*) or mother-in-law (*18*); these are commonly reported causes of hindering utilizing FP services across different backgrounds and different cities in Iraq (*23*).

Although no studies on men's involvement in FP in Iraq were identified in the search conducted for this report, the I-WISH survey reported that less than 50% of men have proper knowledge about FP and reproductive health (*19*).

Valuing larger families

Families in Iraq value having a high number of children (*19*), this was also supported by another national survey where more than half the women said they wanted 3–4 children and 15% said they wanted more than 5 (*27*). In addition, many women also reported using FP services for the first time only after having 3 or more children and/or reaching the desired number of children (*22*).

Religious context

The vast majority of Muslim scholars and leaders have approved the use of FP methods to control the size of the family and advise that women have some time for spacing between pregnancies to maintain good health and well-being (*28*). The I-WISH survey also revealed that only 2% cited religion as the main reason for not using FP methods (*27*).

Discussion

This review aimed to tackle barriers to FP services utilization and uptake. It addressed these barriers through an adapted conceptual framework taking into consideration the country context, policy, services and community and individual levels.

Civil conflict and the humanitarian crisis affected reproductive health services (including FP services) and resulted in damage to the infrastructure, attacks against health care providers and reduced quality of care (*14*).

At the policy level, the previous administration restricted access to FP and encouraged having more children due to wars. However, the new government recognized the role and importance of FP for development through the National Health Plan and the National Reproductive, Maternal, Neonatal, Child and Adolescent Health Strategy but not enough resources were allocated for implementation (*16,17*).

On the other hand, at the service level, even though supplies are supposed to be offered free or heavily subsidized, most women (95%) still have to buy these from private pharmacies and clinics (*19*) as products are unavailable or are misappropriated from the public sector (*5*). Also, there is a lack of information about the affordability and accessibility of commodities and services.

While knowledge about FP methods is generally good, there is a lack of promotional messages to women from health care providers (*5*). This resulted in women having to rely more on information from family and friends, with only half of the women in Basrah citing health care providers as their source of information. Lack of promotional messages could also be the reason for the high contraceptives incorrect use and unintended pregnancies among contraceptive users and contributed to misconceptions and fear of side effects among women not using contraceptives (*18,22,23*).

Similar to affordability and accessibility, there is no information about providers' technical capacity and interaction. Yet, the average visit to a doctor lasts only 2 minutes (*24*), which is not enough time for FP promotion or counselling. Finally, although most contraceptive methods are available through the private sector, some women's choice of contraception is still influenced by the providers' preference (*20*).

This emphasizes the importance of counselling and FP promotion to address accessibility of information and commodities. Offering FP counselling as part of postpartum care visits along with FP promotion during outreach and facility-based immunization serves to tackle misconceptions (*29,30*). Furthermore, this can be boosted through task shifting, i.e. allowing nurses and midwives to offer FP counselling and service provision (including IUD insertion and removal and injectables) (*31*).

Lastly, at the community and individual level, gender roles in the household play a role where men are seen as the key decision-makers in regard to number of children; the decision on whether to use contraception and which method will be used is largely influenced by the husband's preference (*20*). Couples in Iraq still value having many children (half the women in one national survey said they wanted 3 or 4) although religion was found to be supportive of FP (*27,28*). Community and religious leaders through men community groups can champion the use of FP for the woman and child's health to encourage discussions among couples such as in the approach implemented in Egypt (*32,33*) and in the Islamic Republic of Iran, where clergy and religious leaders worked with health officials to design a culturally and religiously acceptable programme that contributed significantly to the success of the programme (*34*). Mass media and social media have both been utilized to promote smaller family size in Egypt and India (*35*).

Conclusion

Women in Iraq still face many barriers to accessing health care services, on top of the social, cultural and economic barriers that hinder them from receiving FP services. This review calls for an urgent need to address these barriers by providing promotional messages and counselling to women, especially as part of postpartum visits, to help them make an informed choice and tackle misconceptions. Men should also be encouraged to make mutual fertility decisions and improve their awareness about the benefits of FP and smaller families through community groups and the media.

In accordance with the findings of this review, policymakers need to support, and allocate more resources for research and FP programmes to make commodities more available in public health facilities and health care workers can spread awareness and accurate information about FP.

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Étudie des obstacles liés au recours aux services de planification familiale et à leur utilisation chez les femmes en Iraq

Résumé

Contexte : La planification familiale permet d'éviter les grossesses non désirées et de réduire la mortalité et la morbidité maternelles. La prévalence de la contraception est encore relativement faible (58 %) en Iraq par rapport aux autres pays de la Région de la Méditerranée orientale, et les taux concernant les besoins non satisfaits (12 %) et la fécondité totale (4,2 enfants par femme) sont encore élevés. Les services sont gratuits ou fortement subventionnés dans de nombreux établissements de santé publics et privés, mais de nombreuses femmes n'y ont toujours pas recours à cause de contraintes sociales, culturelles, financières ou liées aux services de santé.

Objectifs : La présente étude exploratoire examine les obstacles liés au recours aux services de planification familiale et à leur utilisation chez les femmes en Iraq.

Méthodes : L'étude utilise un cadre conceptuel adapté à partir des cadres fondés sur la qualité des soins et les droits de l'homme pour analyser les études scientifiques publiées.

Résultats : Au niveau politique, le gouvernement soutient la planification familiale mais n'a pas alloué de ressources d'une manière suffisante. Au niveau des services, la faible promotion de la planification familiale par les prestataires de soins de santé (notamment durant les consultations prénatales) ainsi que les préjugés des prestataires en faveur de certains types de contraception ont contribué à la diffusion d'informations inexactes et d'idées fausses. Au niveau communautaire et individuel, le choix des femmes est encore largement influencé par le point de vue du mari sur la contraception, puisque les hommes sont toujours considérés comme les principaux décideurs en matière de fertilité. La valorisation d'une famille nombreuse demeure un obstacle à l'utilisation des services de planification familiale et au recours à ceux-ci, et l'on a trouvé que la religion soutenait la planification familiale.

Conclusion : Il faut diffuser des messages promotionnels et encourager les décisions mutuelles en matière de fertilité.

العوائق التي تحول دون استفادة النساء من خدمات تنظيم الأسرة واستخدامها في العراق

يوسف الراوي

الخلاصة

الخلفية: يساعد تنظيم الأسرة على تجنب الحمل غير المرغوب فيه والحد من الوفيات والمراضة بين الأمهات. ولا يزال معدل انتشار وسائل منع الحمل منخفضًا نسبيًا (58٪) في العراق مقارنة بالبلدان الأخرى في إقليم شرق المتوسط، ولا تزال معدلات الاحتياجات غير المُلباة (12٪) والخصوبة الإجمالية (4.2 طفل لكل امرأة) مرتفعة. والخدمات متاحة مجانًا أو مدعومة بشكل كبير في العديد من المرافق الصحية العامة والخاصة، ومع ذلك لا تزال العديد من النساء لا يستخدمنها بسبب القيود الاجتماعية أو الثقافية أو المالية أو القيود على خدمات الرعاية الصحية.

الأهداف: هدفت هذه الدراسة الاستكشافية الى تحديد العوائق التي تحول دون استفادة النساء من خدمات تنظيم الأسرة واستخدامها في العراق.

طرق البحث: استخدم الاستعراض إطارًا مفاهيميًا مكيفًا من الأُطُر القائمة على جودة الرعاية وحقوق الإنسان لتحليل الدراسات العلمية المنشورة.

النتائج: على مستوى السياسات، دعمت الحكومة تنظيم الأسرة ولكن لم تُخصص موارد كافية لذلك. وعلى مستوى الخدمات، ساهم انخفاض تعزيز تنظيم الأسرة من مقدمي خدمات الرعاية الصحية (لا سيَّما خلال زيارات الرعاية السابقة للولادة)، إلى جانب تحيز مقدمي الخدمات لأنواع معينة من وسائل منع الحمل، في عدم دقة المعلومات والمفاهيم الخاطئة. وعلى مستوى المجتمع والأفراد، لا يزال اختيار المرأة يتأثر إلى حد كبير بموقف الزوج من وسائل منع الحمل، حيث لا يزال الرجل هو صانع القرار الرئيسي فيما يتعلق بالخصوبة. ولا يزال إعطاء قيمة بالغة لتكوين أسرة كبيرة يُشكل عائقًا أمام الاستفادة من خدمات تنظيم الأسرة واستخدامها، بينما وُجِدَ أنَّ الدين يدعم استخدام تنظيم الأسرة.

الاستنتاج: هناك حاجة إلى توفير رسائل تعزز وتشجع اتخاذ قرارات الخصوبة بشكل متبادل.

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Taxonomy of effective strategies to reduce unnecessary caesareans: a systematic review

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Abstract

Background: The increasing trend in unnecessary caesarean sections has caused maternal and neonatal health concerns worldwide. Various medical and non-medical interventions have been designed and implemented to reduce caesarian section overuse. However, their efficacy is questionable.

Aims: This study aimed to identify and classify effective interventions to reduce unnecessary caesarian sections.

Methods: We searched EMBASE, MEDLINE, Web of Knowledge and Scopus databases for articles, using appropriate search strategies, up to 2 June 2020. Overall, 7951 identified articles were screened and assessed using a valid quality assessment checklist. Finally, 109 eligible studies were included in this review. Thematic content analysis was used to identify and classify the effective interventions.

Results: Overall, 188 effective caesarian section reduction measures were identified. They were categorized into 45 actions, 16 intervention groups and 6 WHO building blocks, including "governance and leadership", "financing", "health workforce", "medical products and technologies", "information" and "service delivery". Using qualified and competent staff, intra-partum services, and oversight were the most commonly applied interventions to reduce unnecessary caesarian sections.

Conclusions: A taxonomy of effective strategies to reduce unnecessary caesarian sections was developed in this study. A holistic approach is crucial to addressing the new epidemic of unnecessary caesarian section. Multiple interventions based on the underlying causes of caesarian section overuse should be designed and implemented at local and global levels.

Keywords: pregnancy, caesarean section, caesarean reduction interventions, unnecessary procedures

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Introduction

Caesarean section (CS), the surgical mode of birth, was introduced to save the lives of mothers and infants, and having access to this procedure is a vital part of comprehensive emergency obstetric care (*1*). According to the World Health Organization (WHO) statement of 1985, a CS rate of 10–15% at the population level is accepted and there is no justification for having more CSs in any region in the world (*2*). The WHO readdressed this issue due to the controversy on the optimum CS rate in 2015 and emphasized that a rate greater than 10% had no benefit for reducing maternal and neonatal mortality. Considering the potential risks, it was strongly recommended to restrict performing the procedure to medically indicated reasons and applying appropriate interventions to prevent unnecessary CSs.

Moreover, more research has been called for to investigate the immediate and future effects of CS on health (*3*). However, the global figures show an increasing trend worldwide. The average CS rate rose from 6.7% in 1990 to 21% in 2015, with a 3.7% average annual increase from 2000 to 2015 (*4*). The WHO experts estimated that a third of CS procedures, about 6 million worldwide each year, were unnecessary in 2010 (*5*).

