



The WHO Regional Office for the Eastern Mediterranean recently released its first report addressing health-related Sustainable Development Goal targets and indicators in the Region. Challenges remain and progress was made on only half of the 50 indicators reported between 2015 and 2019, even before the COVID-19 pandemic. However, by working together countries and partners in the Region can accelerate progress to address the determinants of health, such as poverty, education, gender equality, climate change, nutrition and water and sanitation.

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### المجلة الصحية لشرق المتوسط

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

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## Editorial

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## Progress on the health-related Sustainable Development Goals in Eastern Mediterranean Region countries: getting back on track in the time of COVID-19

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On 16 June 2021, the World Health Organization (WHO) launched its first report on the ‘Progress on the health-related Sustainable Development Goals (SDGs) and targets in the Eastern Mediterranean Region’ (1). This report presents for the first time a snapshot of the progress made in addressing the health-related SDG targets and indicators in the Region. It is an important mid-way report in recognizing the achievement, and most importantly, the challenges in reaching health-related objectives among the 17 SDGs adopted by the United Nations (UN) General Assembly in 2015 in the Eastern Mediterranean Region (2,3). WHO commitment to SDGs has been re-emphasized in its Thirteenth General Programme of Work and in the Regional Vision, ‘Health for All by All’ (4).

The report uses data reported by Member States and global estimates from WHO and other UN agencies from January 2010 to September 2020 (5,6). In total, 50 health-related SDG indicators (across 9 out of 17 SDGs) are analyzed and presented. The report shows that availability of data for health-related SDG indicators varied considerably for the period, with huge gaps across indicators for cause-specific mortality, hepatitis prevalence, health financing and access to medicine indicators. Notably, the striking result is that the Region is not quite on track in meeting the health-related SDGs (7). Progress was made on only half of the 50 indicators reported between 2015 and 2019, before the COVID-19 pandemic (Table 1).

The regional profile has glimmers of hope. There has been a decline in the reported number of new cases of HIV/AIDS and TB; improvements in routine vaccination coverage; sustained high proportion of births attended by skilled health workers; fewer malnourished children; and an increasing access to improved drinking-water and sanitation. However, the Region still has a long way to go in reducing maternal, child and neonatal mortality. Expansion of vaccination coverage remains suboptimal.

Progress in reducing the overall rates of HIV and malaria cases has stalled. Mortality rates due to noncommunicable diseases (NCDs) and pollution indicate no signs of a reduction. In addition to these concerns, the lessons learnt from the COVID-19 pandemic demonstrate (8,9) an uphill struggle for most countries in their quest for SDGs if the pace of investment in health and action remains at the current rate.

Timely high-quality data are critical in order to monitor progress on the SDGs at the regional, national and subnational levels. Insufficient data meant that progress for one in four indicators could not even be reported for the Region. Data availability is a major concern and demands significant improvement in health information systems (HIS) in countries of the Region (10,11). The development of a Regional Strategy (2021–2025) to strengthen HIS aims to address these concerns. Jointly developed in collaboration with national HIS stakeholders, the strategy outlines a comprehensive plan to improve HIS and create a more robust system for monitoring progress in health and ensure sufficient evidence to inform policies. But investing in HIS alone will not ensure progress on the health-related SDGs – action is required on many fronts including implementation of interventions to address existing health challenges.

The way forward is challenging but by working together countries and partners in the Region can accelerate progress. Hence key decisions and actions are inevitable. Good governance processes with strong leadership, including high level political commitment, multi-sectoral partnership, and a whole-of-society approach, are needed to meet the Sustainable Development Agenda. Those responsible for the health sector (i.e. SDG3 targets) should work with other sectors to address the determinants of health like poverty (SDG1), education (SDG4), gender equality (SDG5), climate change (SDG13) and health-related risks like nutrition (SDG2) and water and sanitation (SDG6) (12,13). Establishment

**Table 1 Summary of progress on the health-related SDGs, 2015–2019**

| Health-related SDG indicators                                                                                          | 2015<br>(or nearest) | 2019<br>(or nearest) | Status of progress                        |
|------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|-------------------------------------------|
| <b>Mortality</b>                                                                                                       |                      |                      |                                           |
| 3.1.1 Maternal mortality ratio (per 100 000 live births) <sup>a</sup>                                                  | 175                  | 164                  | Progress made but too slow to meet target |
| 3.1.2 Births attended by skilled health personnel (%)                                                                  | 98                   | 99                   | Progress fast enough                      |
| 3.2.1 Under-5 mortality rate (per 1000 live births) <sup>a</sup>                                                       | 52                   | 46                   | Progress made but too slow to meet target |
| 3.2.2 Neonatal mortality rate (per 1000 live births) <sup>a</sup>                                                      | 27                   | 25                   | Progress made but too slow to meet target |
| 3.4.1 Probability of dying from NCDs (between ages 30–69) (%) <sup>a</sup>                                             | 20.8                 | 22.0                 | Progress stalled                          |
| 3.4.2 Suicide mortality rate (per 100 000 population) <sup>a</sup>                                                     | 3.9                  | ...                  | Trend not reported                        |
| 3.6.1 Mortality rate from road traffic injuries (per 100 000 population) <sup>a</sup>                                  | 23.5                 | 21.8                 | Progress made but too slow to meet target |
| 3.9.1 Mortality rate attributed to household and ambient air pollution (per 100 000 population)                        | 31.6                 | 41.5                 | Progress stalled                          |
| 3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (per 100 000 population)        | 1.8                  | 1.4                  | Progress                                  |
| 3.9.3 Mortality rate attributed to unintentional poisoning (per 100 000 population)                                    | 1.6                  | 1.5                  | Progress                                  |
| <b>Morbidity</b>                                                                                                       |                      |                      |                                           |
| 3.3.1 New HIV infections (per 1,000 uninfected people)                                                                 | 0.06                 | 0.07                 | Progress stalled                          |
| 3.3.2 TB incidence (per 100 000 population)                                                                            | 118                  | 115                  | Progress                                  |
| 3.3.3 Malaria incidence (per 1000 population at risk)                                                                  | 9                    | 10                   | Progress stalled                          |
| 3.3.4 Hepatitis B prevalence among children under 5 years (per 100 000 population)                                     | 1.6                  | ...                  | Trend not reported                        |
| 3.3.5 Number of people requiring interventions for Leishmaniasis                                                       | 10,616               | 15,367               | Progress stalled                          |
| <b>SDG3 means of implementation of targets</b>                                                                         |                      |                      |                                           |
| 3.5.2 Harmful alcohol use (litres of pure alcohol per capita ≥15 years)                                                | 0.6                  | 0.5                  | Progress                                  |
| 3.7.1 Women of reproductive age (15–49 years) who had their need for family planning satisfied with modern methods (%) | 55                   | 57                   | Progress                                  |
| 3.7.2: Adolescent birth rate (per 1000 women aged 15–19 years)                                                         | 48                   | 41                   | Progress                                  |
| 3.8.1 UHC service coverage index <sup>a</sup>                                                                          | 53                   | 57                   | Progress made but too slow to meet target |
| 3.8.2 Large household expenditure as a share of total health care expenditure (>10%)                                   | 15.2                 | ...                  | Trend not reported                        |
| 3.8.2 Large household expenditure as a share of total health care expenditure (>25%)                                   | 2.3                  | ...                  | Trend not reported                        |
| 3.a.1 Prevalence of tobacco use among persons 15 years and older (%)                                                   | 18.5                 | ...                  | Trend not reported                        |
| 3.b.1 DPT3 Coverage (%)                                                                                                | 80                   | 82                   | Progress                                  |
| 3.b.1 MCV2 Coverage (%)                                                                                                | 68                   | 75                   | Progress                                  |
| 3.b.1 PCV3 Coverage (%)                                                                                                | 50                   | 52                   | Progress                                  |
| 3.b.2 Official development assistance for medical research per capita (US\$)                                           | 1.0                  | 2.0                  | Progress                                  |
| 3.b.3 Availability of essential medicines in public health facilities (%)                                              | 83.4                 | ...                  | Few data points to determine trend        |
| 3.c.1 Density of physicians (per 10 000 population)                                                                    | 14.2                 | 18.2                 | Progress                                  |
| 3.c.1 Density of pharmacists (per 10 000 population)                                                                   | 4.5                  | 5.7                  | Progress                                  |
| 3.c.1 Density of nurses (per 10 000 population)                                                                        | 20                   | 33                   | Progress                                  |
| 3.c.1 Density of dentists (per 10 000 population)                                                                      | 3.6                  | 3.9                  | Progress                                  |
| 3.d.1: International Health Regulations (IHR) capacity and health emergency preparedness                               | 65.5                 | ...                  | Trend not reported                        |

**Table 1 Summary of progress on the health-related SDGs, 2015–2019 (concluded)**

| Health-related SDG indicators                                                                                                                                                                        | 2015<br>(or nearest) | 2019<br>(or nearest) | Status of progress                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------------------------------------|
| 3.d.2.a: Percentage of bloodstream infections due to selected antimicrobial-resistant organisms (due to <i>Escherichia coli</i> resistant to third generation cephalosporin (ESBL- <i>E. coli</i> )) | 58.4                 | 59.5                 | Progress stalled                                   |
| 3.d.2.b: Percentage of bloodstream infections due to selected antimicrobial-resistant organisms (Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) among blood isolates)                     | 36.6                 | 46.1                 | Progress stalled                                   |
| <b>Risk factors for health (direct effect on health)</b>                                                                                                                                             |                      |                      |                                                    |
| 2.2.1 Stunting among children under 5 (%)                                                                                                                                                            | 26.1                 | 24.2                 | Progress                                           |
| 2.2.1 Wasting among children under 5 (%) <sup>a</sup>                                                                                                                                                | 7.5                  | 3.8                  | Progress fast enough                               |
| 2.2.2 Overweight among children under 5 (%)                                                                                                                                                          | 8.1                  | 8.0                  | Progress stalled                                   |
| 6.1.1 Access to improved drinking water (%) <sup>a</sup>                                                                                                                                             | 88                   | 89                   | Progress made but too slow to meet target          |
| 6.2.1 Access to improved sanitation facilities (%) <sup>a</sup>                                                                                                                                      | 73                   | 75                   | Progress made but too slow to meet target          |
| 11.6.2: Annual mean levels of fine particulate matter in cities (mg/m <sup>3</sup> )                                                                                                                 | 54                   | ...                  | Trend not reported                                 |
| 16.1.2 Conflict-related deaths (per 100 000 population)                                                                                                                                              | 4.9                  | 3.3                  | Progress                                           |
| 16.2.1: Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers (%)                                                             | 85                   | ...                  | Trend not reported due to too few data points      |
| <b>Determinants of health (indirect effect on health)</b>                                                                                                                                            |                      |                      |                                                    |
| 1.1.1 Proportion of population living below the international poverty line 9%)                                                                                                                       | 19.0                 | ...                  | Trend not reported                                 |
| 4.1.1 Net primary school enrolment ratio (per 100 school-age children)                                                                                                                               | 93                   | 97                   | Progress but data available for selected countries |
| 4.6.1 Literacy rate (15–24 years) (%)                                                                                                                                                                | 95                   | 97                   | Progress but data available for selected countries |
| 5.2.1 Proportion of ever-partners women and girls aged 15 years and older subjected to violence (%)                                                                                                  | 37                   | ...                  | Trend not reported                                 |
| 5.6.1 Proportion of women aged 15–49 years who make their own informed decisions (%)                                                                                                                 | 50.5                 | ...                  | Trend not reported                                 |
| 8.5.2 Unemployment rate, males (%)                                                                                                                                                                   | 9                    | 8                    | Progress                                           |
| 8.5.2 Unemployment rate, females (%)                                                                                                                                                                 | 21                   | 17                   | Progress                                           |
| 8.5.2 Unemployment rate, both sexes (%)                                                                                                                                                              | 11                   | 9                    | Progress                                           |

<sup>a</sup>SDGs with explicit targets for 2030;

... Limited data for most countries to assess regional progress or determine trend.

of coordinating or steering committees, with decision making power, that include key stakeholders are among effective ways that countries adopt for meeting SDGs. Successful examples of a whole-of society approach in controlling the COVID-19 pandemic are observed in a few countries of the Region (14) and maintaining and expanding such initiatives is the key in achieving WHO's vision for the Region (15).

It is for this reason that the WHO Regional Office for the Eastern Mediterranean embraced the Global Action Plan for Healthy Lives and Well-being (GAP), signed by 12 health and development partners (16). At least eight countries in the Region are using this approach to accelerate progress on the health-related SDGs. This plan also served as the background for the establishment of the Regional Health Alliance, launched in December

2020 (17). The outcomes of this collaboration as a strategy to accelerate progress towards health-related SDGs at country and regional levels are visible.

As seen in the response during the pandemic, placing health at the top of the agenda means putting essential health services and universal health coverage at the forefront (18–20). The COVID-19 pandemic has uncovered many inequities and gaps in our health systems. In addition, the pandemic has all the hallmarks that suggest the progress towards SDGs might be hampered still further. Ensuring functioning health systems and effective governance mechanisms are at the forefront of efforts towards SDGs.

The delivery of health services must be complemented by a commitment to health at the highest levels of

government. This means ensuring sustainable financial investment in basic health services and public health measures, including building resilient health systems to advance universal health coverage (UHC) (21). In addition, good governance is also reflected in laws and regulations. A commitment to the right to health also requires the means for its implementation. For example, NCDs are a major burden in the Region and the provision of health services will do little to address this when the key risk factors are behavioural, tobacco use, unhealthy diet and physical inactivity. Comprehensive approaches, including the implementation of regulations as outlined in the WHO 'Best Buys' (22), can markedly change the epidemiological profile of these diseases in the Region by 2030. As such, countries should "do something, do more, and do better" (23). Moreover, addressing gender equality and health inequities is essential if the Region is going to meet the health-related SDGs. Currently, the Region faces some of the greatest gender disparities and the health inequities between and within countries are vast. For the first time, the findings of the Regional Commission on

the Social Determinants of Health outlined some of the major health inequities particular to the WHO Eastern Mediterranean Region.

At the global and regional levels, COVID-19 poses major challenges to health and well-being, thwarting progress to meet SDGs (24) and the WHO triple billion targets. While we are observing an increase in NCD burden and a greater number of immature deaths, the pandemic has demonstrated that communicable disease threats are real and might be expanding in coming years. Nevertheless, if necessary interventions are implemented and the necessary data are collected, processed and synthesized, progress towards health-related SDGs will not only be reliably measured, but would support countries' efforts to promote health and well-being (25). However, achieving this requires concerted efforts at the country, regional and global levels. The report, as noted above, provides a strong standing for developing a regional action plan that involves all key partners, and guide the efforts towards SDGs.

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# COVID-19, the economic crisis, and the Beirut blast: what 2020 meant to the Lebanese health-care system

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## Introduction

Lebanon has faced numerous challenges in the last three decades that have greatly impacted its health-care system, which has been historically disjointed first by the civil war (1975–1990), and second by the arrival of significant numbers of Palestinian and Syrian and refugees (1). Although Lebanon has tried to absorb these systemic shocks and recover, its health system has continued its slow decline and highlighted by events in 2020.

The fragility of health-care systems worldwide were demonstrated by the COVID-19 pandemic that emerged in 2020 (2). Protective measures that are essential to a health-care system (i.e. standardization of processes, analysis of adverse events, accreditation, etc.) are insufficient for handling unforeseen events (3). Lebanon suffered a hatrnick of simultaneous events during 2020 – the economic crisis, the Beirut blast and the COVID-19 pandemic – which sorely tested its ability to orchestrate recovery efforts. These events have accelerated the slow demise of the Lebanese health-care system into a disastrous free fall.

## The economic crisis

Lebanon is facing its worst economic crisis since the civil war. This was accompanied by a subsequent devaluation of the Lebanese currency against the US dollar and curbs on international transfers out of the country (4). Lebanese hospitals rely mostly on imported products, especially stents, prostheses and medical devices, yet importing such essential supplies was limited, translating into a huge financial burden on the health-care system and a lack of medical equipment (4). In reality, private hospitals provide the majority of Lebanon's health services. Although the government is supposed to refund them through the national social security and military funds, that fact is “private hospitals are owed US\$ 1.3 billion and received no government funds at all in 2019” (4). Health-care workers have suffered pay cuts, deficiencies in equipment supplies, and unemployment. Patients are often unable to afford medical services impacted by the economic crisis, with more than 40% of the Lebanese population now living below the poverty line, especially in underserved areas (5).

## The Beirut blast

On 4 August 2020, the Beirut port was hit by one of the biggest explosions in its history (6). Regardless of the cause, the blast was devastating for the Lebanese health-care system (7). Some 200 people died, 6000 were injured, and tens of thousands were made homeless (8). The World Health Organization (WHO) confirmed that the blast caused damage to more than half of Beirut's health infrastructure - three hospitals became non-functional, three were extensively damaged, 500 hospital bed equivalents were lost, and many primary care facilities destroyed (8) - limiting the health service functionality essential for the response and management of such a crisis (9). Given the massive flow of patients during such a short time frame, hospitals used up two months' stock of medical supplies within days of the blast (10). Economic loss and physical damage were estimated to be US\$ 8 billion according to the World Bank (8).

## COVID-19 pandemic

From the first documented case in Lebanon (21 February 2020) until July 2020, COVID-19 cases were reportedly few in number, especially after a lockdown that was implemented by the Lebanese authorities (11), and the systematic test and trace for symptomatic individuals as per WHO's recommendations (12). This, along with the limited number of public places and transportation services in Lebanon, helped contain the spread of the disease and Lebanon stood out as one of the leading countries in controlling the pandemic. Nevertheless, this reassuring state of affairs was short-lived. The number of cases started to gradually increase from July for various reasons, namely the opening of borders with no central quarantine programme in place; and decreasing public compliance with government public health directions.

The response to the Beirut blast was the first weakening in controlling the COVID-19 pandemic. The urgent situation meant a huge number of patients required medical services all at the same time. Nearly all patients arrived wearing no masks due to their injuries and all were confined together in emergency departments. Thus, it could be said that the blast also destroyed the initial success Lebanon achieved in mitigating the spread of COVID-19. A substantial and unsurprising rise in the

number of positive cases was witnessed after 4 August (Figure 1), from a maximum of 100 daily cases before the event, to over 300 daily cases and seven deaths just one week after the blast. This first wave continued to reach a peak of circa 2000 cases by the end of October 2020 – 220% rise in cases as per the International Rescue Committee (13) – before a gradual decrease in reported numbers.

The second destabilizing factor for the health-care system and its response to COVID-19 was the economic crisis. The Lebanese government had taken the decision not to undergo a lockdown during Christmas and New Year holidays, and retail outlets as well as restaurants remained open, despite the worrying number of COVID-19 cases. The result was a dramatic surge in positive tests and reached circa 6000 cases by mid-January 2021 (Figure 1).

These two devastating waves of COVID-19 infections crippled the Lebanese health-care system and shifted emphasis towards preparing public hospitals to receive COVID-19 patients. Moreover, diverting governmental funds has depleted primary health-care centres' resources, threatening the permanence of their basic services. Lebanese hospitals have not prepared emergency risk management plans for crises such as epidemics (12). As a result, many private hospitals were drawn into the response and established COVID-19 care centres, while putting all elective surgeries on hold. Such steps placed significant economic hardship on private hospitals,

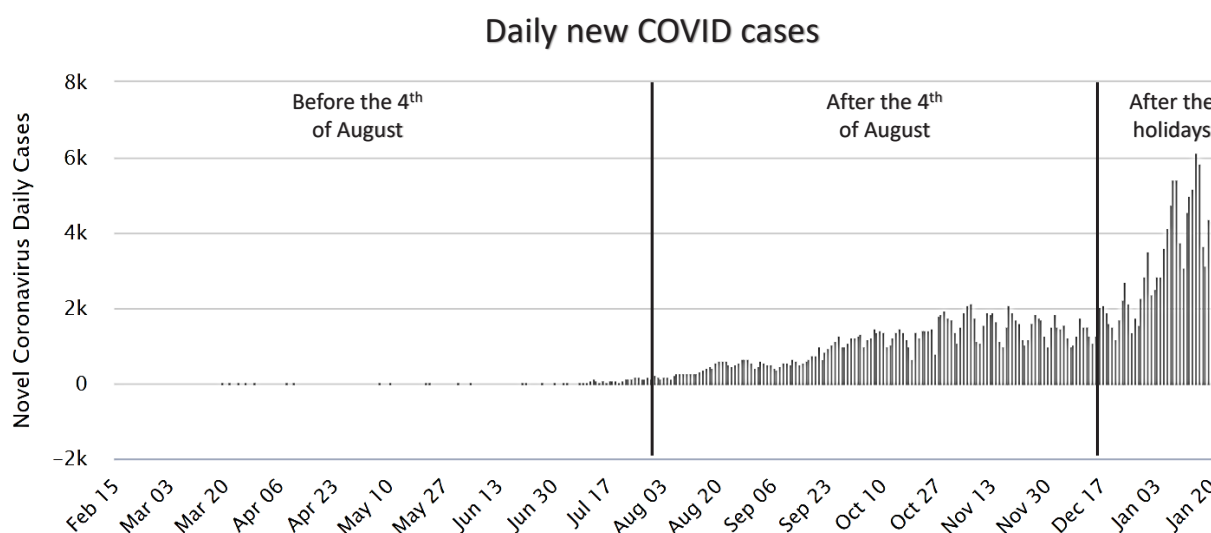
which primarily rely on elective surgeries in order to maintain their financial viability, and so adding to the burden of both the economic crisis and the Beirut blast.

This resulting deterioration in the health-care system, as well as its precarious financial state, have led numerous health-care professionals to leave the country and seek employment overseas, primarily the Gulf States, Europe and the United States of America. This is a serious workforce problem adding to the already fragile health system and undermines Lebanon's reputation as the leading country in the Middle East for health-care expertise and facilities, renowned for its medical tourism.

## Conclusion

The after-effects of this series of events on the Lebanese health-care system have meant it is on the verge of collapse. Is there a possibility the system will endure and be able to orchestrate recovery efforts? And if yes, would this be achievable within the current political environment? Any progress to health-service sustainability requires that lessons be learned from other countries in restructuring the basics of the health system, in order to develop effective crises management plans. It is only through planning for the unexpected that a country stands a chance of surviving the public health crises that Lebanon has been unfortunate enough to suffer.

**Figure 1** Daily new COVID-19 cases in Lebanon divided into three phases, 2020



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# Health laws of Pakistan: compilation and commentary

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## Introduction

The World Health Organization (WHO) defines health law as “the area of law concerned with the health of individuals and populations, the provision of health care and the operation of the health care system” (1). The public health law “includes laws that are intended as health interventions, laws that define the powers, duties and boundaries of health agencies and systems, and laws that have an impact on health but were not enacted with population health in mind” (2).

Law is a traditional public health tool that has made numerous important contributions to the major public health achievements of the 20th century including school immunization laws that helped reduce the rates of infectious disease and tobacco control laws that helped reduce the rates of chronic disease in the United States of America (3).

Public health law research consists of scientifically studying law and legal practices in relation to population health (3). Although a relatively new field it holds great potential for supporting evidence-based policy making for the improvement of population health (3). Through mapping studies such as this one, public health law research can illuminate what has been done, and thus, what kind of action it is necessary for various government units to take in order to update the health-related legal infrastructure. Thus, the objective of this study is the compilation of the health laws of Pakistan and their critical review and analysis informed by informal discussions with federal and provincial policy-makers.

## Methods

A desk review was carried out on the available literature in the area of health laws in Pakistan. A keyword search was conducted using the Internet (Google) and this was supplemented by a more specific keyword search carried out on Pakistan Law Site. The keywords were chosen based on a review of the existing literature. Pakistan Law site (accessed through the High Court) was searched using the key words; health; food; disease; smoking; disasters; malaria; HIV/AIDs; drugs; blood; breast-feeding; maternal health; disabled persons; mental health; health governance; and social determinants of health. In addition, the websites of provincial health departments were

also searched. Our initial search gave us a total of 250 laws and after removing duplicates we were left with 233 laws. Further screening led to the exclusion of another 35 laws based on relevance to Public Health and our final list consists of 198 laws.

After compilation, we classified the health laws into 4 categories in light of the essential public health functions of WHO (4) (Table 1). This was followed by a critical review and analysis.

## Analysis

### Access and central repository

A country's legal infrastructure consists of the laws and policies that govern and monitor the health-related actions of both governmental and nongovernmental organizations (5). However, the mere existence of certain laws is not enough, they need to be accessible to at least the relevant health professionals and policy-makers and preferably to the public as well. A central database of all the public health-related legislation of Pakistan is the first step in meeting the need for access to legal information. Various operational legal databases already exist (6–8); these may be used as a guide in updating the Pakistan law site to serve as such a repository, one that is more comprehensive, functional and up-to-date and which is made accessible to all relevant stakeholders, not just high court lawyers as is currently the case. Moreover, the central database could have links to the health law repositories on the websites of relevant ministries. A database that is regularly updated will also solve the issue of ambiguity regarding the current status of various health-related laws.

### A lack of legal awareness or legal literacy and capacity development of administrators and health care workers

However, due to a lack of legal literacy, such a collection of health laws does not translate into the extraction of relevant information when needed by the relevant professionals. Our review of the health laws of Pakistan and informal discussions with policy-makers has revealed a similar lack of legal awareness among professionals and laymen as determined by the review of environmental

**Table 1 Classification of health laws in Pakistan according to the public health functions delineated by the World Health Organization**

| Classification                                                                                                                                                                    | Topic (No. of laws)                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laws pertaining to preparedness and public health response to disease outbreaks, natural disasters and other emergencies                                                          | Control of communicable diseases (9)<br>Emergencies and disasters (6)<br>Malaria eradication (3)<br>HIV/AIDS (1)                                                                                                                                    |
| Laws pertaining to health protection, including management of environment, food and toxicological and occupational safety                                                         | Food laws (57)<br>Laws related to occupational health (6)<br>Prohibition of smoking and substance (12)<br>Intoxicants (1)<br>Environmental protection (2)<br>Drug laws (13)<br>Laws for the enforcement of the International Health Regulations (8) |
| Laws pertaining to health promotion and disease prevention through population and personalized interventions, including action to address social determinants and health inequity | Blood safety (8)<br>Breast feeding & maternal, newborn and child health (3)<br>Disabled persons (3)<br>Mental health (1)<br>Social determinants of health (28)<br>Laws related to marriage, divorce and child custody and maintenance (13)          |
| Laws assuring effective health governance, public health legislation, financing and institutional structures (stewardship function)                                               | Health governance (24)                                                                                                                                                                                                                              |

laws (9). This becomes a hindrance to the effective implementation of and compliance with laws.

All relevant professional stakeholders (health professionals as well as policy-makers) should have the ability to search for, understand and critically apply the relevant legal information in health policy formulation and implementation and so should the public (5). Thus, there is a need to develop effective mechanisms for creating legal awareness among the public and capacity building among relevant professionals (5).

### **A Policy surveillance approach**

In light of the above, we could possibly take the centralized database one step further using the policy surveillance approach, which requires the use of modern database software and organizes large amounts of data (2,10). Policy surveillance is defined as the “ongoing, systematic collection, analysis, interpretation and dissemination of data about a given body of public health law and policy” (2).

Instead of a simple database of all health laws, using this approach involves the selection of those laws that are of ongoing significance and for which up to date information is available. This is then used for health “planning, capacity-building, tracking progress or conducting evaluations of the legal impact” (2). Such information is comparable across countries and over time (2,10–12). Moreover, it involves the coding of information in a scientific manner that ensures the results can be used for evaluation research (2,12). Organizing the central database of health laws using this approach will make the legal information more meaningful and useable.

### **A Law-making process to be integrated into the policy and planning process, and outdated laws**

The public health needs of a country change over time and thus relevant laws need to be updated accordingly or new laws need to be formulated in order to ensure the presence of a legal infrastructure that makes it possible for the current public health needs to be met effectively (2). Unfortunately, just as health policies are formulated on political inference rather than evidence of the required need (13), so are health laws.

Although some laws have been updated such as the Punjab Maternity Benefit Ordinance of 1958, updated in 2012, many have not. These include the Vaccination Act of 1880, the Public Health (Emergency Provisions) Ordinance of 1944 and the Factories Act of 1934, among others. Outdated laws definitely contribute to the lack of satisfactory progress of most of our health indicators.

The process of law formulation should be well integrated into the policy-making and planning processes (5). All the relevant stakeholders, i.e. “political decision-makers, lawyers, policy analysts, health planners, health providers, health professionals and members of the public” (5), should be a part of the process of law formation and regular updating.

### **Evidence-based law making and missing laws**

The process of classifying health laws revealed that the health laws in Pakistan cover only 4 of the 8 essential public health functions defined by WHO (14). The functions of surveillance and monitoring of health determinants,

risks, morbidity and mortality; assuring a sufficient and competent workforce for effective public health delivery; communication and social mobilization for health; and advancing public health research to inform and influence policy and practice are not addressed by the existing health laws of Pakistan. There is also a lack of laws to address other current public health concerns such as the rising levels of obesity, especially childhood obesity.

In order to address the issue of missing laws (whether for obesity or to address the remaining 4 essential public health functions of WHO) the process of law formulation should not only involve all relevant stakeholders as mentioned above but should also be evidence-based, i.e. take into consideration the current health needs of the population-based on up to date health indicators and data.

### Implementation of health laws

Inadequate implementation of and compliance with health laws is related to a lack of accountability. If strong penalties are put in place and enforced through rigorous monitoring and evaluation, such issues can be overcome.

In a developing country like Pakistan, resources and administrative capacity are limited and the judicial

system is slow, making the implementation of health regulations and standards (which is a resource intensive task) difficult. Traditionally licensing and inspections have been used as regulatory mechanisms to ensure compliance with the laws (15). Since these are expensive to administer, other developing countries have employed formal notices and public disclosure and have found a combination of such methods, referred to as a “cascading hierarchy of sanctions”, to be most effective (15). Health law regulation in Pakistan can benefit from adopting similar mechanisms of regulation and accountability.