A variety of reasons, from health system-related issues to health care user's concerns, affect the rising trend of CS (*6*). Fear of labour pain or assumed damage to the body and baby or even the temptation of choosing the baby's date of birth are some reasons for a women to request CS (*7,8*). In addition, private practice, defensive medicine, financial incentives and convenience induce physicians to perform more CSs (*9*). Generating revenues for hospitals, financial reimbursements and quality of maternity services are some of the reasons rooted in the health system (*9*).

There is robust evidence that costly unnecessary CSs (*5*) are associated with increased maternal and neonatal mortality and morbidity. More surgical complications, hospital readmissions and problems in subsequent pregnancies such as uterine rupture, abnormal placentation, ectopic pregnancy, stillbirth, and preterm birth have been reported after a CS (*9,10*). Surgically born

babies are more prone to neonatal death and neonatal intensive care unit (NICU) admissions due to serious complications. They might also suffer from short-term health risks like altered immune development, allergy, atopy, asthma, and reduced intestinal gut microbiome diversity and long-term risks such as type 1 diabetes, asthma, overweight and even cognitive and educational problems (*10*).

Target 3.1 of the United Nations Sustainable Development Goals asks states to reduce their maternal mortality ratio by 2030 (*11*). Obviously, preventing unnecessary caesareans would protect women and babies from the adverse effects of this surgical procedure. Various strategies have been introduced and applied worldwide to combat the epidemic of unnecessary CS. There have been some systematic reviews on solo interventions such as continuous support during childbirth (*12*) or controlling mothers' fear of labour (*13*). Valuable studies on antenatal and intrapartum interventions (*14*) and nonclinical interventions (*15*) have been published in recent years too, which have provided robust evidence for designing caesarean reduction strategies. However, considering the complex and complicated nature of CS overuse, a holistic approach is needed to control the increasing trend worldwide.

The 6 building blocks of the health system, governance and leadership, financing, health workforce, medical products and technologies, information and service delivery (*16*), should be considered in any comprehensive health related plan. Hence, this study aimed to identify effective interventions to reduce unnecessary caesareans and classify them using the WHO 6 building blocks framework.

Methods

This was a systematic review of studies. It followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (*17*). Studies were searched systematically, identified, screened and reviewed. We systematically searched 4 electronic databases, EMBASE, PubMed (MEDLINE), Web of Knowledge and Scopus, and 2 search engines (Google scholar and Google) to identify relevant articles published up to 2 June 2020. The PICO (population, intervention, comparison, and outcome) search strategy tool was used to develop an effective strategy. English language original quantitative studies in which the participants were pregnant women, with any intervention aiming to decrease caesarean or increase vaginal births and with statistically significant results were included in this study. The search strategy involved 3 components (caesarean, reduction and strategies). In addition, medical subject headings (MeSH) terms were used. Table 1 shows the search strategy in the PubMed database.

The initial search identified 7951 articles. After deleting duplicates, initial assessment of 7682 titles and abstracts was done by screening them against the inclusion and exclusion criteria by 2 researchers (all by LE and 20% by ST). Disagreements were resolved through discussion or by consulting a third reviewer (AMM). Then, the quality of articles was assessed using a quality assessment checklist (*18*). This tool evaluates the quality of articles in 5 areas (literature review and identification of research gaps, research questions and design, population and sampling, data collection and capture, and analysis and results). All articles were scored on a 4-point Likert scale: 0 (not present/not reported), 1 (present but low quality), 2 (present and midrange quality) and 3 (present and high quality). Each article was rated independently by 2 researchers and disagreements were resolved through discussion or by consulting a third reviewer if necessary. Those articles with a core of ≥ 10 out of 15 were included in this study. Ultimately 109 studies were eligible (Figure 1).

A data extraction form covering the authors' names, publication year, country, research method, sample size, interventions, results and article quality scores was used in this study. Thematic content analysis was applied for data analysis. First the interventions were read and data were coded according to their content. Then, similar codes were grouped into themes called actions; similar actions were grouped as intervention groups. Finally, similar interventions were grouped and classified under the WHO 6 building blocks.

Results

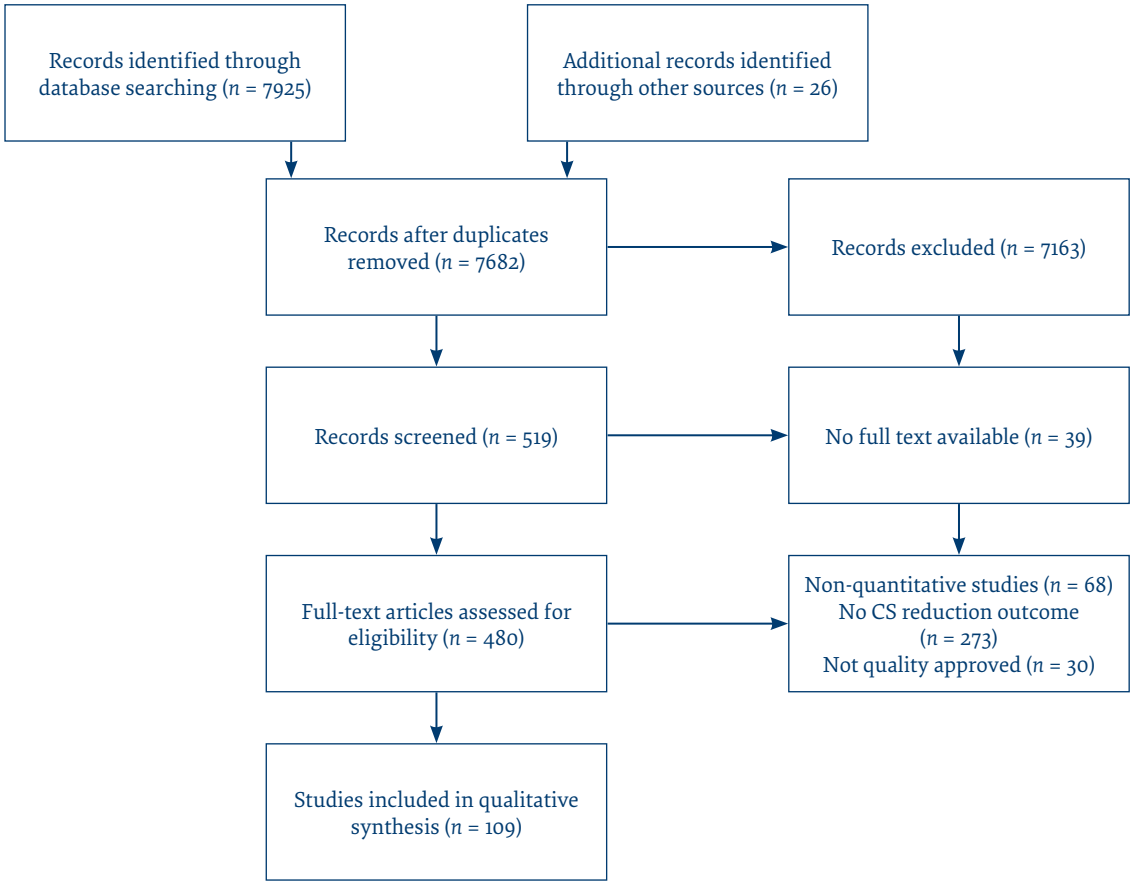
Overview

One hundred and nine (109) original quantitative studies employing observational (75.2%), experimental (22.9%) and quasi-experimental (1.8%) methods were included in this review. They were published from 1988 to 2020, mostly 2010–2020 (70%). The majority of studies were carried out in the United States of America (USA) (29%), followed by the Islamic Republic of Iran (11.2%) and Canada (8.4%). Considering the WHO regions, these studies were conducted in the Americas (41.3%), Europe (23.9%), Western Pacific (17.4%), Eastern Mediterranean (11.9%),

Table 1 Search strategy terms in PubMed

(((((Intervention? OR program OR project OR "evidence based" OR policy OR education adj2 (program OR meeting? OR session? OR strateg OR workshop? OR visit?)))) AND ("Cesarean Section"[Mesh] OR "Parturition"[Mesh] OR "Delivery, Obstetric"[mesh] OR "Cesarean Sections"[tiab] OR "Delivery, Abdominal"[tiab] OR "Abdominal Deliveries"[tiab] OR "Deliveries, Abdominal"[tiab] OR "Caesarean Section"[tiab] OR "Caesarean Sections"[tiab] OR "Abdominal Delivery"[tiab] OR "C-Section (OB)"[tiab] OR "C Section (OB)"[tiab] OR "C-Sections (OB)"[tiab] OR "Postcesarean Section"[tiab] OR "Delivery, Obstetric"[tiab] OR "Deliveries, Obstetric"[tiab] OR "Obstetric Deliveries"[tiab] OR "Obstetric Delivery"[tiab] OR "Parturition"[tiab] OR "Parturitions"[tiab] OR "Birth"[tiab] OR "Births"[tiab] OR "Childbirth"[tiab] OR "Childbirths"[tiab] OR VBAC OR "Vaginal Birth After Cesarean"))) AND ((Elective OR voluntary OR chosen OR willing OR Elective Cesarean?))

Figure 1 Flow chart outlining search strategy and selection of articles on caesarean section (CS) up to 2 June 2020



Africa (3.7%) and South-East Asia (1.8%) regions. A descriptive summary of the studies is presented in Table 2.

Overall, 188 codes (measures) were identified and classified into 45 effective actions to reduce unnecessary CSs. These actions were grouped into 16 intervention groups and finally classified into the WHO 6 building blocks (Table 3). The most commonly used interventions were: using qualified and competent staff (17.4%),

Table 2 Descriptive summary of the studies reviewed

Element	Details
Publication year	Range: 1988–2020 Mode: 2017 (16 studies)
Sample size	Range: 67–10 171 742 deliveries Median: 5201
Method (No.)	
Observational (82)	Case–control (5), cross sectional (7), prospective cohort (10), retrospective cohort (60)
Experimental (25):	Cluster randomized controlled trial (4), non-randomized controlled trial (1), randomized controlled trial (20)
Quasi-experimental (2)	Natural experiment design (1), before–after (1)
Country (No.)	
Single country studies (107)	USA (31), Islamic Republic of Iran (12), Canada (9), China (9), Australia (5), Sweden (5), Taiwan (3), UK (3), Brazil (2), India (2), Ireland (2), Israel(2), Italy (2), Spain (2), Turkey (2), Burkina Faso (1), Lithuania(1), Chile (1), Denmark (1), Ecuador (1), Egypt (1), Finland (1), Jordan (1), Lithuania (1), New Zealand (1), Pakistan (1), Portugal (1), Singapore (1), The Netherlands (1), Ukraine (1), Zimbabwe (1)
Studies in > 1 country (2)	UK and the Netherlands (1), Latin America (1)
WHO Region (No.)	Americas (45), Europe (26), Western Pacific (19), Eastern Mediterranean (13), Africa (4), South-East Asia (2)
No. of interventions applied in each study	1: 60 studies ≥ 2: 49 studies
Quality assessment score (15 scores)	Range: 10–15 Median: 13

Table 3 A taxonomy of interventions to reduce unnecessary caesarean section (CS)

Building block	Intervention	Action
Governance & leadership	Legislation	Laws, regulations
	Policy-making	CS rate goal setting, policies
	Planning	Care models, quality improvement plans, patient safety plans
	Promotion	Use of media for promoting normal birth, nongovernmental organization collaboration
	Oversight	Audit, peer review, second opinion, evaluating and ranking obstetrics centres
	Leadership	Leading by obstetricians, leading by midwives
Financing	Institution reimbursement	Fixed per patient reimbursement, pay-for-performance
	Provider reimbursement	Fixed per patient reimbursement, pay-for-performance
Health workforce	Qualified & competent staff	Optimizing health workforce, staff education and training, supervising obstetrics residents, changing staff attitude towards normal delivery
	Team work	Group health providers, collaborative care
Medical products & technologies	Medicine	Using induction drugs, using medicines for regional anaesthesia
	Equipment & technology	Using equipment and techniques to facilitate birth, using fetal wellbeing assessment technologies
Information	Data gathering & analysis	Electronic medical records, measuring indicators, classification of CS
	Information dissemination	Giving feedback to obstetricians, external dissemination of information
Service delivery	Prenatal services	Dietary counselling, exercise plan in prenatal period, control the woman's fear, prenatal education, prenatal special clinics
	Intra-partum services	Protocol (evidence)-based practice, continuous care, physical and emotional support, physiologic birth, pain control services, vaginal birth after caesarean delivery

intra-partum services (14.1%) and oversight (13.7%). The interventions reported in the articles we reviewed for this study are summarized in Table 4 and some examples are described below.