### Conclusion

In short, there is a need for access to health laws via a central repository, and legal awareness needs to be created among professionals and laymen. The process of law formulation needs to be evidence-based and integrated into the policy planning processes, should involve all relevant stakeholders and should address the issues of outdated and missing laws. These are the changes that need to be made to bring Pakistan’s health-related legal infrastructure up to date. Lastly, the policy surveillance approach of the WHO may be given due consideration for further development of the country’s legal infrastructure.

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# What did we learn from a pilot trial to inform the scale-up of a training based on the Mental Health Gap Action Programme in Tunisia?

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## Background

Primary care is an important part of global mental health, including in the Eastern Mediterranean Region (EMR). It is a promising way of increasing access to needed, timely, comprehensive and effective mental health services (1). Given the connection between mental and physical illness (2), vertical (stand-alone) programmes targeting mental illness and substance use disorders, traditionally favoured in low- and middle-income countries (LMICs), are not as effective as integrated approaches (3). The EMR has developed a regional framework that identifies feasible and cost-effective solutions to better mental health care, including the further integration of mental health into primary care settings (4) through, for example, the involvement of primary care physicians (PCPs) in mental health care (5). While this solution is promising, with many countries in the EMR that have models of care that rely on primary care staff (6,7), persistent gaps have been identified in their mental health capacity (8–10). The World Health Organization (WHO) has thus recognized mental health care as a core component of PCPs' training (11).

The Mental Health Gap Action Programme (mhGAP) Intervention Guide (IG) was developed by WHO in 2010 to increase mental health capacity in primary care and community-based settings by training nonspecialists, such as PCPs, thus improving service access for a wider population (12). mhGAP-based training has been implemented in several countries in the EMR, including Afghanistan (13,14), Egypt (13), Iraq (15), Lebanon (13, 16), Libya (13), Pakistan (13,17,18), Qatar (13), Sudan (19), Syrian Arab Republic (13,15), and Tunisia (20). The training has been used in the Region to enhance the mental health capacity of for example physicians, social workers, nurses, community health workers, family volunteers, psychosocial staff of humanitarian agencies, and pregnant women (13–20).

The first mhGAP-training programme in Tunisia (using version 1.0) (12) was offered to PCPs in the

Greater Tunis area between February and May 2016. Its implementation and evaluation were undertaken collaboratively by members of the Tunisian Ministry of Health, the School of Public Health at Université de Montréal (Canada), and the WHO Office in Tunisia. Training of local trainers (3 psychiatrists) and tutors (7 PCPs in charge of continuing medical education in their respective health sectors and supporting trainees during and after the programme) was held at the end of 2015 and offered by a nonlocal consultant. The mhGAP-based training programme was meant to address PCPs' capacity gaps in depression, suicide/self-harm, psychosis, and problems related to substance use (10), and modules were selected as priority conditions by members of the Ministry of Health involved in the implementation of the mhGAP-based training programme.

The lessons that we have learned to inform the scale-up of a mental health training programme may be useful to other countries of the EMR interested in implementing and/or scaling-up task-sharing initiatives to support commitment to integrating mental health into primary care settings (6,7). The training scale-up is being offered under the programme Essaha Aziza (or “health is precious” in Arabic), which is funded by the European Union to promote proximity health services by ensuring availability of infrastructure and training for personnel in 13 of the 24 Tunisian governorates. The remaining 11 governorates will be offered mental health training through funding provided by WHO.

## Modifying policy

We found through interviews with PCPs after their participation in the pilot training programme that legislation drafted in the 1990s prevented them from prescribing certain psychotropic medications available in Tunisia and listed in the mhGAP-IG (21). This legislation was still in place during the pilot phase (21). For scale-up of the training programme, it was important to revise the legislation. Without revision, PCPs may be encouraged to

refer people to specialized mental health services despite their training in administering pharmacological treatment listed in the mhGAP-IG and available in Tunisia. The Ministry of Health is committed to finding a solution to address this prescription obstacle for the scale-up phase.

## Informing training content

The mhGAP-IG modules of depression, psychosis and problems related to substance use (12) were included in the training programme for scale-up. Of note, version 1.0 of the mhGAP-IG was used, given that we had already adapted the training material to the local primary health-care context during the pilot phase (20). Three changes were made in the choice of the remaining modules, in response to evidence from interviews conducted with some trained PCPs to better understand their perceptions of the pilot programme (21). First, in the 2016 implementation of the mhGAP-based training, PCPs vocalized wanting additional training, including in the suicide/self-harm module to treat and manage suicidal behaviour. This was important given the uneven distribution of mental health specialists across the country amid a recorded increase in suicide and suicidal behaviour (22). The training programme for scale-up was complemented by a suicidal behaviour and risk management course already piloted in Tunisia. Second, Tunisian experts are elaborating a national strategy for the early detection of autism spectrum disorders by PCPs. To support PCPs in early detection, a module on autism spectrum disorders developed by Tunisian experts was included in the training programme for scale-up. This module was perceived a better fit to the country's needs than the mhGAP-IG module on Child and Adolescent Mental and Behavioural Disorders (12). Third, the accompanying training material for the mhGAP module on conditions specifically related to stress (23) was not available in the working languages of Tunisia during the first mhGAP-based implementation (21). This was problematic since problems related to trauma and stress are more pronounced in the country. Scale-up of the training programme includes the available mhGAP module and accompanying training material on conditions specifically related to stress (23). Of note, in the context of COVID-19, many modules offered in the programme scale-up are timely in addressing the negative mental health consequences of the COVID-19 pandemic, including over the longer term (i.e., post-traumatic stress, depressive and anxiety symptoms) (24).

## Operationalizing the mental health strategy

Tunisia is one of the few countries to have produced a mental health strategy in the EMR, which is one of the WHO Regions with the least number of countries to have produced a mental health plan (25). One of the main objectives of the 2013 National Strategy for Mental Health Promotion (26) is to promote the integration of mental health within primary care settings, notably through the

training of PCPs. The pilot implementation of the mhGAP-IG was an attempt to further operationalize one of the Strategy's main objectives and to generate evidence on PCP mental health training. The pilot mhGAP-based training had a significant short-term impact (6 weeks post-training) on mental health knowledge, attitudes, and self-efficacy scores, but not on self-reported practice. When comparing results before and 18 months after training, these changes were maintained, and self-reported referral scores decreased (20). The generated evidence from the pilot evaluation was used to promote the inclusion of the mental health training under the umbrella of initiatives offered by Essaha Aziza. Specifically, this programme aims to enhance primary care system capacity to ensure that health services are more readily available, including for the most at-risk. The inclusion of PCPs' mental health training under the programme's mandate is a testament to the growing importance placed on mental health prevention, promotion and treatment in public health policy and practice in Tunisia.

## Encouraging sustainability

The first implementation of the mhGAP-based training relied on 3 trainer-psychiatrists and a network of PCPs with advanced mental health knowledge to support trainees during and after training (20). They were trained by a nonlocal consultant. For the scale-up of the training programme, a cascade model was used. A cascade model refers to "a series of training processes, each occurring as the result of the one before" (27) and is used to help diffuse expertise in the mental health sector (17,28–31). Specifically, a former local trainer for the first implementation of the mhGAP-based programme trained psychiatrists from the 4 Faculties of Medicine in Tunisia (Tunis, Sfax, Monastir and Sousse) in the mhGAP modules. They, in turn, will train 20 PCPs from each governorate in Tunisia as mental health resources (or mental health focal points) in frontline care, after which they will be available to provide support to other PCPs in the area. Fifty-eight PCPs with the role of mental health resource were trained between January and March 2020 – bearing in mind the interruption to the training caused by the COVID-19 restrictions. Supervision by telemedicine will be offered in 1 governorate of Tunisia as a pilot to assess a more structured way of providing support post-training.

This cascade model of training was developed not only to encourage sustainability of the training's effects through local capacity building, but also to further support collaborations between primary and specialized mental health services. Specifically, in Tunisia, some governorates do not have psychiatrists, as they are over-represented in large cities along the coastline and in the private sector (32). Sectorization allows for public mental health services to be organized according to geographical sectors (i.e., governorates), with each sector affiliated with a university inpatient department of psychiatry (32,33). The university psychiatric inpatient units are responsible for organizing training and supervision sessions for primary healthcare professionals and for

coordinating referrals (32). This sectorization structure will be respected and encouraged through the scaled-up training and beyond. Psychiatrists from the 4 Faculties of Medicine trained to use the mhGAP-IG will teach and support PCPs working in the governorates with which they are affiliated, to ensure that mental health knowledge and skills are maintained.

This new training programme for scale-up across the country aims to: (1) build on evidence from the first implementation of the mhGAP-based training (20,21) to improve mental health policy and to operationalize the National Mental Health Promotion Strategy; and (2)

mobilize and include more local knowledge, initiatives and experts in supporting PCPs' mental health capacity. As Mills and Lacroix (2019) mentioned, these unique ways of working in local contexts with standardized documents like the mhGAP "evidences creative adaptations of the guidelines linked to people's own philosophies, and societal understandings of mental health" (35). With these considerations of context, culture and evidence from pilot-testing, task-sharing initiatives through training and specialist support, as well as their positive effects may be accepted and sustained.

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# Key lessons from a mixed-method evaluation of a postnatal home visit programme in the humanitarian setting of Gaza

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## Abstract

**Background:** The World Health Organization recommends postnatal home visits to improve maternal and newborn health. Evidence of postnatal home visit effectiveness in humanitarian settings is limited.

**Aims:** To evaluate postnatal home visits implemented in the constrained humanitarian context of Gaza.

**Methods:** Qualitative data were obtained through key informant interviews, in-depth interviews and/or focus group discussions with women targeted by the programme, nontargeted women, husbands, and home visitors. These data were complemented by a secondary analysis of quantitative data from existing household surveys and project monitoring data. Qualitative data were analysed using thematic analysis, and quantitative data were analysed to describe trends over time.

**Results:** Women in the programme demonstrated improved breastfeeding practices and increased uptake of breastfeeding, and behavioural changes reduced harmful traditional norms and practices. The programme increased mutual understanding and respect between health providers and women, allowed for a more personalized approach and increased self-esteem among the women. To improve postnatal care throughout the population, interventions should focus not only on home visits but also address immediate postnatal care in maternity, postnatal follow-up in clinics, and improvements in the coordination and communication between the different levels of care.

**Conclusion:** Implementation of postnatal home visits in a constrained humanitarian context such as Gaza is feasible and positively contributes to breastfeeding and newborn care practices, as well as to improved interactions between health providers and their clients. Positive effects could be leveraged if postnatal care were strengthened throughout the continuum of care.

Keywords: postnatal care, home visit, humanitarian setting, breastfeeding, newborn care practices

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## Introduction

Home visits in the first week after birth are recommended to improve maternal and newborn care (1). The World Health Organization (WHO) recommendation is based on evidence from a systematic review in which home visits were associated with a significant reduction in neonatal mortality and improved neonatal care practices, including clean cord care, delayed bathing and early initiation of breastfeeding (2,3). The impact of postnatal home visits on maternal health is less evident. A Cochrane review did not show improvements in maternal mortality or morbidity, but home visits were positively associated with motivation for exclusive breastfeeding and satisfaction with postnatal care (4). There is limited evidence about the role of these home visits in humanitarian settings.

In 2018 an independent formative evaluation was conducted of the United Nations Children's Fund (UNICEF)'s Postnatal Home Visit (PNHV) programme in Gaza, Palestine. The programme started in 2011 and is implemented by the Ministry of Health and two civil society organizations, together covering all 5 governorates of Gaza. The main objective is to reduce

maternal and neonatal mortality and morbidity by ensuring the continuation of care after discharge from the maternity ward, which happens within < 6 hours after delivery for most women in Gaza (5). These goals are met through: (1) training of 36 midwives and nurses on the national postnatal care protocol including home-based postnatal care, neonatal care, postpartum complications, behavioural change communication, and early childhood development; (2) providing them with postnatal home visit kits; and (3) conducting home visits within 48–72 hours postnatally. The home visits complement clinical visits that are still the main point of contact for most postnatal women, especially for their second and third visits. If needed, the second visit after 1 week and a third visit after 6 weeks can also be conducted at home. Through counselling and physical check-up of both the mother and the newborn infant, these visits aim to contribute to the early detection of physical and mental health problems, timely referral, preventive care, physical exercise, hygiene, responsive parenting, family planning, nutrition and breastfeeding, and promote follow-up visits at the health centre for postnatal check-ups and immunization (6). There is insufficient funding to cover

all mothers and newborn infants in Gaza; therefore, the programme focuses on high-risk cases and primiparous women. The criteria for a high-risk pregnancy are guided by the maternal and child health book that is distributed to all pregnant women in Gaza (Table 1).

The objective of this paper is to contribute to filling the knowledge gap on PNHVs in humanitarian settings by describing key lessons of the evaluated effectiveness of the intervention and provide insights on equity and perceptions of care.

## Methods

This mixed-methods study included primary qualitative data and reanalysis of existing quantitative data. Ethical approval was obtained from the UNICEF Institutional Review Board. Qualitative data collection took place between 8 February and 10 March 2018 by 6 trained Palestinian female researchers. In total, 51 individuals were interviewed and 10 focus group discussions (FGDs) took place involving 79 individuals. Participants, purposefully selected through medical records, included women served by the programme, husbands of women in the programme, midwives/nurses that conducted home visits, and women who were not visited despite being at high risk. Interviews were performed in Arabic, lasted approximately 1 hour and were conducted at the homes or offices of interviewees. FGDs, conducted at safe community-based organizations, had an average of 8 participants and duration of 2 hours. Interviews and FGDs were digitally audio-recorded. Written consent was obtained from all participants. The recordings were transcribed and directly translated into English. A coding framework was applied for thematic analysis (7).

A quantitative baseline was not available and a control site was not feasible in the context of Gaza.

Quantitative data for secondary analysis were obtained from the Ministry of Health Annual Reports 2010–2016 (8), Multiple Indicator Cluster Survey (MICS) datasets from 2010 and 2014 (9), publications from the Palestinian Central Bureau of Statistics (10) and descriptive statistics that were extracted from the programme annual reports from 2011 to 2015. Population data on periodically collected indicators such as exclusive breastfeeding and yearly registered births were compiled from the different datasets and analysed in RStudio. The indicators were displayed graphically to describe changes over time. MICS data from 2010 and 2014 were used to estimate the proportion and characteristics of women with a live birth who were eligible for the programme.

## Results

The number of household visits increased on a yearly basis from 5.4% of all registered births in 2011 to 12.9% in 2016. Reanalysis of MICS data showed that an estimated 45.3% (2010) to 55.3% (2014) of all women with a live birth in the past 2 years in Gaza had any of the risk factors for inclusion (Table 1) or were primigravida during their last pregnancy. Therefore, the number of women that were eligible for the programme was higher than the current coverage.

Women and healthcare providers both reported newborn and maternal morbidity that they believed would have been detected too late without the PNHV programme. Many believed that early detection of these cases saved lives. However, Palestinian statistics were not able to reinforce these beliefs on mortality impact. The neonatal mortality rate stagnated between 2005–2009 (11.4 per 1000 live births) and 2010–2014 (11.5 per 1000 live births).

**Table 1 Risk assessment according to the maternal and child health handbook of the Palestinian Ministry of Health**

| Risks related to medical and obstetrical history (identified at first visit) <sup>a</sup>                                                                                                                                                                                                                                                                                                                                                                        | Risks related to current pregnancy <sup>a</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Age &lt; 16 or &gt; 40 yr</li> <li>Consecutive miscarriages (≥ 3)</li> <li>Perinatal deaths (≥ 2)</li> <li>Previous caesarean section</li> <li>Other uterine surgery</li> <li>Grand multiparity (≥ 6 deliveries)</li> <li>Past antepartum haemorrhage</li> <li>Past postpartum haemorrhage</li> <li>Pre-existent diabetes</li> <li>Pre-existent hypertension</li> <li>Heart/renal disease</li> <li>Other risks</li> </ul> | <ul style="list-style-type: none"> <li>Gestational age</li> <li>Gestational diabetes</li> <li>Signs of pre-eclampsia</li> <li>Vaginal bleeding</li> <li>Moderate anaemia (Hb &lt; 9.5 g/dl)</li> <li>Discrepancy of fundal height</li> <li>Oligo/polyhydramnios</li> <li>Malpresentation at ≥ 36 wk</li> <li>Absence of fetal movements at &gt; 24 wk</li> <li>Multiple pregnancies</li> <li>Premature rupture of membranes</li> <li>Rhesus incompatibility</li> <li>Pelvic mass</li> <li>Other risks</li> </ul> |

<sup>a</sup>A woman that meets one of these criteria during pregnancy is eligible to receive PNHV as part of the programme. A woman can become a high-risk case during delivery, such as delivery through caesarean section or postpartum haemorrhage. Monitoring data did not provide data on the numbers of women included for each criterion. Hb = haemoglobin.

## Breastfeeding

Qualitative data revealed that women felt encouraged to breastfeed and increasingly recognized the benefits of breastfeeding. First-time mothers especially benefited, but multiparous women also mentioned that they learned new facts about breastfeeding and about storing expressed milk in the refrigerator, allowing exclusive breastfeeding for a longer period compared to previous pregnancies: "Without the midwife, I wouldn't have known how to hold and breastfeed the baby. My family felt happy. I didn't breastfeed my previous children. They drank artificial milk." (FGD visited women, Rafah)

Through the training, home visitors felt better equipped with the knowledge and skills to make breastfeeding successful. The home visitors were identified as strong agents for change who often had to fight against wrong beliefs about the benefits of artificial milk, not only by the community but also from doctors who prescribed artificial milk for the treatment of (physiological) jaundice.

Within all stakeholder groups it was mentioned that the impact on breastfeeding was the main success of the programme. Secondary analysis of MICS data showed an increase in exclusive breastfeeding in Gaza children aged < 6 months from 14.5% in 2000 to 36.4% in 2014. This increasing trend began before the start of the programme, followed by a steeper increase between 2010 and 2014, simultaneously with the introduction of the programme. The absolute difference of this steep increase was 8.6 percentage points and it was significant (95% confidence interval: 1.7–15.6%). However, due to the absence of a control site it was not possible to prove attribution to the programme.

## Family planning

Through qualitative data it appeared that cultural norms had a stronger influence on family planning than the programme had. Often the husband or mother-in-law decided whether a woman would use family planning.

"I tried my best with her. I said the lady is studying at university and she needs a break between pregnancies. There are a lot of women who get pregnant directly after the 40th day postnatal. But she (the mother-in-law) refused and said "No, we are helping in raising them up". On the second visit, I found that her door was locked by her mother-in-law. I had to receive permission from the mother-in-law in order to do the visit, and the mother-in-law had to be present." (FGD health providers for south and midzone)

Women will often not use family planning until they have reached the desired number of children, including at least 1 boy. There is a worry that contraceptives affect fertility. Analysis of trends over time with secondary data showed that Gaza's contraceptive prevalence rate increased between 2000 and 2014, with currently little over 40% of married women (aged 15–49 years) using any modern form of contraceptives. There was no noticeable change since the introduction of the programme.

## Traditional norms and practices

Through home visits, nurses and midwives became more aware of the many traditional practices present within families. It gave them the opportunity to counsel and change habits.

"Through this project I got to know a lot of different cultures. During our visits, I saw many false traditions, like using oil and salt for the umbilicus. Some people use ink for it. We tried to change these bad habits for people, and we noticed the disappearance of this through the last year, as a result of this project; we increased people's awareness." (FGD health providers for south and midzone)

In addition to oil and salt application, home visitors found practices for the baby such as starch on the navel or twisting the navel with a horsetail hair, immediate bathing after delivery, herbal teas to prevent flatulence, crystalized sugar for the treatment of jaundice, tight wrapping of the baby, eye liner obstructing the lacrimal ducts, and the use of bitter substances for weaning off breastmilk. Many women said the counselling regarding traditional practices was new but informative and changed their habits.

## Fathers

There seemed to be a general belief that men do not have a role in women's affairs. "It is not part of our culture" was often heard, and in some maternal and child health clinics, the presence of men was even forbidden. Qualitative data showed that level of participation and to what extent this was desired varied among women, husbands and healthcare providers. Fathers were often not encouraged to be present and some home visitors asked men not to participate because they felt embarrassed to ask certain questions. Other home visitors told about husbands that encouraged the programme and enjoyed participation, shared responsibilities of care, helped the nurse in her work and encouraged their wives to follow the nurse's advice. Some husbands that were interviewed were not interested in being present or informed, whereas others thought they were benefiting from the home visit, which increased their motivation to support their wives and children: "That encouraged me to take care of my kids more and more, and these things calm my wife down, and the kids love me more and more. My daughter related to me so much." (husband from midzone)

The same variation was found among women. Some women said they would not encourage the presence of their husband, but many also mentioned feeling emotionally supported when their husband was involved in care.

## Equity

Although congenital anomalies were one of the leading causes of neonatal mortality in Gaza, no special attention was given to women with disabilities or children with congenital disabilities. Additionally, there were no criteria for inclusion based on social risks, such as economic

status, distance to a facility, literacy rate or (social) problems at home. Women with the lowest education profiles were less likely to be included in the programme: women with primary or elementary education accounted for 0.6% of the women who attended, compared to an estimated 3.6% in the overall high-risk population (4).

Qualitative data showed that women in rural areas risked being left behind. Some midwives and nurses avoided visiting border or rural areas because they feared sexual harassment, or attacks by dogs. Ambulances could not easily reach houses in rural areas due to road conditions.

### Perceptions of care

The programme in many cases increased mutual understanding and respect between healthcare providers and women. Healthcare providers mentioned that home visits made them kinder, more sensitive and improved their relationship with mothers and their families: “We learned to become humble and more human with people from the home visit; we have a kind relationship with them as a result of that.” (FGD health providers from south)

Women mentioned feeling valued and cared for and that the home visit raised their self-esteem. In general, women were highly satisfied with the programme and appreciated the attitude of providers. These feelings increased trust in the healthcare system and motivated patients to make better use of care. Due to the PNHVs, women and their families were more aware of the importance of postnatal care. However, while many women went or wanted to go for clinical follow-up, barriers persisted relating to transport, care for other children, crowds at facilities, bad attitudes of staff in facilities, lack of privacy and lack of drugs. Although women were generally positive about the programme, they were also frustrated about the lack of continuity of care after the home visits ceased. Some of the nurses complained that women would continue calling them with questions.

### Discussion

This mixed-method study provides valuable insights into Gaza’s PNHV programme, triangulating data from multiple sources. However, the strengths of quantitative approaches could not be fully leveraged. Due to the observational study design without a baseline or control site, a counterfactual quantitative assessment to attribute changes in health indicators was not possible. This drawback was further compounded by the lack of programme-specific monitoring data. The statistics of the programme reports were insufficient, not consistently measured throughout the years, and could not be linked to individuals.

Key findings of the programme related to qualitative aspects, such as improved breastfeeding practices and transformative behaviour towards cord care, bathing and the use of substances, such as herbal teas, crystalized sugar or eyeliner, for the newborn. Secondary

quantitative data showed a significant steep increase for exclusive breastfeeding of children aged < 6 months in Gaza after implementation of the programme. While it was not possible to prove attribution, the programme may have been a trigger for this increase because qualitative data indicated that women had a changed attitude towards and increased motivation to continue breastfeeding. The contributions of the programme to breastfeeding and newborn care practices are in line with those in the international literature (3,4,11–14). The time and focused attention for custom advice was highly valued by the mothers and contributed to this success. In many instances, the programme increased mutual understanding and respect between healthcare providers and women. This shows how a personalized approach can help motivate women and those around them to exclusively breastfeed and apply healthy newborn care practices. It also shows how services can be enhanced through better relationship building.

The study was not able to confirm an effect on mortality, despite evidence in other settings (2,12,14). Qualitative data revealed that detection and referral of complications seemed to happen, but these observations could not be underpinned with statistical evidence from the programme or national data. Given that the programme covers < 13% of total live births in Gaza, any impact of the initiative on mortality at the regional level seems rather unrealistic. The low coverage rate of PNHVs is similar to programmes in other countries. A review of PNHV programmes implemented at scale in 12 Asian and African countries showed that programme coverage is generally too low to have a meaningful impact on maternal and newborn mortality (15).

The effects of the programme on family planning will remain limited without active involvement of husbands or mothers (in law). International literature is scarce on the role of fathers in postnatal care and often limited to the effects on breastfeeding (16,17). Qualitative data from this evaluation show that, even while people tend to think that men should not or do not want to be involved, the reality is often different and there should be room to customize to the family’s situation. Out of respect for both women and their husbands, the presence of the latter should at least be allowed and proposed as an option during care in the clinic and at home. Healthcare providers should be encouraged and empowered to promote involvement of fathers and enhance their competency for including fathers.

Scarce resources seem to justify the focus on high-risk cases, but even these are only partially served. Risk stratification of the programme was based on medical characteristics only and no criteria were developed for inclusion based on social risks. Nevertheless, populations who are socially at risk, might benefit more from postpartum support to improve parenting skills and enhance maternal mental and physical health and quality of life (18).

The findings of this evaluation confirm that the implementation of PNHVs cannot be a stand-alone

intervention but requires a broader health system approach. The remaining barriers to visit a clinic show that an effect on postnatal follow-up visits cannot be expected unless facility care is enhanced as well. The tenacious calls of women to home visitors after ending a provider–client relationship show that women need a trustworthy accessible source for information. Additionally, the programme does not address the problem of early discharges from maternity wards (5), while the immediate postnatal period provides many opportunities for care and counselling, including instruction on the early initiation of breastfeeding. When determining whether and how to use PNHV, context and local feasibility need to be considered, rather than looking at the absolute effectiveness of the intervention (15). To improve access to quality postnatal care throughout Gaza, a more holistic approach is needed to strengthen and connect postnatal care at different levels, including at the hospital, clinic and at home. Factors contributing to success, such as personalized care with appropriate time investment and focused attention, can be provided anywhere and should be enhanced throughout all levels of care. Facility care can

be complemented with home-based care for individuals who are at high risk or not able to come to the clinic and, in line with WHO recommendations (1), supplemented with additional telephone- or web-based contacts.

## Conclusion

This study shows that the implementation of postnatal home visits in a constrained humanitarian setting is feasible and can enhance breastfeeding practices, identify (life-threatening) maternal and neonatal complications and promote newborn care practices, as well as improving client–provider interactions. However, there are challenges in achieving appropriate and equal postnatal care coverage. Positive effects of the programme could be leveraged if postnatal care is strengthened throughout the continuum of care with an added focus on immediate postnatal care in the maternity wards, in addition to customized and personalized postnatal care in primary care facilities.

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## Enseignements clés d'une évaluation à méthode mixte d'un programme de visites postnatales à domicile dans le contexte humanitaire de Gaza

### Résumé

**Contexte :** L'Organisation mondiale de la Santé recommande des visites postnatales à domicile pour améliorer la santé maternelle et néonatale. Les preuves de l'efficacité de ces visites dans les situations humanitaires sont limitées.

**Objectifs :** Évaluer les visites postnatales à domicile mises en place dans le contexte humanitaire caractérisé par des restrictions de Gaza.

**Méthodes :** Des données qualitatives ont été obtenues par le biais d'entretiens avec des informateurs clés, d'entretiens approfondis et/ou des groupes de discussion thématique avec des femmes ciblées par le programme, ainsi qu'avec des femmes, des maris et des visiteurs à domicile non ciblés. Ces données ont été complétées par une analyse secondaire des données quantitatives des provenant enquêtes auprès des ménages existantes et des données de suivi des projets. Les données qualitatives ont été analysées à l'aide d'une analyse thématique, et les données quantitatives ont été examinées pour décrire les tendances dans le temps.

**Résultats :** Les femmes participant au programme ont montré une amélioration des pratiques d'allaitement au sein et une adoption accrue de ce mode d'allaitement et les changements de comportement ont permis de réduire les normes et pratiques traditionnelles néfastes. Le programme a amélioré la compréhension et le respect mutuels entre les prestataires de soins et les femmes, a permis une approche plus personnalisée et a renforcé l'estime de

soi des femmes. Pour améliorer les soins postnatals dans l'ensemble de la population, les interventions devraient se concentrer non seulement sur les visites à domicile, mais aussi porter sur les soins postnatals immédiats à la maternité, le suivi postnatal dans les dispensaires et les améliorations de la coordination et de la communication entre les différents niveaux de soins.

**Conclusion :** La mise en œuvre des visites postnatales à domicile dans un contexte humanitaire caractérisé par des restrictions comme celui de Gaza est réalisable et contribue positivement aux pratiques d'allaitement au sein et de soins aux nouveau-nés, ainsi qu'à l'amélioration des interactions entre les prestataires de santé et leurs clients. Les effets positifs pourraient être mis à profit si les soins postnatals étaient renforcés tout au long du continuum des soins.

## الدروس المستفادة من التقييم القائم على مزيج من الأساليب لبرنامج الزيارات المنزلية بعد الولادة، في ظل الأوضاع الإنسانية القائمة في غزة

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### الخلاصة

**الخلفية:** توصي منظمة الصحة العالمية بإجراء زيارات منزلية بعد الولادة لتحسين صحة الأمهات والمواليد. ولا يتوافر سوى قدر ضئيل من الدلائل على فعالية الزيارات المنزلية بعد الولادة في الأوضاع الإنسانية.

**الأهداف:** هدفت هذه الدراسة إلى تقييم الزيارات المنزلية بعد الولادة في السياق الإنساني الذي تحده القيود في غزة.

**طرق البحث:** تم الحصول على بيانات نوعية من خلال عقد مقابلات مع المستجيبين الرئيسيين، ومقابلات متعمقة و/أو مناقشات المجموعات البؤرية مع النساء اللاتي يستهدفهن البرنامج، والنساء غير المستهدفات، والأزواج، والقائمين على الزيارات المنزلية. واستُكملت هذه البيانات عن طريق تحليل ثانوي للبيانات الكمية من المسوحات الأسرية المتوافرة وبيانات رصد المشروعات. وحُللت البيانات النوعية باستخدام التحليل المواضيعي، وحُللت البيانات الكمية لوصف الاتجاهات بمرور الوقت.