Governance and leadership

Legislation, policy-making, planning, promotion, oversight and leadership interventions were classified as subgroups of the governance and leadership building block. Laws and regulations enforced the reduction of unnecessary CSs in some countries. In Texas (USA), a law was passed to eliminate Medicaid payment for early elective deliveries in 2011; this was followed by Georgia, Michigan, New Mexico, New York and South Carolina in 2013 (*19*). In China, rules and regulations were also applied to control caesarean delivery on maternal request, and obliged providers to encourage mothers to choose vaginal delivery (*20*).

Policy-making, including setting goals and defining policies, was also employed. In North Carolina, a target of 28.5% reduction in CS (27.9% to 21.7%) for nulliparous women with a term, singleton pregnancy and vertex presentation was set in 3 hospitals in 2015. The hospitals achieved a 19.7% CS rate, beyond the established goal (*21*). National and provincial policies were established in some countries such as the Normal Delivery Promotion Plan in the Islamic Republic of Iran (*22*) and the Healthy Texas Babies initiative in the USA (*19*).

Planning included designing different models of care, quality improvement or patient safety programmes. The community-based model for continuity of care (*23*) and the team-based shared-care model (*24*) were successful in reducing caesareans in Australia and Canada. The Lean Six Sigma technique was adopted in Tiazhou, a tertiary hospital in Zhejiang province, China in 2014. Using the Lean Six Sigma methodology (define, measure, analyse, improve and control) reduced the CS rate from 41.8% to 32% over a period of 10 months (*25*). The Patient Safety Bundle" is a patient safety programme implemented in 3 hospitals in North Carolina, USA. It comprised 4 stages: readiness, recognition and prevention, response, and reporting and systems learning, and resulted in a reduction in the CS rate from 27.9% to 19.7% (*21*).

Promotional interventions through collaboration with media and nongovernmental organizations were also influential in reducing the CS rate. Public campaigns to raise awareness about caesarean like the "Go the Full 40" campaign in the USA were launched (*26*). Social media and nongovernmental organization collaboration, creating a special WeChat group, holding professional forums on www.dxy.cn (the largest Chinese biomedical blog), and providing a monthly webinar called "Modern L&D Virtual Lecture Hall" via YY Voice, a Chinese web-based education application, were used to promote a CS reduction plan in China (*27*).

Oversight was one of the most commonly used interventions, employed in almost every plan to reduce caesarean overuse. It was implemented by conducting medical audits and peer reviews and asking for second opinions (*28,29*). The performance of birth facilities was also evaluated, ranked and reported to the public in some countries like China and the USA (*21,30*).

Table 4 Characteristics of the studies reviewed (*n* = 109)

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Bartuseviciene et al. (2018)	Retrospective cohort 2667	Lithuania	Midwifery-led care	CS rate was 4.4 and 5.2% in the midwife-led and 10.7 and 11.8% in the obstetrician-led group in 2012 and 2014 ($P < 0.001$)	14
Pérez et al. (2018)	Retrospective cohort 53 338	Spain	Standardized multifaceted strategy, defining indications for emergency and scheduled CSs, encouraging protocol-based practice, continuous monitoring the indicators, external audit, feedback to providers, professional training and publishing the CS results	CS rate decreased by 1.19 percentage point (from 22.69% to 21.50%; 95% CI: 0.48–1.90).	11
Davies-Tuck et al. (2018)	Retrospective cohort 833 231	Australia	Planned home birth	Unplanned CS for low risks was 2.5% in home birth group compared to 12.5% in hospital ones ($P < 0.001$) and for high risks 8.9% vs 39.4% (p< 0.001).	14
De Jonge et al. (2017)	Retrospective cohort 141 472	UK & the Netherlands	Providing maternity services for low risk women in midwife-led settings	CS rates were higher among low risk English obstetric unit births compared to Dutch midwife-led hospital births (AOR 1.89 (95% CI: 1.64 to 2.18) and 3.66 (2.90 to 4.63) respectively).	14
Fisch et al. (2009)	Retrospective cohort 15 329	USA	Induction audit: development and enforcement of induction guidelines, peer review, medical staff education	CS rate in nulliparas with elective induction dropped 60% from 34.5% to 13.8% ($P = 0.01$).	14.5
Gardner et al. (2014)	Prospective cohort 396	Australia	"Next birth after caesarean" clinic run by 3 high-risk obstetric consultants to counsel and support women deciding on mode of birth for their next pregnancy after a primary CS	Overall vaginal birth after caesarean delivery (VBAC) rate improved from 17.2% to 27.0% ($P < 0.001$).	13
Gilbert et al. (2013)	Prospective cohort 15 800	USA	Improving hospital obstetric quality measures by improving data collection, providing consistent and accurate data reporting and making physicians' performance transparent	CS rate in nulliparous term singleton vertex decreased from 31.3% to 24.7% ($R^2 = 0.28$; $P < .001$).	15
Grigg et al. (2017)	Prospective cohort 692	New Zealand	Freestanding midwifery care for low risk births	More spontaneous vaginal birth in freestanding midwifery care group (77.9%vs62.3%, adjusted OR 1.61; 95% CI: 1.08–2.39),	15
Hickland et al. (2018)	Retrospective cohort 356	Ireland	Breech clinic to counsel women on management of breech presentation and performing external cephalic versions	Number of breech term CSs decreased from 199 to 154.	10
Kaboré et al. (2016)	Cluster randomized controlled trial 4174	Burkina Faso	Use of clinical algorithms for CS decision-making, in-site training, audits and feedback of caesarean indications	CS rate decreased in the intervention group (18.96 to 6.56%) compared with the control group (18.27 to 23.30%); OR for incremental change over time, adjusted for hospital and patient characteristics, 0.22; 95% CI, 0.14 to 0.34; ($P < 0.001$)	15
Kozhimannil et al. (2018)	Retrospective cohort 671 177	USA	Blended payment policy, which is single payment for birth regardless of mode of delivery to reduce financial incentives for performing CS	CS rate in intervention state decreased 3.24 percentage points, compared with control states ($P = 0.01$).	15
Lesieur et al. (2018)	Retrospective cohort 250 564	USA	CS audit and provision of training to trainee doctors at the maternity facility	Audits (19.83%, $\beta = -2.48$, $P = 0.03$) and training the trainee doctors (20.28%, $\beta = -1.08$, $P = 0.04$) were associated with CS reduction over the 4 years.	13
Liao et al. (2019)	Cross sectional 93745	China	Introducing 2-child policy	Overall CS rate of 2 provinces decreased from 45.1% to 38.9% (p< 0.001).	14

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Meng et al. (2019)	Natural experiment design 17 322	China	Episode-based bundled payment (EBP) for childbirth by lowering uncomplicated caesarean tariff (from ¥5352 to ¥3600) and increasing uncomplicated vaginal birth tariff (from ¥1591 to ¥2000) and payment for complex conditions still on a fee-for-service basis	The EBP reform was associated with a 33.97% (= 1−EXP-0.4150, $P < 0.01$) decrease in the probability of caesarean delivery	11
Muoto et al. (2018)	Retrospective cohort 187 704	USA	Hard stop policy limiting elective early delivery, required review and approval for scheduled caesareans and inductions of labour, occurring prior to 39 weeks gestation with no documented medical indication	Overall CS prevalence dropped from 26.8% to 25.8% ($P < 0.001$)	13.5
Ogunyemi et al. (2018)	Prospective cohort 11 715	USA	Safety bundle with a focus on natural labour consisting of research on local CS risk factors, provider and patient education, multidisciplinary reviews based on published guidelines, feedback, provider report cards and encouraging commitment to labour duration guidelines	CS rate in primary singleton vertex decreased from 23.4% to 14.1% and the nulliparous term singleton vertex rate decreased from 34.5% to 19.2% ($P < 0.0001$)	13
Overgaard et al. (2018)	Retrospective cohort (with matched control group) 1678	Denmark	Freestanding midwifery unit versus obstetric unit for low risks	More spontaneous vaginal birth among women managed in freestanding midwifery units (1.06, 1.03 to 1.09) $P < 0.0001$	14.5
Ozdemir et al. (2018)	Case–control 100	Turkey	Systematic birth preparation programme, including prenatal, postnatal, and neonatal care, providing information about changes in pregnancy, possible emergencies, physical exercise programme, breathing techniques, hydrotherapy, aromatherapy, and reflexology, newborn care and breastfeeding	More vaginal delivery (group A: 78%, group B: 56%) and less maternal request for elective CS (group A: 8%, group B: 28%).	10
Rasouli et al. (2017)	Randomized controlled trial 234	Iran	Motivational interviewing	1.4 times higher natural delivery (68.4% vs 48.1%, 95% CI: 1.1–1.8)	14
Rouhe et al. (2013)	Randomized controlled trial 371	Sweden	Psychoeducative group therapy starting at 26 weeks pregnancy	More spontaneous vaginal delivery (63.4% vs 47.5%, $P = 0.005$) and fewer CSs (22.9% vs 32.5%, $P = 0.05$)	13
Runmei et al. (2012)	Retrospective cohort 25 280	China	Quality improvement programme including staff education, pay cut for nonindicated CSs, daily CS audit, protocol, prenatal education, non-medical CS stated as unnecessary CS in hospital records, filling consent for mothers insisting on CS, goal setting, evaluating maternal and perinatal outcomes	Significant CS reduction from 54.8% to 40.3% (OR 0.56; 95% CI: 0.52–0.59; χ^2 test: $P < 0.001$).	15
Safari-Faramani et al. (2016)	Retrospective cohort 33 888	Iran	Normal delivery promotion plan	Overall CS and first time CS decreased from 54.5 and 54.1% to 49.6 and 47% at the end of the period ($P < 0.0001$).	11
Shaffer et al. (2011)	Retrospective cohort 3258	USA	Trial of manual cephalic rotation for occiput posterior (OP) or transverse (OT) position in the second stage of labour	Less likelihood of CS in manual cephalic rotation group [adjusted OR 0.12; 95% CI: 0.09–0.16).	10
Shakiba et al. (2020)	Single-blind clinical trial 120	Iran	Prenatal motivational interview	Less CS in intervention group ($P = 0.03$).	10