**النتائج:** أظهرت النساء اللاتي شملهن البرنامج تحسناً في ممارسات الرضاعة الطبيعية، بالإضافة إلى زيادة معدلات ممارسة الرضاعة الطبيعية، وقلّت التغيرات السلوكية كذلك من المعايير والممارسات التقليدية الضارة. وقد زاد البرنامج من الفهم والاحترام المتبادلين بين مقدمي الخدمات الصحية والنساء، وهو ما سمح باتباع نهج أكثر خصوصية، وزاد من احترام الذات بين النساء. ولتحسين رعاية ما بعد الولادة على مستوى السكان، ينبغي ألا تُركز التدخلات على الزيارات المنزلية فقط، بل ينبغي أن تتناول أيضاً رعاية ما بعد الولادة في عيادات الأمومة ومتابعة ما بعد الولادة، وتحسينات التنسيق والتواصل بين مختلف مستويات الرعاية.

**الاستنتاجات:** يُعد تنفيذ الزيارات المنزلية بعد الولادة في سياق إنساني تحده القيود، مثل غزة، أمراً مُجدّياً، ويُساهم مساهمةً إيجابيةً في ممارسات الرضاعة الطبيعية ورعاية المواليد، وأيضاً في تحسين التفاعلات بين مقدمي الخدمات الصحية وعملائهم. ويمكن الاستفادة من الآثار الإيجابية في حالة تعزيز رعاية ما بعد الولادة على امتداد سلسلة الرعاية.

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# Trends for rotavirus acute gastroenteritis in children under 5 years old before and after vaccine introduction, Morocco, 2006–2014

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## Abstract

**Background:** In Morocco, acute gastroenteritis in children is a public health issue. Since 1987, several strategies have been conducted to reduce its burden by the Moroccan Ministry of Health, including the introduction of the anti-rotavirus vaccine into the national immunization programme in 2010.

**Aims:** To evaluate the impact of the anti-rotavirus vaccine in outpatients and inpatients with acute gastroenteritis under 5 years old.

**Methods:** We conducted descriptive studies and a retrospective cohort study using data from the hospital's sentinel surveillance system and the national ambulatory surveillance registry for acute gastroenteritis from 2006 to 2014. This included the period before and after the implementation of the rotavirus (RV) vaccine on children under age 5 years.

**Results:** The decrease in acute gastroenteritis cases was about 5.2%, mainly among children aged 0–11 months. The proportion of acute RV gastroenteritis (RVGE) decreased from 37.0% to 31.1% after the vaccine's introduction; it was statistically significant among the children aged 0–11 months (38.8% to 28.1%;  $P = 0.009$ ). The proportion of RVGE among inpatients decreased from 97.0% to 91.7% ( $P = 0.022$ ). Diarrheal disease cases without dehydration increased from 7.8% to 11.1% ( $P < 0.001$ ); RVGE was 2.3 times more frequent among unvaccinated children. The vaccine effectiveness was estimated at 57%. The proportion of G1P[8] genotype infections decreased after the introduction of the RV vaccine (56% to 40%;  $P < 0.001$ ), while the G2P[4] genotype became more frequent (13% to 21%;  $P = 0.015$ ).

**Conclusions:** The introduction of the RV vaccination into the national immunization programme in Morocco has allowed significant reduction in the incidence and severity of RVGE among children under 5 years old.

Keywords: acute gastroenteritis, rotavirus vaccine, children, immunization programme, Morocco

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## Introduction

Rotavirus remains the most common cause of severe childhood diarrhoea in developing countries. Indeed, the World Health Organization (WHO) estimates that 527 000 children under the age of 5 years die of rotavirus (RV) disease each year, and these deaths occur predominantly in the poorest countries (1). The WHO recommends that RV vaccines should be included in all national immunization programmes, particularly in countries with high RV gastroenteritis-associated fatality rates (2).

Against the background of the introduction of the rotavirus vaccine into the Moroccan National immunization programme, a sentinel surveillance network of acute RV gastroenteritis (RVGE) was set up in 2006 at 5 hospitals in different regions of Morocco (3–5). The sentinel sites included paediatric departments at selected regional hospitals in north, east and central Morocco (Tangier, Oujda, Rabat, Casablanca, Beni Mellal) to discover the most severe cases of acute gastroenteritis (AGE). In 2009, the surveillance system was extended to the primary health care services to include within the ongoing surveillance system any AGE patients not

admitted to hospitals. In parallel, the evaluation of the rotavirus surveillance system alerted that there was a slackening of the RVGE surveillance system in some sites (6), except in the Oriental region in eastern Morocco, represented by the city of Oujda, which was the best performing sentinel surveillance site (3–5).

The anti-RV vaccine was introduced into Morocco's national immunization programme in December 2010 (7). It is a live attenuated vaccine of human RV, monovalent, orally administered in 2 doses at ages 2 and 3 months. Since the introduction of the vaccine, no studies have been conducted to evaluate effect on the incidence of AGE using both clinical data and laboratory data; however, a concomitant study has documented the effect of monovalent RV vaccine on RV disease burden and circulating RV strains among children in Morocco using only laboratory data (8). At the end of 2014, the monovalent vaccine was replaced by a pentavalent vaccine, and virological surveillance of rotavirus has seen a reduction.

The aim of this study was to evaluate the impact of the RV vaccine among Moroccan children on: the global

trend of AGE in Morocco among children under 5 years; the epidemiological profile of in- and outpatients with AGE in the sentinel sites; and the characteristics of circulating RV.

## Methods

### Data sources

Data on the burden and characteristics of RVGE in children were extracted from a number of sources. Table 1 gives an overview of the data sources used to evaluate the impact of the anti-RV vaccine implementation over a period of 8 years (June 2006 to April 2014; 2010 was excluded since it was the year of implementation of the vaccination, with a disparity between the regions of Morocco). Results are presented according to 3 steps related to distinct data sources and the availability of the clinical, laboratory and overall AGE characteristics.

### Study design and population

#### STEP 1: Global trend of AGE in Morocco among children under 5 years old

This included all patients under 5 years old presenting with AGE, regardless of the cause, in all primary health

care facilities before and after the introduction of the RV vaccine.

The aim of this part of the study was to define the progressive trends of ambulatory patients presenting with AGE in all primary health care facilities in Morocco before and after implementation of the anti-RV vaccine.

#### STEP 2: Trend of confirmed RVGE among children under 5 years old

This included the population of the Oriental region sentinel site before and after the implementation of the anti-RV vaccine. The objectives were to evaluate the number of in- and outpatients under 5 years old with confirmed RVGE; determine the epidemiological and clinical characteristics for children under 5 years old with confirmed RVGE; and estimate the proportion of RV-positive samples.

#### STEP 3: Rotavirus vaccine effectiveness among Moroccan children under 5 years old

A retrospective cohort study was carried out on children under 5 years old presenting with RVGE (suspected or confirmed) who attended primary health care facilities or were admitted to Oujda hospital between 1 January 2011 and 30 April 2014. Children with unknown vaccination status or laboratory results were excluded.

**Table 1** Overview of the data sources used to evaluate the implementation of anti-rotavirus (RV) vaccine in Morocco over a period of 8 years

| STEP                                                          | Study design                                                              | Study site                       | Study population                                                                                                                                                                                                                                   | Data source                                                                | Objectives                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Global trend of AGE in Morocco among children < 5 years    | Descriptive survey of the pre- and post-RV vaccine programme introduction | National                         | Children under 5 years who have presented an AGE, and attended primary health care facilities between 2007 and 2012                                                                                                                                | Ministry of Health, Directorate of Planning and Financial Resources        | To describe the global trend of AGEs in children under 5 years in Morocco<br>To describe their characteristics by age group and degree of dehydration before and after the RV vaccine introduction.                                                                                     |
| 2. Trend of confirmed RVAGE among children < 5 years          | Descriptive survey of the pre- and post-RV vaccine programme introduction | Oujda surveillance sentinel site | Children under 5 years who had presented an AGE due to RV and had attended primary health care facilities or had been admitted at the sentinel site in Oujda between June 2006 and April 2014                                                      | National surveillance network<br>National laboratory surveillance          | To compare before and after introduction of the RV vaccine: proportion of positive rotavirus specimens<br>• clinical and epidemiological characteristics of RV-positive AGE cases<br>• no. of positive AGE cases requiring consultation and/or hospitalization (children < 5 years old) |
|                                                               |                                                                           | National                         | Children under 5 years who presented an AGE related to RV requiring a consultation or hospitalization at the national rotavirus surveillance sentinel sites between June 2006 and April 2014                                                       | National laboratory surveillance                                           | To describe the genotype distribution before and after vaccine introduction<br>To study the concordance of the isolated genotypes with the strain contained in the national immunization vaccine                                                                                        |
| 3. RV vaccine effectiveness among Moroccan children < 5 years | Retrospective cohort study                                                | Oujda surveillance sentinel site | Children under 5 years who presented an AGE to RV (suspected or confirmed) and who were vaccinated or unvaccinated and attended primary health care facilities or had been admitted at the Oujda hospital between 1 January 2011 and 30 April 2014 | National surveillance sentinel network<br>National laboratory surveillance | To estimate the risk of developing RVAGE among the children who had been vaccinated<br>To estimate the preventive fraction among the studied cohort                                                                                                                                     |

The aim of this step was to estimate the vaccine effectiveness.

## Case definition

### Acute gastroenteritis:

Two case definitions were used:

- In the first step of our study, we employed the case definition used by the department in charge of the primary health care and hospital morbidity statistics in the Ministry of Health. This is the Integrated Management of Childhood Illness definition (9) which defines AGE as: “Any child under the age of 5 years with a diarrheal episode which lasts less than 14 days, started on the first day when the child presents at least 3 liquid or loose stools, and the last day is when stools return to normal aspect”.
- For the 2nd and 3rd steps, the sentinel RV surveillance used the WHO definition for RVGE (10):
  - suspected case of RVGE: any child under the age of 5 years old who visits a health care facility or is admitted into one of the designated hospitals for an AGE;
  - AGE: acute episode ( $\leq 7$  days before the consultation) with these clinical signs: fluid or loose diarrhoea  $> 3$  stools/24 hours (and/or vomiting  $\geq 2/24$  hours, not explained by any other condition);
  - confirmed case of RVGE: any suspected case for whom an in-laboratory stool examination, using the ELISA technique, reveals the presence of RV.

## Definition of vaccination status

We considered children as vaccinated if they had received at least 2 doses of the RV vaccine. These data were collected by the RVGE surveillance network from the vaccination book, the primary health care facility vaccination registry or the mother's interview, or from any other family member who knew the vaccine status.

## Cohort definition (Oujda site)

We conducted a cohort study in the Oriental region because the surveillance system evaluation indicated good performance there. The cohort comprised children under 5 years old who met the case definition of RV (suspected or confirmed), and who attended the Oriental region's site for an ambulatory consultation or had been admitted between 1 January 2011 and 30 April 2014.

We considered:

- exposed: vaccinated child from the cohort;
- non-exposed: non-vaccinated child from the cohort;
- sick: every child from the cohort with a stool positive for RV, identified by ELISA;
- not sick: every child from the cohort with a stool negative for RV (by ELISA).

Non-inclusion criteria: a case was not included in the cohort study if they presented one or more of the following criteria:

- unspecified date of the beginning of the diarrhoea,
- gastroenteritis occurring during hospitalization for other disease,
- had unknown laboratory results,
- had unknown vaccine status.

The study flow chart (Figure 1) shows the case selection process.

## Data analysis

We used Ministry of Health data, comprising monthly aggregated data of AGE cases according to age group, degree of dehydration, region and location (rural or urban) to study the trends of AGE (11). We also used the RVGE surveillance data collected from the Oriental region sentinel site. We collected the demographical, epidemiological and clinical characteristics of all children who presented with RVGE. The stool samples were analysed at the RV national laboratory using the ELISA technique; this laboratory used the polymerase chain reaction technique for RV genotyping. We merged both clinical and biological data using the unique identification number.

To calculate the cumulative incidence of AGE in different regions, we used as denominator the population at risk, i.e. children under 5 years old, extracted from the Moroccan Ministry of Health annual statistics report covering 2011–2014.

For the cohort analysis, the association between vaccination and confirmed RVGE was estimated using the relative risk and its 95% confidence interval.

We estimated the vaccine effectiveness (VE) according to the formula  $VE = 1 - RR$  (12) as well as the preventive fraction among all vaccinated AGE cases in the Oriental region.

We analysed the data using *Excel* and *EpiInfo*, 3.5.4, software. The proportions were compared using parametric and non-parametric tests. A test was considered statistically significant when the *P*-value was  $< 0.05$ .

## Ethical considerations

Confidentiality was respected as the data used were provided anonymously by the Ministry of Health's epidemiological surveillance service.

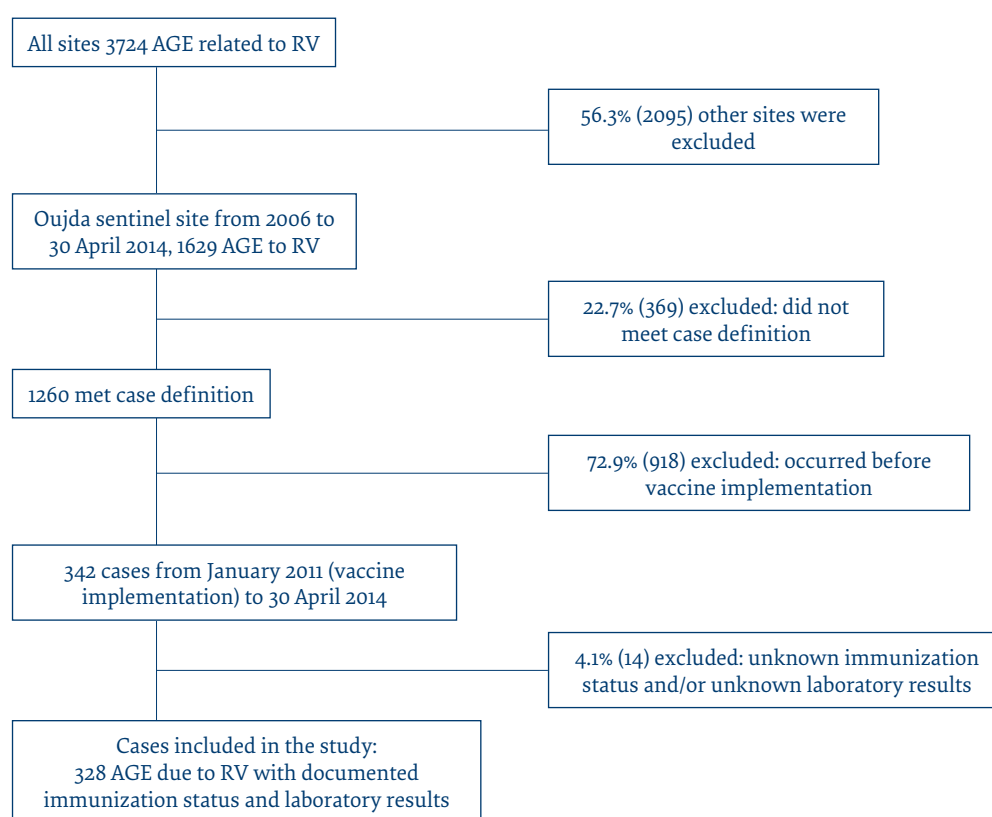
## Results

### Step 1: Trend of AGE at the primary health care centres

#### Time-trend

Between 2007 and 2012 (2010 was excluded since this was the year vaccination was implemented, with some disparity between regions), 2 249 536 children under 5 years were seen in primary health care facilities for an AGE episode. We counted 1 369 159 between 2007 and 2009 and 880 377 between 2011 and 2012.

The number of AGE cases decreased by 5.2%, from 461 858 cases in 2007 to 437 861 in 2012. This reduction had

**Figure 1 Study flow chart: selection of the study population at the Oujda rotavirus surveillance sentinel site**

been noticed during the period before the introduction of the anti-RV vaccine and afterwards. Indeed, between 2007 and 2009, the yearly reduction was 7697 AGE cases, while between 2011 and 2012, it was about 4655.

### Age trend

During the study period, 827 523 (36.8%) cases were diagnosed among children aged 0–11 months, 754 893 (33.6%) among children aged 12–23 months and 667 120 (29.6%) among children aged 24–59 months. Compared with the age group 12–23 months, fewer cases were observed among those aged 0–11 months, however, the 24–59 months age group registered a greater number of cases between 2007 and 2012 (Figure 2).

The proportion of AGE cases where no dehydration was observed was 98.7% between 2007 and 2009 and 98.9% between 2011 and 2012. The proportion of moderate dehydration cases decreased by 1.2% before vaccine implementation and by 1.1% afterwards. The proportion of cases with severe dehydration varied between 0.2% (2007–2009) and 0.1% (2011–2012).

### Geographical distribution of cases

All regions of Morocco recorded cases of AGE. The Tadla Azilal region in central Morocco experienced the highest incidences during the study period with a maximum of 22 801.6/100 000 children under 5 years in 2008 and 21 386.3/100 000 in 2011. This incidence was lower, not exceeding 10 000 cases of AGE/100 000 children under

5, in the Lâayoune-Boujdour-Sakia Lhamra region in the south of the country throughout the study period.

The number of AGE cases was higher in the rural than the urban area between 2007 and 2012. A slight decrease in the number of rural cases was noticed in 2011 and 2012. There was no change in AGE trend in the urban area.

### Step 2: Evolution of RVGE in the Oriental region sentinel site

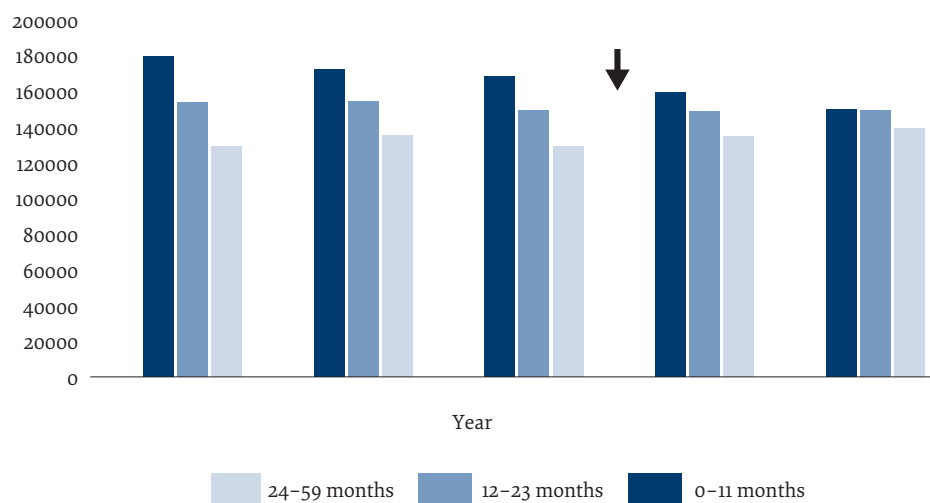
Between June 2006 and April 2014, the total number of RVGE cases (suspected or confirmed) that needed a consultation at the primary care level or a hospital admission in the Oriental region sentinel site (primary health care centre or hospital) was about 1260. Among these, 1249 (99.1%) had a documented laboratory result.

The proportion with confirmed RVGE was 37.0% (334/902) between May 2006 and December 2009 versus 31.1% (108/347) between January 2011 and April 2014. The decrease was only statistically significant for the age group 0–11 months, reducing from 38.8% (192/495) to 28.1% (52/185) ( $P = 0.009$ ).

The proportion of positive cases in the hospital setting, went down from 38.1% (324/850) between June 2006 and December 2009 to 35.1% (99/282), between January 2011 and April 2014. Thus, admissions related to positive RV decreased by 7.8% ( $P = 0.37$ ).

The proportion of RVGE-confirmed cases admitted at the sentinel hospital in the Oriental region decreased from 3.42% to 1.30% after the introduction of the vaccine. This reduction was 73.5% for the age group 0–11 months.

**Figure 2** Number of acute gastroenteritis cases among children under 5 years old reported in the hospital and primary health care facilities, Morocco, before and after the vaccine introduction into the National Immunisation Programme 2007–2012 (data source: Ministry of Health, Rabat) (arrow indicates vaccine introduction)



No confirmed RVGE case has been hospitalized since August 2012.

The most significant variations between the periods before and after the RV vaccine implementation were observed in the proportion of hospital admissions for AGE and in the degree of dehydration (Table 2).

### Step 3: Vaccine effectiveness analysis

Our cohort from the sentinel surveillance site in the Oriental region comprised 328 cases (Figure 1). The median age was 11 months (Q1: 5 months; Q3: 19 months) and the male/female ratio was 1.34. Around 80% of the cases (263/328) were admitted to the hospital and around 95% (312/328) were from rural areas. The mean duration of the diarrhoea was 2.9 (standard deviation 2.0) days and vomiting was reported in just over 75% (247/328) of cases. Just over 23% (76/328) did not show any sign of dehydration whereas 25% (82/328) were moderately dehydrated and 51.8% (170/328) severely dehydrated.

In our cohort, 14.9% (49/328) were vaccinated (Table 3). Among the vaccinated children, 14.3% (7/49) were diagnosed RV-positive, versus 33.3% (93/279) for the non-vaccinated children (Table 4). The vaccine was able to prevent 57.1% (95% CI: 13–79) of sickness among the vaccinated children in our cohort. The vaccination coverage (2nd dose) in the Oriental region in 2013 was of 87%. Thus, the vaccine was able to prevent 49.7% (preventive fraction = 49.7%; 95% CI: 11.3–68.7) of RVGE cases for children under 5 years who present an AGE in this region. We observed that the number of patients decreased between 2011 and 2013 as immunization coverage increased.

The proportion of the G1P[8] genotype decreased during the study period from 56% to 40% ( $P < 0.001$ ), while the G2P[4] genotype increased from 13% to 21% ( $P = 0.015$ ).

## Discussion

In Morocco, the number of outpatients with AGE in primary health care facilities decreased by 5.2% between 2007 and 2012. This decrease began before the introduction of the anti-RV vaccine, and was probably due to improvements in hygiene conditions, the promotion of breastfeeding and other public health interventions. For this study, we only had access to the data of the 2 years following the vaccine introduction, so we were not able to estimate absolutely the attributable incidence decrease for the vaccine; otherwise, we would have used a modelling time series to determine the incidence trends over time (13–15).

The decrease in number of cases has been more significant in the age group 0–11 months. The age group 12–23 months, which included vaccinated and non-vaccinated children, did not experience any change. The age group 24–59 months was not vaccinated: they were over the age limit for the first anti-RV vaccine dose at the time of vaccine introduction in 2010. This may explain the absence of a decrease in the number of cases for the age groups 12–23 months and 24–59 months. Similar results have been reported in developing countries (2,14,16,19,20), where the greatest reduction in number of deaths was observed among children younger than 2 years, who had the highest rates of vaccination.

In the Oriental region of Morocco, the vaccination coverage rate (2 doses) with the monovalent vaccine within the national immunization programme increased from 68% in 2011 to 83% in 2012, and reached 87% in 2013. The proportion of RV positivity in this region between 2006 and 2009 was 37.0%. In the sentinel hospital, it was 38.1%, similar to the result obtained in another study conducted in Morocco over the same period (39.4%) (3). The vaccination reduced by 56.7% the proportion of confirmed RVGE cases among children under 5 years old who were admitted in the sentinel hospital in the Oriental

**Table 2** Distribution of rotavirus (RV) positive acute gastroenteritis cases before and after the introduction of the vaccine in the Moroccan National Immunization Programme, Oujda surveillance sentinel site, June 2006–April 2014

| Characteristic                         | Before introduction of RV vaccine <sup>a</sup><br>(n = 334) | After introduction of RV vaccine <sup>b</sup><br>(n = 108) | P-value  |
|----------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|----------|
|                                        | %                                                           | %                                                          |          |
| Age (months)                           |                                                             |                                                            |          |
| 0–11                                   | 57.5                                                        | 48.1                                                       | 0.207    |
| 12–23                                  | 21.9                                                        | 28.7                                                       |          |
| 24–59                                  | 20.7                                                        | 23.1                                                       |          |
| Sex                                    |                                                             |                                                            |          |
| Male                                   | 62.0                                                        | 57.4                                                       | 0.398    |
| Area <sup>c</sup>                      |                                                             |                                                            |          |
| Urban                                  | 92.5                                                        | 88.9                                                       | 0.240    |
| Rural                                  | 7.5                                                         | 11.1                                                       |          |
| Admission structure                    |                                                             |                                                            |          |
| Primary care services                  | 3.0                                                         | 8.3                                                        | 0.022*   |
| Hospital                               | 97.0                                                        | 91.7                                                       |          |
| Clinical symptoms                      |                                                             |                                                            |          |
| Fever                                  | 77.5                                                        | 70.4                                                       | 0.130    |
| Vomiting                               | 91.9                                                        | 91.7                                                       | 0.934    |
| Dehydration absent                     | 7.8                                                         | 11.1                                                       | < 0.001* |
| Moderate dehydration                   | 85.6                                                        | 31.5                                                       |          |
| Severe dehydration                     | 6.6                                                         | 57.4                                                       |          |
| Evolution                              |                                                             |                                                            |          |
| Recovered                              | 99.4                                                        | 100                                                        | 0.571    |
| Died                                   | 0.6                                                         | 0.                                                         |          |
| Mean (SD) duration of diarrhoea (days) | 2.50 (1.06)                                                 | 2.28 (0.98)                                                | 0.051    |

<sup>a</sup>June 2006–December 2009.<sup>b</sup>January 2011–April 2014.<sup>c</sup>The data were available for 333/334 patients before the introduction of the RV vaccine.

SD = standard deviation.

\*Statistically significant.

region. Better results have been obtained in developed countries such as the United States of America (USA) (96%) and Belgium (65–83%) using a monovalent vaccine (3,17,18). This decrease could be partly attributed to the slackening of the sentinel monitoring site in the Oriental region, even though it is more efficient compared with the other sentinel sites in recruiting cases. We found that RVGE was more frequent in males before and after the vaccination, but with no significant association between the disease and sex, as seen in other studies in Morocco and the USA (3,17).

In the Oriental region, 57.5% of children were under the age of one year before the introduction of the vaccine and 48.1% after. Greater vaccine effectiveness was registered in this age group throughout the world (2,16–19). The decrease in the proportion of positivity was greater for this age group, similar to in Mexico where the same age group experienced a significant decrease in diarrhoea-related hospitalizations (16,20).

Regarding the severity of the disease, a reduction in confirmed RVGE mortality was recorded, no deaths linked to RV have been reported in the Oriental region after introduction of the vaccine. Studies in Mexico and

Brazil showed a large decrease in diarrheal mortality after rotavirus vaccination (14,16,20).

The variation of circulating genotypes in Morocco between 2006 and 2007 has been well documented (4). After the introduction of the anti-RV vaccine, the proportion of the G1P[8] genotype decreased (40%), while the G2P[4] increased significantly from 13% to 21%. A study conducted in Belgium showed an increase in G2P[4] in children vaccinated with the monovalent vaccine (21). Unfortunately, as the genotyping data were aggregated, we were not able to study the genotype variation according to vaccination status.

The vaccine effectiveness in the cohort study was of 57.1%. This relatively low value could be due to the fact that the G2P[4] strain was prevalent in the Oriental region while the vaccine used within the national immunization programme was monovalent and essentially covered the G1P[8] genotype. This vaccine effectiveness in our cohort was similar to findings from some African countries (19). In the USA and in Europe, effectiveness exceeded 90% (17,18,21).

**Table 3 Characteristics of acute gastroenteritis patients according to immunization status, Oujda surveillance sentinel site, June 2006–April 2014**

1000 April 2017

| Patients characteristic                | Vaccinated<br>n = 49 (14.9%)<br>(%) | Not vaccinated<br>n = 279 (85.1%)<br>(%) | P-value  |
|----------------------------------------|-------------------------------------|------------------------------------------|----------|
| Age (months)                           |                                     |                                          |          |
| 0–11                                   | 67.4                                | 50.2                                     | 0.001*   |
| 12–23                                  | 30.6                                | 24.7                                     |          |
| 24–59                                  | 2.0                                 | 25.1                                     |          |
| Sex                                    |                                     |                                          |          |
| Male                                   | 57.1                                | 57.4                                     | 0.979    |
| Area                                   |                                     |                                          |          |
| Urban                                  | 100                                 | 94.3                                     | 0.086    |
| Rural                                  | 0                                   | 5.7                                      |          |
| Admission structure                    |                                     |                                          |          |
| Primary care services                  | 67.4                                | 11.5                                     | < 0.001* |
| Hospital                               | 32.7                                | 88.5                                     |          |
| Clinical symptoms                      |                                     |                                          |          |
| Fever                                  | 30.6                                | 66.0                                     | < 0.001* |
| Vomiting                               | 36.7                                | 82.1                                     | 0.934    |
| Dehydration absent                     | 69.4                                | 15.1                                     |          |
| Moderate dehydration                   | 2.0                                 | 29.0                                     | < 0.001* |
| Severe dehydration                     | 28.6                                | 55.9                                     |          |
| Outcome                                |                                     |                                          |          |
| Recovered                              | 100                                 | 100                                      | < 0.001* |
| Died                                   | 0                                   | 0                                        |          |
| Mean (SD) duration of diarrhoea (days) | 3.7 (1.5)                           | 2.4 (1.1)                                |          |

\*Statistically significant

There are some limitations in this study in that we studied RVGE cases only in the sentinel site of the Oriental region, which is the most efficient in recruiting cases, rather than other sites where there were many missing data, mostly concerning vaccination status. The choice of the study population among children who all presented an AGE constitutes a selection bias. Vaccine effectiveness would have been estimated more accurately if we had used the test negative design and estimated the odds ratio instead of the relative risk (22). We were not able to study the correlation between the vaccination status and the circulating strains in Morocco as the data concerning the genotypes were aggregated. Despite these limitations, this study has allowed us to compare the data

collected by the Ministry of Health from both primary health care facilities and the RVGE sentinel surveillance site based on virological confirmation to estimate the global effect of the vaccine on AGE in terms of number of cases and severity.