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Taheri et al. (2014)	Case-control 130	Iran	Self-efficacy education with discussions, lectures, exercise and sharing the experience of normal deliveries by other new mothers	More normal delivery in intervention group (71.4%) compared to control group (53.8%) $P < 0.001$.	12
Thuillier et al. (2018)	Retrospective cohort 6351	USA	Introducing new guidelines and redefining the threshold of active labour (from 4 to > 6 cm) and arrest of first and second stage of labour	CS rate decreased from 9.4% to 6.9% (OR 0.71, 95% CI: 0.59-0.85; $P < 0.01$).	13.5
Vadnais et al. (2017)	Retrospective cohort 15 144	Israel	Quality Improvement Initiatives including provider education, guideline-based practice, CS audit and feedback	Total and nulliparous term single vertex CS decreased from 40.0% and 34.8% to 29.1% and 21.2% in 2015($P < 0.05$).	11
Van Dillenet al. (2008)	Retrospective cohort 2437	Netherlands	Daily CS audit in report meetings	Total CS rate decreased from 23.4% to 18.7% ($P < 0.01$)	14
Wong et al. (2015)	Retrospective cohort 1646	Australia	Continuity midwifery model in which a designated midwife provides all care in pregnancy, is 'on call' for and cares for her in labour and provides postnatal support for 2 weeks	Increased rates of normal vaginal birth (57.7% vs 48.9% $P = 0.002$) and spontaneous vaginal birth (38% vs 22.4% $P < 0.001$), decreased rates of instrumental birth (23.5% vs 28.5% $P = 0.050$) and CSs (18.8% vs 22.5% $P = 0.115$) in the midwifery continuity cohort	15
Xia et al. (2019)	Repeated cross-sectional 1 921 932	China	Professionals training, including health education professionals, obstetricians, paediatricians, neonatologists, anaesthesiologists, neonatal nurses, public education, mothers' education, near-miss centre capacity-building, use of film, posters, leaflets, TV, newsletters, social network, city LCDs	Monthly CS rate declined across the intervention stages ($Z = 75.067$, $P < 0.001$), with an average rate of 42.4% at baseline, 39.8% at Stage 1, and 35.0% at Stage 2	15
Ziadeh et al. (1995)	Retrospective cohort 58 979	Jordan	Guidelines for managing dystocia, previous caesarean delivery, fetal distress and breech presentation, an anaesthesiologist available 24/7 and epidural anaesthesia to 30% of patients	CS rate decreased from 15.5% in 1987 to 8.7% in 1993	10
Lokugamage et al. (2020)	Prospective cohort 6335	UK	Birth preparation and weekly acupuncture sessions from 37weeks of gestation	More normal births (OR 0.76, 95%CI: 0.64–0.91)	13
Abdel-Aleem et al. (2005)	Randomized controlled trial 438	Egypt	Therapeutic amnioinfusion	Significant CS reduction for fetal distress in the amnioinfusion group (RR, 0.7; 95% CI, 0.6–0.83)	10.5
Acanfora et al. (2013)	Single-blind randomized controlled trial 80	Italy	Use of the Baby-guard system	Fewer caesarean deliveries ($P < 0.02$)	12
Aghlmand et al. (2008)	Retrospective cohort 100	Iran	Quality improvement care model including use of admission and care guidelines and patient education	CS rate decreased from 42% to 30%, the relative risk of CS was significantly higher before the plan (RR = 3.55, 95% CI: 2.07–6.07)	12
Akoury et al. (1998)	Case–control 1105	Canada	Active management of labour	CS rate decreased from 13% to 4.3% ($P < 0.005$)	11
Altmanet al. (2017)	Rertospective cohort 1441	USA	Labour and delivery care managed by midwives or nurse-midwives	Lower CS in women managed by nurses and midwives (OR, 0.29, 95% CI, 0.12-0.69, $P = 0.005$)	13

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Annapoorna et al. (1997)	Non-randomized controlled trial 478	Singapore	External cephalic version with the use of tocolysis and vibroacoustic stimulation for breech pregnancies	Overall CS rate in the study group was 32.5% comparing to 51.4% in control group. The study group had significantly lower CSs (nulliparas $P < 0.007$, multiparas $P < 0.005$)	12
Arefi et al. (2015)	Case-control 140	Iran	Prenatal education (BASNEF method)	Lower CS rate in case group (25.7%) than control group (60%), $P < 0.001$	14
Attanasio et al. (2018)	Cross-sectional 16 4653	USA	Labour and delivery care managed by midwives	Lower odds of birth by CS (a OR, 0.70, 95%CI, 059-0.82) in the setting with 15-40% of birth attended by midwives compared to no midwife attended births	15
Ayres□De□Campos et al. (2015)	Retrospective cohort 133 228	Portugal	National action: protocol-based practice, no unnecessary labour inductions before 41 weeks of gestation, promotion of VBAC, use of external cephalic version, regular CS audits, dissemination of obstetric indicators, staff training (fetal monitoring and simulation-based training of obstetric emergencies), an important percentage of hospital funding was indexed to the annual CS rate, CS issue presented in national scientific meetings and scientific publications	CS rate decreased 15.4%, from 33.2 to 28.1%, time trend ($P < 0.001$)	11
Bala et al. (2018)	Randomized controlled trial 150	India	Delayed amniotomy	Overall CS rate was higher in the early amniotomy group (10.7%) comparing with delayed amniotomy (2.7%), $P < 0.0495$	13
Barakatet al. (2012)	Randomized controlled trial 290	Spain	Structured, moderate-intensity exercise programme including light resistance, toning, aerobic dance and pelvic floor exercises during the entire length of pregnancy	CS rate in the exercise group were lower than in the control group (15.9%, $n = 22$; vs 23%, $n = 35$, $P = 0.03$)	13
Bardos et al. (2017)	Retrospective cohort 5201	USA	Senior obstetrician–gynaecologist coverage on the labour floor during the daytime to supervise resident deliveries and help teach operative, specifically forceps deliveries.	CS rate significantly decreased from 27.3% to 24.5% (adjusted OR 0.68, 95% CI: 0.55–0.83)	15
Bastani et al. (2006)	Randomized controlled trial 110	Iran	Applied relaxation training (6 sessions)	CS rate in intervention group was 15.4% comparing to 40.4% in control group ($P = 0.001$)	15
Beigi et al. (2003)	Double-blind randomized controlled trial 156	Iran	Cervix ripening by 200 µg oral mesoprostol	CS rate was significantly lower in the misoprostol group 12.8% vs 28.2 ($P < 0.05$)	14
Bell et al. (2017)	Retrospective cohort 834	USA	Patient safety bundle: building culture of spontaneous vaginal birth, goal setting (21.7%), adapting protocols (admission, induction, dystocia, fetal distress, assessment of hospitals and individuals, performance, training for physicians and nurses, leadership by 4 physician leaders, use of peanut ball, mother and family education, mothers' education and support during labour, data collection from electronic records	CS rate in nulliparous, term, singleton, vertex decreased from 27.9% to 19.7% (OR 0.63, 95% CI: 0.46–0.88).	13

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Benatar et al. (2013)	Retrospective cohort 423 859	USA	Delivery in birth centres and managed by freestanding midwives	Significantly less CS in the freestanding birth centre group compared with usual care (19.7% vs 29.4%, OR 0.59, $P < 0.01$)	14
Berglund et al. (2010)	Retrospective cohort 7227	Ukraine	Provision of training on "effective perinatal care", including clinical activities and a team approach to maternity care for all staff (obstetricians, neonatologists, midwives, paediatric nurses, paediatricians and anaesthesiologists)	CS rate dropped significantly in 2 maternity centres (from 30% and 33% to 18.4% and 12%, $P < 0.001$)	12
Bergström et al. (2010)	Retrospective cohort (secondary analysis of randomized controlled trial) 857	Sweden	Use of psychoprophylaxis	Lower risk of emergency CS (adjusted OR 0.57; 95% CI: 0.37–0.88)	13.5
Dahlen et al. (2017)	Retrospective cohort 10 171 742	USA	Healthy Texas Babies initiative, including payment reform was implemented; passing a law to eliminate Medicaid payment for early elective delivery, adding coding modifiers to billing codes to identify unnecessary delivery before 39 weeks gestation	Adjusted change of CS in Texas was −0.61, $P < 0.001$, adjusted difference-in-differences change in Texas vs 3 states without collaborative efforts or legislative changes were: −0.51, −0.68, −1.12, $P < 0.001$)	15
Doyle et al. (2014)	Randomized controlled trial 233	Ireland	Ten prenatal home visits, providing information on healthy prenatal behaviours and the birthing experience	Less CS rate in intervention group (15.1%) compared to the control group (25%), OR 0.53,95% CI: 0.27,1.07 ($P < 0.05$)	15
Gagnon et al. (1999)	Retrospective cohort (secondary analysis of a randomized controlled trial) 100	Canada	Continuous one-to-one care to women by maternity nurses providing physical and emotional support and applying relaxation methods, training for maternity nurses every 3 months	56% reduction in the risk of total CS (RR of experimental vs control = 0.44, 95% CI: 0.19–1.01)	14
Gregory et al. (1999)	Prospective cohort 38 541	USA	Continuous quality improvement: physician education about CS indications in grand rounds and before the programme started, all clinical and non-clinical staff involvement in CS reduction programme (collaboration of leading obstetricians, nurse-physician meetings regarding alternative pain management strategies for latent phase and new arrivals: late active phase (> 8 cm), physicians, nurses and residents' focus groups on attitude about VBAC, feedback on pitocin protocol, formed department CS reduction task force, providing physician-specific data before intervention, dissemination of CS rate of physicians (anonymously) and hospital every 3 months, survey of nurse strategy for labour support, role play regarding nursing interventions for labour support, precertification for (elective) CSs and inductions, walking epidurals, ambulatory telemetry and development of department patient education and pamphlet on VBAC	CS rate decreased from 26% in 1993 to 20.5% in 1997 ($P < 0.05$)	10