Finally, efforts should be made to ensure the completeness of the data, continue the genotype monitoring and ensure the sustainability of rotavirus vaccine into the national immunization programme. A new evaluation of the vaccine strategy against rotavirus must be conducted, especially after switching to the pentavalent vaccine, and the surveillance system for this virus must be strengthened to allow such evaluation.

**Table 4 Risk estimation of acute rotavirus-positive gastroenteritis among Moroccan children (data extracted from the Oujda surveillance sentinel site, June 2006–April 2014)**

| Status             | Positive<br>rotavirus<br>No. (%) | Negative<br>rotavirus<br>No. (%) | Total | Relative risk | 95% confidence<br>interval |
|--------------------|----------------------------------|----------------------------------|-------|---------------|----------------------------|
| Vaccinated         | 7 (14.3)                         | 42 (85.7)                        | 49    | 0.43          | 0.21–0.87                  |
| Not vaccinated (R) | 93 (33.3)                        | 186 (66.7)                       | 279   | —             | —                          |
| Total              | 100                              | 228                              | 328   | —             | —                          |

## Acknowledgement

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**Funding:** None.

**Competing interests:** None declared.

## Tendances de la gastroentérite aiguë à rotavirus chez les enfants de moins de cinq ans avant et après l'introduction du vaccin (Maroc) 2006-2014

### Résumé

**Contexte :** Au Maroc, la gastroentérite aiguë chez l'enfant constitue un problème de santé publique. Depuis 1987, plusieurs stratégies ont été menées par le ministère de la Santé marocain pour réduire la charge de morbidité associée, dont l'introduction du vaccin antirotavirus dans le programme national de vaccination en 2010.

**Objectifs :** Évaluer l'impact du vaccin antirotavirus chez les patients ambulatoires et hospitalisés âgés de moins de cinq ans qui sont atteints de gastroentérite aiguë.

**Méthodes :** Nous avons mené des études descriptives et une étude de cohorte rétrospective en utilisant les données du système de la surveillance sentinelle hospitalière et du registre national de la surveillance ambulatoire de la gastroentérite aiguë de 2006 à 2014. Ceci inclut notamment la période précédant et suivant l'administration du vaccin antirotavirus aux enfants de moins de cinq ans.

**Résultats :** La diminution du nombre de cas était d'environ 5,2 %, principalement chez les enfants âgés de 0 à 11 mois. La proportion de gastroentérite aiguë à rotavirus est passée de 37,0 % à 31,1 % après l'introduction du vaccin ; cette diminution était statistiquement significative chez les enfants âgés de 0 à 11 mois (38,8 % à 28,1 % ;  $p = 0,009$ ). La proportion de gastroentérite aiguë à rotavirus parmi les patients hospitalisés est passée de 97,0 % à 91,7 % ( $p = 0,022$ ). Les cas de maladie diarrhéique sans déshydratation ont augmenté, passant de 7,8 % à 11,1 % ( $p < 0,001$ ) ; la gastroentérite aiguë à rotavirus était 2,3 fois plus fréquente chez les enfants non vaccinés. L'efficacité vaccinale a été estimée à 57 %. La proportion d'infections de génotype G1P[8] a diminué après l'introduction du vaccin antirotavirus (de 56 % à 40 % ;  $p < 0,001$ ), tandis que le génotype G2P[4] est devenu plus fréquent (de 13 % à 21 % ;  $p = 0,015$ ).

**Conclusions :** L'introduction de la vaccination antirotavirus dans le programme national de vaccination du Maroc a permis une réduction significative de l'incidence et de la gravité de la gastroentérite aiguë à rotavirus chez les enfants de moins de cinq ans.

## اتجاهات التهاب المعدة والأمعاء الحاد الناجم عن الفيروس العجلي في الأطفال دون سن الخامسة قبل استحداث اللقاح وبعده، المغرب، 2006-2014

هند الزين، أحمد الرقيق، مريم ناصري، إيمان جروندى

### الخلاصة

**الخلفية:** يُعد التهاب المعدة والأمعاء الحاد في الأطفال إحدى قضايا الصحة العامة في المغرب. ومنذ عام 1987، نُفذت استراتيجيات عديدة لتقليل العبء الذي تنوء به وزارة الصحة المغربية، ومنها إدراج اللقاح المضاد للفيروس العجلي في البرنامج الوطني للتحصين في عام 2010.

**الأهداف:** هدفت هذه الدراسة إلى تقييم أثر اللقاح المضاد للفيروس العجلي على المرضى الخارجيين والمرضى الداخليين المصابين بالتهاب المعدة والأمعاء الحاد، الذين تقل أعمارهم عن 5 سنوات.

**طرق البحث:** أجرينا دراسات وصفية ودراسة أثرية بأثر رجعي باستخدام بيانات من نظام الترصد المخفري للمستشفيات، والسجل الوطني للترصد الإسعافي لالتهاب المعدة والأمعاء الحاد، في الفترة بين عامي 2006 و2014. ويشمل ذلك الفترة السابقة والفترة اللاحقة لاستحداث اللقاح المضاد للفيروس العجلي للأطفال الذين تقل أعمارهم عن 5 سنوات.

**النتائج:** بلغت نسبة انخفاض حالات التهاب المعدة والأمعاء الحاد حوالي 5.2 %، خاصة بين الأطفال الذين تتراوح أعمارهم بين 0 و11 شهرًا. وقد انخفضت نسبة التهاب المعدة والأمعاء الحاد الناشئ عن الإصابة بالفيروس العجلي من 37.0 % إلى 31.1 % بعد استحداث اللقاح؛ وكان لذلك دلالة إحصائية كبيرة بين الأطفال الذين تتراوح أعمارهم بين 0 و11 شهرًا (38.8 % إلى 28.1 %؛ القيمة الاحتمالية = 0.009). وانخفضت نسبة التهاب المعدة والأمعاء الناشئ عن الإصابة بالفيروس العجلي بين المرضى الداخليين من 97.0 % إلى 91.7 % (القيمة الاحتمالية = 0.022). وزادت

حالات أمراض الإسهال دون جفاف من 7.8٪ إلى 11.1٪ (القيمة الاحتمالية > 0.001)؛ وكانت نسبة التهاب المعدة والأمعاء الناشئ عن الإصابة بالفيروس العجلي أعلى بين الأطفال غير المطعمين بمقدار 2.3 مرة. وقدّرت نسبة فعالية اللقاح بنحو 57٪. وانخفضت نسبة إصابات النمط الجيني G1P [8] بعد استحداث اللقاح المضاد للفيروس العجلي (56٪ إلى 40٪؛ القيمة الاحتمالية > 0.001)، في حين أصبحت إصابات النمط الجيني G2P [4] أكثر تواتراً (13٪ إلى 21٪؛ القيمة الاحتمالية = 0.015).

الاستنتاجات: ساعد إدراج التطعيم باللقاح المضاد للفيروس العجلي في البرنامج الوطني للتحصين في المغرب على إحداث انخفاض كبير في معدلات الإصابة بالتهاب المعدة والأمعاء الناشئ عن الإصابة بالفيروس العجلي ووخامته بين الأطفال دون سن الخامسة.

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# Tendency towards violence and social roles: a descriptive study among high school students in Turkey

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## Abstract

**Background:** Violence affects more than half of women worldwide and the perception of social roles has a significant role in this. Adolescence is a sensitive developmental period in the life of an individual. It is therefore important to understand the perception of violence and change the acceptance of violence among adolescents.

**Aims:** To address the experiences that adolescents had with violence and its relationship with attitudes towards women.

**Methods:** This descriptive study, comprising 2321 high school students, was conducted in Izmir, Turkey, between May and August 2015. We used a questionnaire to collect data on sociodemographic information and the perceptions that adolescents have of violence. The Violence Tendency and Attitudes Towards Women Scales were applied to show the perceptions of adolescents of social roles.

**Results:** One third of the adolescents reported that they were exposed to some kind of violence. More than half had witnessed violence against their family members, relatives, or close friends. Conservative and traditional attitudes towards women were associated with a higher tendency towards violence among adolescents.

**Conclusions:** To end violence against women, public health actions should focus on the young population and their representation of social roles.

Keywords: adolescents, public health, social roles, violence against women, women health

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## Introduction

Violence can affect the life of an individual and result in long-term mental, physical, reproductive and sexual consequences, along with behavioural changes. The consequences may vary from post-traumatic stress disorder to chronic disease, unintended pregnancy, brain injury, or even death (1,2). According to the National Violence Against Women Survey in the United States, 43.4% of women and 54.3% of men have experienced some type of violence as a child or adolescent (3,4). The survey reported psychological, physical and sexual violence that varied from bullying to homicide and from teen-dating violence to intimate-partner sexual violence.

In a study by Craig et al., crossnational profiles of violence were studied in 40 different countries, and showed that women were subjected to violence more than men were (5). Furthermore, according to a report by the World Health Organization (WHO), 1 in 3 women (35%) experience some sort of violence at least once in their lifetime (6). A multinational study by WHO on women's health and domestic violence against women found that women aged 15–19 years were at a higher risk of repetitive violence when compared with older women (1). The prevalence of violence among women in Peru was

41% among those aged 15–19 years versus 8% for those aged 45–49 years.

Adolescence is a sensitive developmental period in the life of an individual. It is therefore important to understand the perception of violence and change the acceptance of violence among adolescents. It is known that acceptance of violence is associated with varying factors, such as past exposure to violence, violence in the home, parental socioeconomic difficulties, cultural and social beliefs about the masculine and feminine social roles, and lack of job opportunities (7,8).

Violence against women is a social, cultural and public health problem among both adults and adolescents in Turkey, as well as in most, if not all, other countries. In Turkey, 38% of women are exposed to violence during their lifetime according to data from the 2015 National Violence against Women Survey (9). Women reported that the most common reasons for violence were problems with their partner's family, men-related issues, and economic reasons. Men reported economic issues as the main reason. The survey also showed that children and adolescents who have witnessed violence in the past were vulnerable to violence in adulthood (9).

A study by Celbiş et al., which examined 1175 high school students in Eastern Turkey, found that during

the previous 12 months, 24.5% of students had been in a physical fight and 4.3% had carried a weapon on school property (10). Another study of high school students by Yavuz et al. found that 10% of students were exposed to violence. Girls mostly experienced violence in the family, whereas boys mostly experienced violence at school. Yavuz et al. argued that the prevention of violence was possible with an increase of awareness in adolescents, determination of risk factors in the family, and additional support to adolescents who were exposed to violence and/or exhibited violent behaviour (11).

The aim of this study was to explore perceived violence, exposure and tendency towards violence, and perspectives on social roles among adolescents in Western Turkey.

## Methods

### Study design and setting

This cross-sectional descriptive study was performed between 1 May and 1 July 2015, in high schools located in Izmir, Turkey. A total of 2321 students from 30 high schools were included based on the criteria for cluster sampling techniques (12). A questionnaire was administered by the authors to the students while they were in class.

In order to calculate the necessary number, a power analysis was performed. There were 40 209 students in their final year at high school (provided by official authorities at [izmirmeb@gov.tr](mailto:izmirmeb@gov.tr)). There were 300 public and 66 private schools. For this calculation, 40 000 grade 12 high school students were used, in 30 clusters, with 50% prevalence of outcome variable, a  $\pm 3$  confidence interval, 95% confidence level, and design effect of 2.0. As a result of this calculation, the minimum necessary sample size was determined as 2310 students. To ensure a minimum sample size, 2 classes were chosen from each school, assuming an average class size of 20–30 students. For this purpose, the 366 schools were arranged in alphabetical order, starting with a random school, and 30 schools were selected by systematic sampling with 13 intervals.

### Data collection

Data were collected using a questionnaire that combined 2 sections created for this study, along with 2 other sections that had already been created and tested for validity and reliability in previous studies. In the first part, sociodemographic information such as sex, age and socioeconomic status of students, and parental education levels was collected. In the second part, data on experiences of violence and the thoughts of the students about the types of and reasons for violence were collected. Their experiences of violence were inquired about using “Have you ever experienced ...” likert-type questions, with possible answers as never, rarely, sometimes, usually, and always. The thoughts of the students about violence were categorized as physical, emotional, economic, restriction of human relationships with others, sexual, verbal, and other, and multiple answers were possible. Reasons for vio-

lence were also categorized and the students were free to choose more than 1 response. These categories were disrespect towards men, riposte against men, income conflicts, honour troubles, alcohol use, psychological problems, and other. The third part consisted of the Violence Tendency Scale (VTS). The VTS was originally developed in Turkish by Haskan and Yıldırım in 2012, and it consists of 20 items and includes 4 factors, comprising the feeling of violence, violence through information technologies, feeling of harming others, and using violence against others. In the study of Haskan and Yıldırım, the Cronbach  $\alpha$  of the scale was measured as 0.87 and the test–retest reliability factor was 0.83 (13). The fourth part consisted of the Turkish version of the Attitudes towards Women Scale (AWS), which was developed by Spence et al. in 1973 (14). The validity and reliability of the Turkish version, which comprised 15 items, was assessed in 2013 (15). In this study, Cronbach  $\alpha$  was determined as 0.81. A high score indicated a profeminist (advocacy of women’s rights on the grounds of equality of the sexes) egalitarian attitude and a low score indicated a traditional, conservative attitude. The first two authors visited all of the selected classes in person in the selected schools, and ensured that all of the attending students who were present in the classroom answered the questionnaires. However, some students were absent due to illness or other reasons. The head teachers of the classes estimated the average absence rate to be < 5%.

### Data analysis

The statistical analysis was performed using SPSS version 21.0 (IBM Corp., Armonk, NY, USA). Means and

**Table 1 Sociodemographic features of participants and awareness of types of violence among adolescents**

|                                   | No./total (%)    |
|-----------------------------------|------------------|
| <b>Sex</b>                        |                  |
| Female                            | 1255/2321 (54.1) |
| Male                              | 1066/2321 (45.9) |
| <b>Economic status</b>            |                  |
| Low                               | 115/2321 (5.0)   |
| Middle/high                       | 2206/2321 (95.0) |
| <b>Maternal education level</b>   |                  |
| Lower than high school            | 1187/2321 (51.1) |
| High school or higher             | 1134/2321 (48.9) |
| <b>Paternal education level</b>   |                  |
| Lower than high school            | 995/2321 (42.9)  |
| High school or higher             | 1326/2321 (57.1) |
| <b>Types of violence</b>          |                  |
| Physical                          | 2144/2321 (92.4) |
| Verbal                            | 1878/2321 (80.9) |
| Emotional                         | 1849/2321 (79.7) |
| Sexual                            | 1828/2321 (78.8) |
| Restriction of social interaction | 1197/2321 (51.6) |
| Economic                          | 1010/2321 (43.5) |

standard deviations were calculated for the continuous variables. Frequencies and percentages were calculated for the categorical variables.  $\chi^2$  test and analysis of variance were used to analyse relations between the dependent and independent variables. *Stepwise multiple logistic regression* was performed using R version 1.1.383.  $p < 0.05$  was considered to be statistically significant.