Table 4 **Characteristics of the studies reviewed (n = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Grunebaum et al. (2013)	Retrospective cohort 45 655	USA	Patient safety programme: elimination of scheduled labour induction below 39 weeks without medical indications, define protocols (standardized oxytocin protocol, oxytocin initiation checklist, chain of communication protocol, electronic templates for shoulder dystocia and operative deliveries, labour and delivery team training, staff training (electronic fetal monitoring interpretation certification, obstetric emergency drills, Internet-based reading assignment and testing), recruitment of labourist, physician assistants added to labour and delivery staff, dedicated gynaecology attending, obstetric patient safety nurse, postpartum haemorrhage kit, risk management measures and consultant review	CS rate decreased from 41.6% to 32.7% ($P < 0.001$)	10
Hannah et al. (1996)	Retrospective cohort (secondary analysis of a randomized controlled trial) 3407	Canada	Induction of labour after 41 weeks gestation	Less CS in induction group (21.2%) versus expectant group (24.5%) $P = 0.03$	11
Hollinghurst et al. (2010)	Randomized controlled trial 742	UK	The decision analysis programme including educating women about advantages and disadvantages of normal delivery and CS using an educational software	Less CS in decision analysis programme group (63%) comparing to usual care (70%)	13
Homer et al. (2001)	Randomized controlled trial 1089	Australia	Community-based model of continuity of care: define standard of collaborative continuous care (low risk mothers managed by midwives and high risks by obstetricians), assign an on-call midwife to answer mother's questions, continuous one to one care during labour and delivery, mothers meet all midwives in a session to know them, midwife accompanies mother in operation room, if CS needed	Significant difference in CS rate between community-based group (13.3%) and control group (17.8%). This difference was maintained after controlling for known contributing factors to CS (OR 0.6, 95% CI: 0.4–0.9, $P = 0.02$)	14.5
Hoskins et al. (2017)	Retrospective cohort 6991	USA	Multi-strategy approach for CS reduction including second opinion for both scheduled and medically indicated CS, audit, dissemination every obstetrician's CS rate, educational evening sessions about VBAC for mothers with previous CS by obstetricians	CS rate decreased from 39% to 29% ($P < 0.05$)	11
Hu et al. (2016)	Retrospective cohort 54 930	China	No pain labour and delivery (NPLD) programme, including regional anaesthesia for normal delivery, obstetric anaesthesia protocols and professional responsibility protocols for anaesthesia services and nursing care, care providers' education with books and lectures, on-site training for maternity team including physicians, residents and nurses, use of social media to promote NPLD, 9 bilingual labour analgesia documents and epidural analgesia protocols, patient's education books and lectures, collaboration with nongovernmental organizations to inform community about NPLD	CS rate decreased from 41% to 34% ($P = 0.002$)	10

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Iglesias et al. (1991)	Cross sectional 1161	Canada	Protocol for VBAC, dystocia and breech deliveries	CS rate decreased from 23% in 1985 to 13% in 1989 (P = 0.001).	10
Iriye et al. (2013)	Retrospective cohort 6206	USA	Recruitment of full-time labourist	CS rate decreased from 39.2% (no labourist) to 33.2% (full-time labourist), $P < 0.01$	11
Javernick et al. (2017)	Retrospective cohort: Pre and post measure design 994	USA	Quality improvement project including a defined policy on limited non-medically indicated induction of labour before 41 weeks, intermittent auscultation (instructing the providers, design posters for nurses on intermittent auscultation),staff education on counselling women about policy of induction), triage flow sheet for admission (not less than 4 cm), calculate each obstetrician's primary and total caesarean birth rates, audit and feedback on each obstetrician's primary and total caesarean birth rates, feedback on each obstetrician's performance in monthly meetings, via email and on the hospital managerial dashboard, counselling women at their 36-week visit about policy of limited non-medically indicated induction of labour before 41 weeks, a handout of the "Go the Full 40" campaign for mothers, audit patient consultation, using a pre- and post-quality-improvement-process-measures tool for evaluation	Primary CS rate decreased from 28.9% to 12.2% (OR, 0.345; z = 6.52, P =0.001; 95% CI, 0.249-0.479).	12
Johri et al. (2017)	Cluster randomized trial 105 351	Canada	Onsite training, capacity building, 3-month audit cycles, using local data to assess the appropriateness of caesarean delivery, engage in collective learning, provide feedback to clinicians, and implement best practices based on the results	The intervention group experienced per-patient reductions of 0.005 CS (95% CI: −0.015 to 0.004, P = 0.09) and $180 (95% CI: −$277 to−$83, $P < 0.001$)	15
Kacerauskiene et al. (2017)	Retrospective cohort: Before-after 48 395	Lithuania	CS audit based on Robson classification	CS rate decreased from 26.9% to 22.7% ($P < 0.001$). The greatest contributions to the overall CS rate were made by groups 1, 2 and 5	13
Kashanian et al. (2010)	Randomized controlled trial 100	Iran	Continuous labour support by a midwife	CS deliveries were significantly were lower in intervention group (4 vs 12, P = 0.003)	10
Poma (1998)	Retrospective cohort 12 912	USA	Protocol for labour pain control, adopted labour management and caesarean delivery guidelines, review of every caesarean delivery that did not meet guidelines and confidential individual feedback, educating providers on advantages and disadvantages of natural vaginal delivery and CS, public education on advantages and disadvantages of natural vaginal delivery and CS	Total and primary CS rates decreased from 22.5% and 13.5% to 18.6% (P = 0.001) and 10.6% (P = 0.001) respectively	12
Kozhimannil et al. (2016)	Retrospective cohort: secondary data analysis 67 082	USA	Doula services	Doula support was associated with substantially lower odds of caesarean among full-term births (adjusted OR 0.44, 95% CI: 0.39–0.49)	15
Kozhimannil et al. (2013)	Cross sectional 280 087	USA	Doula services	Less CS rate among doula-supported births (22.3%) comparing to Medicaid beneficiaries nationally (31.5%). After control for clinical and sociodemographic factors, odds of caesarean delivery were 40.9% lower for doula-supported births (AOR 0.59; $P < 0.001$)	13.5

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Lagrew et al. (1996)	Retrospective cohort 12 118	USA	Changes in guidelines, training for nurses on electronic fetal monitoring and active labour management, monthly CS rate report, analysis, feedback and confidential report to obstetricians every 6 months	Total and primary CS rate decreased from 31.1% and 17.9% to 15.4% and 9.8%; repeat CS and nulliparous CS rate fell from 13.2% and 28.1% to 5.7% and 16.9% respectively ($P < 0.00001$)	12.5
Liu et al. (2013)	Retrospective cohort 35 616	Taiwan	Hospital-based self-management including postoperative CS peer reviews and audits and the hospital global budget system consisting of a prospective direct and complete government funding of hospital	Immediate CS improvement and then be maintained at same value (RR 0.9109; 95% CI: 0.8430-0.9845, $P = 0.0183$)	13
Liu et al. (2016)	Retrospective cohort 81 495	China	Ranking obstetric centres by performance (with CS rate and lowering that rate), ranking performance of attending physicians within the hospital (with CS rate used as one of 4 perinatal indicators, along with case mix, number of discharges, length of stay, and complication rate), the fixed per-patient reimbursement by government regardless of mode of delivery (for women with social insurance and in the regular care model), instituted pay-for-performance, bonus and financial support from government to obstetrics centres that had a better rank (to support the hospital's infrastructure), a larger salary bonus for providers with a favourable ranking (having a low CD rate), free perinatal health care classes for mothers (advantages and benefits of vaginal delivery were emphasized), companionship of family and an experienced midwife during labour, epidural available if needed	CS rate decreased from 51.5% in 2008 to 36.1% in 2014, mostly due to a reduction in non-indicated antepartum CS from 27.9% in 2010 to 11.9% in 2014; after adjustment, a period effect remained with delivery between 2011 and 2014 associated with a 31% reduction in the odds of CD compared with delivery between 2007 and 2010 (OR: 0.69, 95% CI: 0.66–0.71) and a 33% reduction in the odds of antepartum CD (OR 0.67, 95% CI: 0.64–0.69)	15
Maet al. (2012)	Randomized clinical trial 1966	China	Bionic midwifery airbag	CS in the intervention group (14.39%) were lower than those in the controls (23.04%) $P = 0.048$	14
Mahomedet al. (1991)	Randomized controlled trial 208	Zimbabwe	External cephalic version with tocolysis for breech pregnancies	CS decreased from 33% to 13%; no troublesome complications from the procedure ($P < 0.001$)	11
Mawson (2004)	Multicentre cluster randomized controlled trial 149 276	Latin America (Argentina, Brazil, Cuba, Guatemala, Mexico)	Mandatory second opinion for non-emergency CSs and CS guidelines	Small but significant reduction in rates of CS (mean difference in CS rate change between groups: −1·9%; 95% CI: −3·8 to −0·1; $P = 0·044$; relative rate reduction 7·3%; 0·2–14·5)	15
Mohammadi et al. (2012)	Retrospective cohort: before–after 3494	Iran	Individual case reviews by 4 evaluators consisted of 2 board-certified obstetricians, a senior midwife and a GP, review of 25% of all primary CS patient records in monthly meetings, written feedback to doctors if CS not indicated, financial incentives to practitioners who matched clinical criteria and achieved the lowest percentage of CS	Overall CS rate decreased from 40% to 33% ($P < 0.001$)	14
Navaee et al. (2015)	Blind clinical trial 67	Iran	Educating mothers to overcome fear of pain by role playing	There was a significant difference between the 2 groups (lecture and role play) concerning reduction of elective CS and decision on mode of delivery at the time of admission in the labour room ($P < 0.0001$)	10

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Oshiro et al. (2013)	Retrospective cohort 29 030	USA	Quality improvement programme including a "hard stop" policy to reduce early elective inductions and CSs by defining related protocols, composing a quality improvement team (consisting of a physician champion, nursing leader(s), scheduler, and quality improvement staff member), quality improvement team's training, reviewing scheduled deliveries before 39 weeks of gestation without a listed medical indication by a nurse and referred to physician leadership if necessary, evaluation the rate of scheduled singleton elective early-term deliveries and early-term medically indicated and unscheduled deliveries, neonatal intensive care unit admissions, and singleton term fetal mortality rate	Elective CSs decreased 84% from 43.5% to 7.1% ($P < 0.001$)	10
Pavicic et al. (2009)	Retrospective cohort 1367	Canada	Expectant management before 41 weeks	CS rate in expectant management group was 17.7% and 21.3% in induction group ($P = 0.09$)	13
Peng et al. (2016)	Retrospective cohort 3781	Taiwan	CS audit including defining dystocia, fetal distress and indications of induction, screen high risk women in post term pregnancies (fetal ultra sound, non-stress test and biophysical profile and umbilical wave form studies), clinical audit and feedback in triweekly obstetric morning meetings (all cases briefly) and monthly audit conferences (cases with ambiguous caesarean indications), monthly reporting of the audit's results were submitted to the hospital president, feedback to all obstetric staff	CS rate was lower in audit group (31.1%) than pre-audit group (34.5%), OR = 0.85, 95% CI: 0.74–0.97, $P = 0.02$	13
Ragusa et al. (2016)	Prospective cohort 419	Italy	The comprehensive management of labour including periodical meetings to standardize the clinical activity of doctors and midwifes and to enforce the commitment to change, daily audit and discussion of clinical cases by medical and midwifery staff, intrapartum ultrasonography alongside traditional clinical assessment to determine fetal head and trunk position accurately, epidural analgesia on request, encouraging upright position, walking during labour and give birth in the most comfortable position, manual rotation of the fetal head if needed, attention to psychological well-being by continuous midwifery care and support, change of midwife if the midwife–patient relationship was deemed unsatisfactory, encouraging the presence of a partner, assessment of the nutritional status, free access to caloric snacks and foods and water	CS rate was 10.3% and lower in the comprehensive management group comparing to 22.2% in the standard management group ($P = 0.001$)	14
Reisneret al. (2009)	Prospective cohort 20 037	Sweden	Goal-setting to reduce elective inductions, induction protocol and consent form designed and trialled, commitment of obstetric team including obstetricians, midwives, nurses, unit staff and management, meeting with practice managers from all office prior to initiation of programme to inform them about the rationales of caesarean reduction specially in nulliparous, staff education on induction of labour	Elective unplanned primary CS rate in nulliparous was 26.9% before project and decreased to 17.9% [RR = 0.66, (0.4–1.1)] after project: 4% in multiparas before and 1.9% after [RR = 0.47 (0.25–0.87)]	12

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Robertson et al. (2018)	Retrospective cohort 174	Australia	Individual nutritional assessment and dietary counselling conducted by a dietitian for women with body mass index > 35 kg/m²	CS rate were lower among participants (35.5%) compared to obese populations in comparable studies (48.7%)	10
Rudge et al. (2011)	Cross sectional 27 387	Brazil	The safe motherhood referral system based on the exchange of patients from the level II to the level III hospital (all high-risk pregnant women were planned to deliver at the level III hospital, and all low-risk pregnant women were planned to deliver at the level II hospital), a separate cadre of level III with better-paid health workers comprised of obstetricians, anaesthesiologists, neonatologists, residents and medical and nursing students, more specified responsibilities was established, providing supplemental compensation for health care in level III hospitals, service availability, referral and other communication systems, transport between level II and level III hospitals	CS rate decreased from 46.5% to 23.4% at the level II hospital while remaining unchanged at the level III hospital ($P < 0.001$)	11
Saisto et al. (2001)	Randomized controlled trial 176	Finland	Intensive therapy for women with fear of labour consisted of provision of information and conversation regarding previous obstetric experiences, feelings and misconceptions during routine obstetric check-ups to assure the normal course of the pregnancy, combined with cognitive therapy	CS rate was lower in intensive therapy group (27%) compared to r those who refused to fill in the questionnaires (57%), $P = 0.001$	11
Scarella et al. (2011)	Prospective cohort 4813	Chile	Implementation of 10-group classification and data-gathering system, meeting with staff to inform them about the Ten Group classification system (TGCS) and statistics related to CS and its indications, medical- midwifery staff meeting every 3 months to report changes in TGCS and overall CS rate, tables and figure showing TGCS changes and overall CS rate distributed to all staff by letter	CS rate decreased from 39.4% (basal period) to 27.4% (intervention period). In total a decrease of 5.08% from the basal period (RR 0.86 95% CI: 0.76–0.97)	11
Shoemaker et al. (2017)	Prospective Cohort 6226	Canada	Care strategy including developing guideline to define and support normal physiological birth, reviewing women's educational tools, updating admission and labour induction policies, reviewing all induction requests by the on-call physician and facilitating nurse, providing a comfortable space in the triage area for women who are not yet in full labour, updating maternity staff by the chief of obstetrics about the initiative, baseline rates, and targets, staff education on the benefits of supportive care, providing facilities in every labour and delivery room to encourage nurses to remain close to women in labour, use of auscultation instead of electronic fetal monitoring during labour, monthly audit and feedback on indicators such as rate of CS, VBAC and induction for the unit overall and individual physicians (blinded for the first 3 months, then unblinded among peers), public education campaign to increase awareness of the CS reduction initiative, VBAC counselling	At the intervention hospital, 30.3% (964/3181) of women underwent CS in 2009–2010, compared with 26.4% (803/3045) in 2012–2013 (difference −3.9%, $P < 0.001$). By contrast, no significant difference was recorded in control hospitals [28.1% (23 694/84 361) vs 28.2% (23 683/83 895); difference 0.1%, $P = 0.5157$]	13

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Sloan et al. (2000)	Quasi experimental: before-after 27 094	Ecuador	Policy to provide patient co-management for CS candidates, second opinion from a supervising obstetrician or resident for all caesarean candidates, spot checks, staff training, supervising residents by two senior obstetricians including a co-principal investigator, discussion in a grand rounds seminar regarding CS, appropriate indications, and consequences of inappropriate surgical delivery and providing copies of a Spanish translation of CS-related articles	CS rate declined by 4.5% (P = 0.001) in the intervention hospital	14
Wilson-Leedy et al. (2016)	Retrospective cohort: before–after 200	USA	Labour management's guideline was defined, the induction policy was presented at departmental meetings and circulated to all faculty and residents by e-mail, also included among nursing policies, and made available online for reference	Among women delivering after induction or augmentation, the CS rate decreased from 35.5% to 24.5% (OR 0.59, 95% CI: 0.38–0.91). The overall CS rate decreased from 26.9% to 18.8% (AOR 0.59, CI: 0.38–0.92)	13.5
Xirasagar et al. (2006)	Cross sectional 253 618	Taiwan	Group private obstetrics/gynaecology practices versus solo ones	Solo practices have 7% excess caesarean cases relative to large group practices; after controlling for covariants, solo practice physicians were 5.38 times (CI: 4.18–6.93), 2-physician practices 3.87 times (CI: 2.99–5.01) and 3-physician practices 2.72 times (CI: 2.06–3.59) as likely as 4+ physician practices to provide CS	13
Ma et al. (2017)	Retrospective cohort: pre-post intervention 131 312	China	Policies to decrease the high CS rate by controlling the CDMR rate, specific CS indications and guidelines, the regulation on the Management of Maternal Health Care and the Norms of Maternal Health Care (to encourage mothers to choose vaginal delivery, control indications for CS, strictly control CDMR), a multifaceted strategy to tackle the high CDMR rate, annually obstetricians and midwives' training programmes (necessary skills for problematic child delivery and procedures for emergency obstetric care), the CS rate included among patient safety indicators, a monthly audit of whether medically unnecessary CS procedures were performed, providing services such as painless childbirth through intervertebral anaesthesia, one-to-one doula, delivery by midwives, face-to-face health education was provided by doctors, nurses, and nutritionists to mothers and their families once or twice a week in a hospital, women educational contents displayed on TV and billboards at hospital outpatient service halls and inpatient wards at the obstetrics departments, when preparing for CDMR, obstetricians shared the potential risks of CS with mothers, and then the mothers were asked to sign a medical informed consent form for CDMR	After institutional interventions, overall CS rate declined by 1.29% (P = 0.002) and average annual growth rate of the CS decreased from 0.29% to −6.73%	13

Table 4 **Characteristics of the studies reviewed (n = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Naiden and Deshpande (2001)	Retrospective cohort 27 780	USA	Goal setting to reduce operative deliveries, encouraging vaginal birth after caesarean delivery (VBAC) as a standard of care, feedback to physicians their own delivery statistics, asking physicians with higher rates to review the literature, defining active management of labour protocol including applying Oxytocin only under the supervision of the attending physician by experienced labour and delivery nurses and experts in the assessment of fetal heart rate patterns and initial treatment of abnormal patterns	The overall CS rate decreased from 16.59% to 10.92%, the primary CS rate decreased from 9.22% to 7.11% and the repeated CS rate from 7.37% to 3.81%. All significant differences	12
Socol et al. (1993)	Retrospective cohort 26 619	USA	Use of delivery data, calculation of indicators such as primary and repeat CSs, VBAC, neonatal intensive care unit admissions, neonatal and perinatal mortality rates, Apgar scores, and umbilical cord arterial pH values, encouraging vaginal birth after one prior low-transverse CS, annual feedback to physicians about their performance, defining and implementing the protocol of the active management of labour for term nulliparous patients based on the results of a randomized trial	Total, primary, and repeat CS rates declined from 27.3%, 18.2% and 9.1% to 16.9%, 10.6% and 6.4%, respectively; perinatal mortality dropped from 19.5 to 10.3; significant reductions in abdominal deliveries occurred for both private patients (30.3% to 19.1%, $P < 0.0001$) and clinic patients (20.8% to 11.5%, $P < 0.0001$)	11
Sanchez-Ramos et al. (1990)	Retrospective cohort 18 291	USA	Calculating indicators such as proportion of primary and repeat CSs, review of each CS and its indications at weekly conferences, participating departmental resident and obstetric faculty physicians, establishing new guideline for performing primary CS, intrapartum management of women with prior CSs, diagnosis of dystocia, using electronic fetal monitoring records, umbilical cord gas results, Apgar scores, fetal acoustic stimulation to assess fetal well-being	Overall CS rate decreased steadily from 27.5% of deliveries to 10.5% ($P < 0.0001$)	10
Santerre (1996)	Retrospective cohort 47 480	USA	Implementing ACOG guideline on VBAC, promoting the guideline by publishing a number of influential books on CS, important information dissemination by popular press and, large number of newspaper articles on excess CS	VBAC rate increased from 6.6% in 1985 to 25.4% in 1993	10.5
Robson et al. (1996)	Retrospective cohort 21 125	UK	Pre-intervention survey on CS reasons classification, developing guidelines for spontaneous labour in nulliparous women by senior obstetricians and midwives, guideline education by simultaneous in-service training, improving cooperation and under- standing between midwives and physicians, reviewing CS cases and the quality of labour and delivery management, antenatal classes to enable women to make better-informed choices, collection, publication and prompt distribution of monthly results to inform everybody involved of the effect of the new guidelines, monthly medical audit meetings to review the results	Overall CS rate decreased from 12% to 9.5% ($P < 0.0001$)	10

Table 4 **Characteristics of the studies reviewed (*n* = 109)** *(continued)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Sheikh et al. (2008)	Retrospective cohort 1409	Pakistan	Gathering information, introducing strategies related to acceptable standards for obstetric practice and universally defined criteria for principal indications for inductions and CSs, audit	Primary emergency CS rate decreased from 17% to 12%	10
Amer□Wåhlin et al. (2000)	Retrospective cohort 85 691	Sweden	Use of sufentanil for epidural analgesia	Fewer risk of CS for nulliparae (OR 0.79; 95% CI: 0.72–0.88) but not for multiparae (OR 0.93; 95% CI: 0.80–1.07)	11
Bleicher et al. (2017)	Retrospective cohort	Israel	Policy for induction of labour at 41 weeks to reduce caesarean rate	CS rate was lower, 15% versus 19.4% (P = 0.0135)	12
Blomberg (2016)	Retrospective cohort 8100	Sweden	Clinical quality improvement project, including monitoring of obstetric results, recruitment of a midwife coordinator, risk classification of women (according to a traffic-light model), combining level of midwife competence with risk assessment of women in labour, obstetrician–midwife team work, obstetrical morning rounds, improving staff skills on fetal monitoring summaries and obstetrical skills by simulation training on a regular basis and public promotion of the strategy via lectures for women and their partners by a group of dedicated midwives, being open towards journalists, which resulted in positive stories in the media, presenting several quality variables on their official website	CS rate in nulliparous women at term with spontaneous onset of labour decreased from 10% in 2006 to 3% in 2015; during the same period overall CS rate fell from 20% to 11%	10
Boylanet al. (1991)	Retrospective cohort 3900	USA	Protocol of active management of labour	Significant 4.4% reduction (95% CI: = 1.3–7.5) in CS incidence between the 12 month control period and the initial 6-month active management of labour intervention period	10
Burns (2013)	Randomized controlled trial 102	USA	The HEM-AVERT device to be used during the second stage of labour	Lower CS rate (12.0% for HEM-AVERT patients versus 39.6% for control patients, P = 0.0017)	12
Caliskan et al. (2009)	Randomized controlled trial 230	Turkey	Fetal heart rate monitoring and intermittent pulse oximetry after induction of labour with misoprostol	There was a reduction both in the overall CS [study n = 18, (15.7%); vs control n = 31 (26.7%); P = 0.04] and the rate of CS performed for non-reassuring fetal status in the study group [study n = 11, (9.6%); vs control n = 23 (19.8%); P = 0.03]	14
Chai et al. (2017)	Retrospective cohort 2140	China	Using Lean Six Sigma methodology (a 5-phase roadmap consisting of define, measure, analyse, improve, and control), the principal causes of CS identified, enhanced midwifery team building, improved parturient women assessment system, strengthened pregnancy nutrition guidance and implementation of painless labour techniques	CS rate decreased from 41.83% to 32% and the 6 sigma score increased from 1.706 to 1.967 (P < 0.001)	12
Chaillet et al. (2015)	Cluster randomized trial 18 4952	Canada	Quality of Care, Obstetrics Risk Management, and Mode of Delivery (QUARISMA) trial including empowering the health professionals (training on monitoring indications for caesarean delivery and managing intrapartum care and conducting audits),4 3-month audit cycles (information gathering, analysis according to standards, feedback), feedback the results	Significant but small reduction in CS rate before and after intervention (22.5% to 21.8% intervention group; 23.2% to 23.5% control group); OR for incremental change over time, adjusted for hospital and patient characteristics, 0.90; 95% CI: 0.80–0.99; P = 0.04; adjusted risk difference, −1.8%; 95% CI: −3.8 to −0.2)	13.5

Table 4 **Characteristics of the studies reviewed (n = 109)** *(concluded)*

Author (year)	Method sample size	Country	Intervention	Results	Quality score
Choudhary et al. (2010)	Case-control 292	India	Amnioinfusion for intrapartum passage of moderate or thick meconium	Significant reduction in CS incidence in the study group (31%) compared to control group (61%) $P = 0.001$	12
Mehdizadeh et al. (2005)	Randomized clinical trial 200	Iran	Birth preparation classes consisting of 8 sessions of education, counselling and neuromuscular exercises	Rate of vaginal delivery was significantly higher in trial group (97/100) than in control group (90/100; $P = 0.044$)	10
da Gama et al. (2016)	Retrospective cohort 23 894	Brazil	Participation of nurses and nurse-midwives in childbirth care	Less CS in women receiving birth care with participation of nurse midwives (OR 0.78, 95% CI: 0.62–0.98)	14
Harris et al. (2012)	Retrospective cohort 1238	Canada	Team-based shared-care model by midwives, family physicians, nurses and doulas and in case of any complication, referred to an obstetrician; 10 group prenatal sessions ranging from exercise and nutrition to labour and birth preparation and care of the newborn, meeting doulas once before labour and then provide one-on-one continuous support during latent and active phases of labour, postpartum home visits by midwife or physician the next day with additional home visits as needed, weekly drop-in clinic for up to 6 months postpartum, pooled medical services plan billings for midwives and physicians and remunerated at the same rate on a sessional basis for their services, free of charge for women	Less CS in the programme participants than in matched controls (RR 0.76, 95% CI: 0.68–0.84) and among those with a previous CS, more likely to plan a vaginal birth (RR 3.22, 95% CI: 2.25–4.62)	14

Leadership helped create confidence among the maternity team and encouraged a positive environment for adherence to protocols and cooperation in CS reduction plans. This was achieved by physician leaders and chiefs of obstetrics (*31*) or leading midwives (*25*).

Financing

The financing building block consisted of institution and provider reimbursement interventions. Institutions were paid via different methods, and some, e.g. fee-for-service, may drive CS overuse. Fixed payment and pay-for-performance strategies were associated with a decrease in caesareans. The blended payment method used in the USA (*32*) and the global budget system in Taiwan (*33*) are examples of fixed payments. In addition, pay-for-performance in the form of bonuses and financial support of obstetrics centres with appropriate CS rates (*30*) or a pay cut for non-medically indicated caesareans (*34*) were conducted.

Individual reimbursement was effective too. This also included fixed payment in form of blended payment (*32*) and pay-for-performance measures such as larger salary bonus for providers with a favourable CS ranking (*30*).

Health workforce

Interventions related to recruiting qualified and competent staff and teamwork are subgroups of the health workforce building block. Recruiting qualified and competent staff was the most commonly used intervention in the studies we reviewed. It was attained by optimizing the available workforce through employing freestanding midwives to care for low risk women (*35*), doulas for continuous support in labour (*36*), full-time labourists and obstetric patient safety nurses for hospitals (*28*). Another example, from Linköping hospital, Sweden, was assigning a mix of midwives with different levels of competency, ranging from midwife coordinator (highest level) to new graduate midwives (lowest level), in each working shift in order to combine the level of midwives' competence with the risk assessment of women in labour (*37*).

Staff education and training are essential to having a competent workforce. Courses such as clinical guidelines education (*38*), electronic fetal monitoring interpretation (*28*) and effective teamwork workshops (*28*) were found to be beneficial. For this purpose various methods of training such as lectures, drills, Internet-based assignment (*28*) and on-site training were used (*27*). Considering the role of obstetrics residents in providing quality maternity care, recruiting a senior obstetrician-gynaecologist to train and supervise staff (*39*) and including residents in staff training programmes (*27*) were noted. Moreover, as the attitude of staff towards normal delivery is of importance, measures such as periodical meetings to standardize clinical activities (*40*), asking staff to review literature on CS (*41*) and characterizing non-medical CS as "unnecessary CS" in hospital records (*33*) were employed.

Teamwork was the other essential component of this block. Group private practice compared to solo obstetricians was associated with a lower rate of CS (*42*).

Collaborative continuous care was another successful action in Australia, where a team of midwives and obstetricians provided antenatal and intra-partum care for women. Shifts were scheduled so one of the familiar providers was always on call to take care of women in hospital (*23*).

Medical products and technologies

Medicines, equipment and technology were classified under this building block. Some medicines, like misoprostol, used for labour induction, (*43*) and sufentanil combined with epidurals to relieve labour pain (*44*) were associated with a lower caesarean rate.

Some devices and techniques were also applied to facilitate normal birth. Techniques such as external cephalic version for breech pregnancies (*45*) and manual cephalic rotation in persistent transverse or posterior vertex position (*46*) increased the chance of normal vaginal delivery. Use of the "Baby-guard system" in Italy (*47*) and the "peanut ball" in the USA (*21*) were also reported as effective. Technologies to assess fetal well-being such as amnioinfusion, chemical fetal health assessment, fetal ultrasound, non-stress test, biophysical profile and umbilical wave were also used (*48,49*)

Information

Health information building blocks comprised interventions such as data-gathering and analysis, and information dissemination. To gather related data, electronic medical records were used (*21*) and indicators like total caesarean, primary caesarean, vaginal birth after caesarean (VBAC), induction rates and maternal and neonatal outcomes were measured (*21,50–52*). Caesarean classification groups such as the Robson CS classification, based on presentation of fetus, gestational age, parity, number of fetuses, previous uterine scar and initiation of labour, were used in a hospital in Chile and resulted in a 10% decrease in CS (*52*).

In a hospital in Colorado, USA, caesarean-related information was disseminated by providing individual feedback to physicians in hospital section meetings, via e-mail or on a dashboard (*26*). Additionally, measures such as releasing information via popular press agencies in the USA (*53*) or publishing it on the hospital's official website in Sweden (*37*) were found effective.

Service delivery

Prenatal and intra-partum services were categorized in the service delivery building block. Prenatal services such as dietary counselling, specifically for women with body mass index > 35 kg/m^2 in Australia (*54*), and the prenatal exercise plan in Spain were associated with lower CS rates (*55*). Fear control through cognitive therapy and psychoprophylaxis were also effective (*55,56*).

Pregnant women and their families participated in educational programmes such as birth preparation classes. They learnt about the physical and emotional changes in pregnancy, advantages and disadvantages of different modes of birth (*57*), nutrition in pregnancy (*20*), controlling fear of pain (*58*), relaxation techniques (*59*) and VBAC (*45*). Considering the fact that safe VBAC and external cephalic version for breech pregnancies would result in fewer caesareans, special prenatal clinics like the Next Birth After Caesarean (NBAC) clinic in Australia and the Breech Clinic in Ireland were established (*45,60*).

Intra-partum services, including protocol-based practice, continuous care, physical and emotional support, physiologic birth, pain control and VBAC, were the most commonly used interventions to reduce CSs. Guidelines were developed and used for defining dystocia, fetal distress and indications for induction in Taiwan (*49*). Using guidelines for performing primary CS, intra-partum management of women with prior CS and a diagnosis of dystocia were beneficial in lowering the CS rate (from 28% to 11%) in a teaching hospital in the USA (*61*). Continuous care and physical and emotional support during labour, and delivery by a partner (*40*), midwife (*23*) or doula (*36*) were also effective.

The physiologic approach to birth, which defines pregnancy as a normal event in a woman's life with attempt to keep labour and delivery as natural as possible, with the least unnecessary medical interventions, was important (*21*). In Italy, encouraging the presence of the partner and free access to caloric snacks, foods and water along with other interventions resulted in a significant reduction in CS, from 22.2% to 10.3% (*40*).

Although a variety of pain relief services are available, most studies focused on regional anaesthesia such as epidurals (*27,30*). Likewise, providing VBACs also lowered the CS rate (*31*).

Discussion

This systematic review aimed to identify and classify interventions effective in reducing the number4 of unnecessary CSs using a health system approach. A systemic horizontal approach is indeed critical to addressing complex health problems such as excessive CSs and achieving the best sustained results. The WHO has proposed the 6 building blocks framework as the perquisite to achieving the health systems goals (*16*). These building blocks interact with each other and also with external environment factors such as political, economic, social, technological and legal factors. The quality of these building blocks and their internal and external interactions affect the achievement of the health systems goals (*62*). An alphabetically arranged list of the full references for the studies we reviewed is given in Table 5.

Governance and leadership interventions were applied to reduce caesarean delivery on maternal request in China. This policy required maternity care providers to encourage mothers to choose vaginal birth, and rigorously to control CS indications. The caesarean rate was considered an important indicator, and professionals who did not maintain the CS rate within a reasonable range would face financial penalties. These measures resulted in an 8% reduction in CS (*20*). Financing interventions such as "blended payment" was adopted

for normal deliveries and uncomplicated caesareans in the USA. The payment for uncomplicated childbirth (both CS and normal vaginal delivery) was $3528 for facilities and $867.37 for individuals. Facility fees used to be $3144 for normal vaginal delivery and $5266 for CS, and professional fees for prenatal, delivery and postpartum care were $776.62 for normal vaginal delivery and $1147.42 for CS. Reducing financial incentives was effective in lowering unnecessary caesareans 0.27 percentage points per quarter after the intervention. Comparing with control states, the CS rate decreased 3.24% overall (*32*).

Recruiting the right health workforce proved to be effective too. Providing comprehensive and collaborative care by family physicians, community health nurses, midwives and doulas and referring pregnant women to an obstetrician if medically needed resulted in fewer caesareans (21.1%) compared with standard care (31.3%) in Canada (*63*). Additionally, applying medical technology such as electronic fetal monitoring, scalp pH sampling and fetal acoustic stimulation helped clinicians assess and manage dystocia and fetal distress, and reduced the overall CS from 27.5% to 10.5% in the USA (*61*).

The health information system enabled policy-makers to design and implement effective evidence-based interventions. The Robson CS classification system was used for assessing and monitoring caesareans in Chile. Each group caesarean rate, the relative size of groups and contribution of each group to the overall CS rate were assessed. Auditing caesareans based on this classification system reduced the numbers in groups 1, 5a and 10 significantly. Overall, the CS rate also dropped from 36.8% to 31.8% after this intervention (*52*). Providing the right health services such as protocol-based intra-partum services and supporting normal physiological birth and prenatal services like women's education and VBAC counselling lowered the CS rate by 4% in a hospital in Canada (*31*).

The most successful plans were those comprehensive plans which were organized in a systematic way. For example, the "Patient Safety Bundle" in North Carolina successfully reduced the CS rate in nulliparous women. It embraced several actions such as goal-setting, protocol-based labour management, staff education, mothers' education, facilitating physiologic birth, providing labour support and pain relief, gathering and analysing data, CS audit and feedback to the physicians (*21*).

The International Federation of Gynecology and Obstetrics (FIGO) also suggested governments, professional organizations, women's groups, and other stakeholders could help reduce unnecessary CSs through actions such as using the Robson CS classification, informing women, better care, pain relief, practical skills training for doctors and midwives, the reintroduction of vaginal instrumental deliveries, publishing annual hospital CS rates and financing partly based on CS rates (*64*). This would be more comprehensive by adding certain interventions such as optimizing the workforce, improving the attitudes of health care providers towards the culture of normality of pregnancy and birth, designing mother-centred models of care and developing proper financing.

Considering the fact that recent WHO statements and publications on CS have attracted global attention to the problem of overuse, it seems that governance and leadership interventions such as legislation, policy-making, planning, promotion, oversight and leadership by international organizations like WHO would strengthen national CS control plans. Periodic publications about CS, holding frequent regional and international conferences on this issue and naming one day of the year as "Birth is Normal" might be helpful promotional plans to cut unnecessary CSs. Considering the CS rate as a component of the Maternal Health Index combined with other main maternal health indicators to be monitored by WHO has also been suggested.

Last but not least, comprehensive CS reduction strategies at the hospital level covering governance, financing, human resources, equipment, information and service delivery processes should be supported by strengthening its subsystems, i.e. the involvement and commitments of professionals and mothers and the super systems, the health policy-makers.

This systematic review using an exploratory approach identified 16 effective interventions and 45 actions for reducing unnecessary CS by examining the findings of 109 related studies. More research should be conducted, particularly in the Africa, South-East Asia and Eastern Mediterranean regions of WHO to augment the findings of this study. Furthermore, it would be of interest to compare the efficacy of these interventions to see which are more effective at reducing unnecessary CS.

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Taxonomie des stratégies efficaces pour réduire les césariennes inutiles : une analyse systématique

Résumé

Contexte : La tendance croissante au recours à des césariennes inutiles a suscité des inquiétudes pour la santé maternelle et néonatale dans le monde entier. Diverses interventions médicales et non médicales ont été élaborées et mises en œuvre pour réduire le recours excessif aux césariennes. Cependant, leur efficacité reste contestable.

Objectifs : La présente étude visait à identifier et à classer les interventions efficaces pour réduire le nombre des césariennes inutiles.

Méthodes : Nous avons recherché des articles dans les bases de données EMBASE, MEDLINE, Web of Knowledge et Scopus, en utilisant des stratégies de recherche appropriées, jusqu'au 2 juin 2020. Au total, 7951 articles identifiés ont été analysés et évalués en utilisant une liste de contrôle valide pour l'évaluation de la qualité. Finalement, 109 études éligibles ont été incluses dans cette analyse. Une analyse de contenu thématique a été utilisée pour identifier et classer les interventions efficaces.

Résultats : Au total, 188 mesures efficaces visant à réduire le nombre de césariennes ont été identifiées. Elles ont été réparties en 45 mesures à prendre, 16 groupes d'intervention et 6 blocs constitutifs de l'OMS, notamment « gouvernance et leadership », « financement », « personnels de santé », « produits et technologies médicales », « information » et « prestation de services ». Parmi les interventions les plus couramment appliquées pour réduire le nombre de césariennes inutiles, on peut citer le recours à un personnel qualifié et compétent, aux services offerts pendant l'accouchement et à la surveillance.

Conclusions : Une taxonomie des stratégies efficaces pour réduire le nombre des césariennes inutiles a été mise au point dans cette étude. Une approche holistique est essentielle pour lutter contre la nouvelle vague de césariennes inutiles. Des interventions multiples basées sur les causes fondamentales du recours excessif aux césariennes devraient être élaborées et mises en œuvre aux niveaux local et mondial.

تصنيف الاستراتيجيات الفعَّالة للحدّ من العمليات القيصرية غير الضرورية: استعراض منهجي

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الخلاصة

الخلفية: تسبَّب الاتجاه المتزايد لإجراء العمليات القيصرية غير الضرورية في ظهور مخاوف على صحة الأمهات وحديثي الولادة في جميع أنحاء العالم. وتم تصميم العديد من التدخلات الطبية وغير الطبية وتنفيذها للحد من الإفراط في إجراء العمليات القيصرية. غير أنَّ فعاليتها مشكوك فيها.

الأهداف: هدفت هذه الدراسة إلى تحديد التدخلات الفعَّالة وتصنيفها للحدِّ من العمليات القيصرية غير الضرورية.

طرق البحث: بحثنا في قاعدة بيانات EMBASE، ونظام استرجاع المعلومات البيليوجرافية الطبية والبيولوجية (قاعدة بيانات Medline)، وموقع شبكة المعرفة وقواعد بيانات Scopus للاطلاع على المقالات، باستخدام استراتيجيات البحث المناسبة، وذلك حتى تاريخ 2 يونيو/ حزيران 2020. وبوجه عام، تم فحص 7951 مقالاً محددًا وتقييمها باستخدام قائمة مرجعية صالحة لتقييم الجودة. وأخيرًا، أدرجت 109 دراسات مؤهلة في هذا الاستعراض. واستُخدم تحليل محتوى الموضوعات في تحديد التدخلات الفعَّالة وتصنيفها.

النتائج: بوجه عام، تم تحديد 188 تدبيرًا فعَّالاً للحدّ من العمليات القيصرية. وتم تصنيفها إلى 45 إجراءً، و16 مجموعة من التدخلات، و6 مكونات أساسية لمنظمة الصحة العالمية، بما يشمل: "القيادة والحوكمة"، و"التمويل"، و"القوى العاملة الصحية"، و"المنتجات الطبية والتكنولوجيات"، و"المعلومات"، و"تقديم الخدمات الصحية". وكانت الاستعانة بالموظفين المؤهلين والأكفاء، والخدمات المقدمة أثناء الولادة، والرقابة أكثر التدخلات المطبقة شيوعًا للحدّ من العمليات القيصرية غير الضرورية.

الاستنتاجات: وُضِعَ في هذه الدراسة تصنيف للاستراتيجيات الفعَّالة للحدّ من العمليات القيصرية غير الضرورية. ويعد اتباع نهج شمولي أمرًا بالغ الأهمية للتصدي لَلوباء الجديد المُتمثِّل في العمليات القيصرية غير الضرورية. وينبغي تصميم تدخلات متعددة قائمة على الأسباب الكامنة وراء الإفراط في إجراء العمليات القيصرية، وتنفيذها، على المستويين المحلي والعالمي.

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Prioritizing tobacco control under the Thirteenth General Programme of Work (GPW13)[1]

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Introduction

The Thirteenth General Programme of Work (GPW13) – the World Health Organization's (WHO) five-year strategy for 2019–2023 (*1*) – focuses on measurable impacts on people's health at the country level. The five-year strategy encompasses three main targets, known as the "Triple Billion targets": one billion more people to benefit from universal health coverage, one billion more people better protected from health emergencies, and one billion more people enjoying better health and well-being. The GPW13 targets also serve as milestones for the health-related targets of the 2030 Sustainable Development Goals (SDGs).

Tobacco control is estimated to have the second biggest impact on achieving GPW13's Triple Billion targets (*2*). With a relatively high prevalence of tobacco use, countries in the Eastern Mediterranean Region (EMR) have the potential to make particularly strong progress in the Triple Billion targets if they strengthen tobacco control measures (*2*). Therefore, the Tobacco Free Initiative (TFI) at the WHO Regional Office for the Eastern Mediterranean (WHO/EMRO) held a virtual intercountry meeting on prioritizing tobacco control under the GPW13 during 22–24 February 2021 (*3*). The 3-day meeting was led by representatives from WHO headquarters and the WHO/EMRO, along with experts from the University of Newcastle, United Kingdom, and MonEval International, United Kingdom. The meeting included participation by focal points in 6 WHO country offices as well as representatives from the 13 ministries of health, i.e. Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Syrian Arab Republic, Tunisia and United Arab Emirates.

The objectives of the meeting were to:

- discuss tobacco control progress in the Eastern Mediterranean Region;
- develop strategies to achieve the GPW13 targets through scaling up tobacco control efforts; and
- present international best practices for countries that managed to reduce prevalence of tobacco control.

Summary of discussions

Currently, the EMR is exhibiting alarmingly high tobacco use trends, with minimal decreases projected in future trends compared to other WHO regions. The discussion clarified the urgent need to significantly intensify implementation of tobacco control policies, in order to meet the GPW13 goal of 25% relative reduction in adult tobacco use by 2025 and ultimately a 30% reduction in line with the 2030 SDG targets. Due to the considerable room for improvement in tobacco control in the EMR, the Region has high potential to make significant changes in its tobacco use prevalence.

The discussion further solidified the importance of establishing a comprehensive surveillance system to monitor tobacco use and tobacco control policies, both nationally and regionally. A reliable surveillance system requires thoroughly planned, periodic and representative monitoring with widespread dissemination of the collected information. Reliable data is essential to effectively advocate for evidence-informed implementation of tobacco control policies by policy-makers and other stakeholders.

Recommendations

To WHO

- Initiating organizational preparations with countries to conduct individual virtual missions for discussion of the Interactive Smoking Projection and Target Setting Tool (ISTP) findings and future action plans.

To Member States

- Highlighting to policy-makers and other stakeholders the significant impact of tobacco control as a quick win to accelerate progress towards GPW13, noncommunicable disease and SDG targets;
- adapting and implementing the regional strategy and action plan for tobacco control (*2*) at the country level;
- strengthening surveillance of tobacco use and tobacco control policies through planned, periodic and representative monitoring;
- strengthening national surveillance systems through a multisectoral approach by including ministries of health, finance, education as well as national bureaus of statistics;
- disseminating collected information on tobacco use across relevant stakeholders within government, civil society and the media.

[1] This summary is extracted from the report on the intercountry meeting on prioritizing tobacco control under the Thirteenth General Programme of Work (GPW13), virtual meeting, 22–24 February, 2021 (https://applications.emro.who.int/docs/WHOEMTFI229E-eng.pdf?ua=1).

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