### Permissions/ethical considerations

Ethical approval was obtained from the Dokuz Eylul University Faculty of Medicine Non-Invasive Research Ethics Committee and permission was authorized by the Izmir Division of the National Ministry of Education.

## Results

The total number of participants was 2321 and the response rate of the students attending class on the day that the questionnaire was administered was 100%. The mean age was 17.13 (0.62) years (range: 15–20 years). Table 1 displays the sociodemographic features and awareness of the types of violence among the adolescents. Among the adolescents, 45.9% ( $n = 1066$ ) were male, 95% ( $n = 2206$ ) had middle or high economic status, 51.1% ( $n = 1187$ ) had a mother with lower than high school education, and 42.9% ( $n = 995$ ) had a father with lower than high school education. Physical violence was the type most known by the students at a rate of 92.4% ( $n =$

2144), while economic violence was less known at a rate of 43.5% ( $n = 1010$ ).

Among the participants, 45% ( $n = 1044$ ) had taken part in some kind of attempted violence directed towards their family members, relatives, or close friends, and 38.7% ( $n = 898$ ) had experienced some kind of violence directed towards themselves by their family members, relatives, or close friends (Table 2). Moreover, 57.7% ( $n = 1340$ ) had witnessed violence directed towards their family members, relatives, or friends by others and 57.4% ( $n = 1331$ ) had witnessed attempted violence towards their family members, relatives, or friends by others.

Psychological problems (78.8%;  $n = 1830$ ) and alcohol use (76.4%;  $n = 1774$ ) were considered as the reasons for violence towards women by most of the students. Disrespect and insults against men were stated as reasons by a smaller number of students, but the percentage was still 27.1% ( $n = 628$ ). Honour issues were mentioned by 57.5% ( $n = 1334$ ) of the adolescents and 40.6% ( $n = 943$ ) mentioned income conflicts.

The mean VTS and AWS values were 47.23 (10.68) and 40.07 (6.43), respectively. There was a significantly negative relationship between the VTS and AWS scores ( $r = -0.310$ ,  $P < 0.001$ ). The relationships of these values with the demographic features and knowledge of the types of violence are presented in Table 3. Adolescents who had a low economic status had significantly higher VTS scores ( $P < 0.001$ ) and lower AWS scores ( $P < 0.001$ ). The education

**Table 2** Adolescents' experience of violence

|                                                                                    |     | No./total (%)    |            | n (%)      |
|------------------------------------------------------------------------------------|-----|------------------|------------|------------|
| Took part in violence directed towards family members, relatives, or friends       | Yes | 1044/2321 (45.0) | Rare       | 691 (29.8) |
|                                                                                    |     |                  | Sometimes  | 221 (9.5)  |
|                                                                                    |     |                  | Often      | 55 (2.4)   |
|                                                                                    |     |                  | Very often | 77 (3.3)   |
|                                                                                    | No  | 1277/2321 (55.0) |            |            |
| Violence attempts received from family members, relatives, or friends              | Yes | 898/2321 (38.7)  | Rarely     | 613 (26.4) |
|                                                                                    |     |                  | Sometimes  | 177 (7.6)  |
|                                                                                    |     |                  | Often      | 61 (2.6)   |
|                                                                                    |     |                  | Very often | 47 (2.0)   |
|                                                                                    | No  | 1423/2321 (61.3) |            |            |
| Observed attempted violence directed towards family members, relatives, or friends | Yes | 1340/2321 (57.7) | Rarely     | 770 (33.2) |
|                                                                                    |     |                  | Sometimes  | 364 (15.7) |
|                                                                                    |     |                  | Often      | 104 (4.5)  |
|                                                                                    |     |                  | Very often | 102 (4.4)  |
|                                                                                    | No  | 981/2321 (42.3)  |            |            |
| Observed attempted violence towards family members, relatives, or friends          | Yes | 1331/2321 (57.4) | Rarely     | 811 (34.9) |
|                                                                                    |     |                  | Sometimes  | 315 (13.6) |
|                                                                                    |     |                  | Often      | 99 (4.3)   |
|                                                                                    |     |                  | Very often | 106 (4.6)  |
|                                                                                    | No  | 990/2321 (42.7)  |            |            |

level of the parents had no significant relationship with the VTS scores of the adolescents. However, adolescents who had a mother or a father with lower than high school level of education had significantly lower AWS scores ( $p < 0.001$ ). Adolescents who described violence as emotional, restriction of social interaction, sexual and verbal had significantly lower VTS scores and higher AWS scores ( $p < 0.05$ ). Adolescents who described violence as economic had significantly higher VTS scores and higher AWS scores ( $p < 0.05$ ).

Additionally, the relationships of the VTS and AWS scores with the experiences of violence that the adolescents had are given in Table 4. The AWS scores decreased and the VTS scores increased with increased experiences of violence ( $p < 0.001$  for both scores).

Finally, based on the *stepwise multiple logistic regression* results, 14% of the variation in tendency towards violence could be explained with the AWS, sex, received attempted violence from family members, relatives, or friends, and observed attempted violence towards family members, relatives, or friends (Table 5). The most prominent effect was seen when there was an observed attempt of violence towards family members, relatives or friends (coefficient = 2.12).

## Discussion

In the current study, more than one third of the adolescents had been exposed to physical, verbal, emotional or sexual violence. More than half had witnessed violence related to their family members, relatives, or close

**Table 3 Relationship of Violence Tendency Scale and Attitudes towards Women Scale with demographic features and types of violence**

| Demographic features                     | Violence Tendency Scale | P       | Attitudes towards Women Scale | P       |
|------------------------------------------|-------------------------|---------|-------------------------------|---------|
| <b>Sex</b>                               |                         |         |                               |         |
| Female                                   | 46 (10.05)              | < 0.001 | 42 (5.27)                     | < 0.001 |
| Male                                     | 49 (11.15)              |         | 37 (6.67)                     |         |
| <b>Economic status</b>                   |                         |         |                               |         |
| Middle/ high                             | 47 (10.37)              | < 0.001 | 40 (6.24)                     | < 0.001 |
| Low                                      | 54 (13.90)              |         | 37 (8.53)                     |         |
| <b>Maternal education level</b>          |                         |         |                               |         |
| Lower than high school                   | 48 (11.04)              | 0.194   | 39 (6.51)                     | < 0.001 |
| High school or higher                    | 47 (10.30)              |         | 41 (6.17)                     |         |
| <b>Paternal education level</b>          |                         |         |                               |         |
| Lower than high school                   | 47 (10.01)              | 0.692   | 39 (6.66)                     | < 0.001 |
| High school or higher                    | 47 (10.44)              |         | 41 (6.12)                     |         |
| <b>Types of violence</b>                 |                         |         |                               |         |
| <b>Physical</b>                          |                         |         |                               |         |
| Yes                                      | 47 (10.43)              | 0.059   | 40 (6.32)                     | < 0.001 |
| No                                       | 49 (13.33)              |         | 36 (6.20)                     |         |
| <b>Emotional</b>                         |                         |         |                               |         |
| Yes                                      | 47 (10.31)              | 0.004   | 41 (6.11)                     | < 0.001 |
| No                                       | 49 (11.97)              |         | 37 (6.56)                     |         |
| <b>Economical</b>                        |                         |         |                               |         |
| Yes                                      | 48 (10.70)              | 0.045   | 41 (6.46)                     | < 0.001 |
| No                                       | 47 (10.67)              |         | 40 (6.37)                     |         |
| <b>Restriction of social interaction</b> |                         |         |                               |         |
| Yes                                      | 47 (10.53)              | 0.171   | 41 (6.16)                     | < 0.001 |
| No                                       | 48 (10.85)              |         | 39 (6.46)                     |         |
| <b>Sexual</b>                            |                         |         |                               |         |
| Yes                                      | 47 (10.44)              | 0.025   | 41 (6.27)                     | < 0.001 |
| No                                       | 48 (11.50)              |         | 37 (6.31)                     |         |
| <b>Verbal</b>                            |                         |         |                               |         |
| Yes                                      | 47 (10.38)              | 0.003   | 41 (6.19)                     | < 0.001 |
| No                                       | 49 (11.78)              |         | 37 (6.48)                     |         |

**Table 4 Relationship of Violence Tendency Scale and Attitudes towards Women Scale with adolescents' history of violence**

|                                                                                     | Violence Tendency Scale | P       | Attitudes towards Women Scale | P       |
|-------------------------------------------------------------------------------------|-------------------------|---------|-------------------------------|---------|
| <b>Took part in violence directed towards family members, relatives, or friends</b> |                         |         |                               |         |
| Never                                                                               | 44 (9.65)               | < 0.001 | 40 (5.90)                     | < 0.001 |
| Rarely                                                                              | 48 (9.010)              |         | 40 (6.06)                     |         |
| Sometimes                                                                           | 52 (9.50)               |         | 38 (6.68)                     |         |
| Usually                                                                             | 58 (11.32)              |         | 38 (6.94)                     |         |
| Very often                                                                          | 64 (12.86) <sup>a</sup> |         | 31 (9.10)                     |         |
| <b>Violence attempts received from family members, relatives, or friends</b>        |                         |         |                               |         |
| Never                                                                               | 45 (10.52)              | < 0.001 | 40 (6.30)                     | < 0.001 |
| Rarely                                                                              | 47 (9.28)               |         | 40 (5.89)                     |         |
| Sometimes                                                                           | 50 (10.73)              |         | 40 (6.44)                     |         |
| Usually                                                                             | 52 (10.30)              |         | 39 (6.58)                     |         |
| Very often                                                                          | 63 (14.20) <sup>a</sup> |         | 30 (9.09)                     |         |
| <b>Observed violence directed towards family members, relatives, or friends</b>     |                         |         |                               |         |
| Never                                                                               | 45 (10.53)              | < 0.001 | 40 (6.31)                     | < 0.001 |
| Rarely                                                                              | 46 (9.10)               |         | 41 (5.58)                     |         |
| Sometimes                                                                           | 49 (10.49)              |         | 40 (6.55)                     |         |
| Usually                                                                             | 50 (11.20)              |         | 39 (6.68)                     |         |
| Very often                                                                          | 58 (14.50) <sup>a</sup> |         | 34 (9.17)                     |         |
| <b>Observed attempted violence towards family members, relatives, or friends</b>    |                         |         |                               |         |
| Never                                                                               | 45 (9.97)               | < 0.001 | 40 (6.17)                     | < 0.001 |
| Rarely                                                                              | 46 (9.46)               |         | 40 (5.80)                     |         |
| Sometimes                                                                           | 50 (10.32)              |         | 39 (6.45)                     |         |
| Usually                                                                             | 51 (11.79)              |         | 38 (7.24)                     |         |
| Very often                                                                          | 59 (14.16) <sup>a</sup> |         | 33 (8.69)                     |         |

<sup>a</sup>This subgroup had significant results in the post hoc Bonferroni analysis.

friends. Adolescents who had experienced violence directed towards themselves or close relations had a higher tendency to act violently themselves. In the study of Özgür et al., among high school students, 10% of the adolescents experienced physical violence directed towards themselves, and in the same study, only 45% of the students defined psychological violence as violence (22). In the current study, the number of adolescents who experienced only physical violence was not available because all types of violence were included while asking about perceptions and experiences of violence. When considering all types of violence, the frequency of perceived violence was almost 5 times higher than that in the study of Özgür et al., although that study focused on physical violence.

More than half of our respondents considered psychological problems, alcohol, or perceptions of honour as the main reasons for the experienced violence. Males had a greater tendency towards violence and a less profeminist attitude when compared to females. A greater tendency to resort to violence by male when compared to female adolescents was confirmed by other studies

(16,22–24). These findings can be explained by the differences in the upbringings of male and female children, and the given social roles during that time (24,25).

We found that conservative and traditional attitudes towards women were associated with a higher tendency towards violence among adolescents. The finding of a negative relation between attitudes towards women and the tendency towards violence is supported by the literature. Similar findings were reported by Çetinkaya (16). Reyes et al. reported that the perception of gender roles was associated with dating violence among adolescents (17), which was also determined among Canadian adolescents in the study of Sears et al. and in Chinese adolescents by Shen et al. (18,19). In many other studies, it has been shown that masculinity and domination by men are both linked to the perpetration of violence by men (20,21).

The strength of this study was that it was based on a large well-chosen sample from the whole population in a large city in Western Turkey. However, there were also some limitations to the study. First, considering

**Table 5 Stepwise multiple logistic regression for tendency towards violence among adolescents**

| Independent variable                                                     | Odds ratios             | 95% confidence interval                          | Standard error | t ratio | P       |
|--------------------------------------------------------------------------|-------------------------|--------------------------------------------------|----------------|---------|---------|
| Attitudes towards women score                                            | 1.40                    | 1.30–1.54                                        | 0.41           | 2.86    | < 0.001 |
| Sex                                                                      | 4.95                    | 2.12–11.59                                       | 0.41           | 2.86    | < 0.001 |
| Violence attempts received from family members, relatives, or friends    | 4.17                    | 2.46–7.10                                        | 0.24           | 16.39   | < 0.001 |
| Observed violence attempts towards family members, relatives, or friends | 8.33                    | 5.37–13.07                                       | 0.22           | 4.23    | < 0.001 |
| Intercept                                                                | 1.44 x 10 <sup>13</sup> | 1.65 x 10 <sup>12</sup> –1.19 x 10 <sup>14</sup> | 1.02           | 30.01   | < 0.001 |

R<sup>2</sup> = 0.14

P &lt; 0.001

n = 2321

the population of the whole country and the diversity of ethnicities, traditions, and social lives in each region, results based on only 1 city cannot be generalized to the entire population. A second and more serious limitation was the social bias in the recruitment in high schools. Our data represented the views of adolescents attending high schools in Western Turkey, who traditionally have a higher economic status when compared with the rest of the country. A deeper understanding would be gained by the inclusion of low-income adolescents from other regions. Third, the study was cross-sectional and therefore could not show causal relationships between the tendency towards violence and attitudes towards women. Fourth, the perceptions of the different types of violence were investigated using words such as physical and emotional. Adolescents might have interpreted these terms differently and that might have resulted in an underestimation of the true prevalence of violence. A better approach would be to give case definitions and

ask adolescents if they considered the related scenarios as violence.

## Conclusion

One in three adolescents experienced or observed violence in their immediate environments. Thus, psychological screening may be performed to recognize recipients and observers of violence and support them medically and socially. Since there was a negative correlation between the attitudes towards women and the tendency towards violence, improving either one of these may have a positive effect on the other. From a long-term perspective, policies that protect and advocate the rights of adolescents, which can prevent the reoccurrence of violence, should be further developed and then successfully implemented.

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## Tendance à la violence et rôles sociaux : une étude descriptive parmi les lycéens en Turquie

### Résumé

**Contexte :** La violence touche plus de la moitié des femmes dans le monde et la perception des rôles sociaux joue un rôle important à cet égard. L'adolescence est une période de développement sensible dans la vie d'un individu. Il est donc important de comprendre la perception de la violence et de changer l'acceptation de cette dernière parmi les adolescents.

**Objectifs :** Aborder les expériences des adolescents en matière de violence et sa relation avec les attitudes envers les femmes.

**Méthodes :** La présente étude descriptive, comprenant 2321 lycéens, a été menée à Izmir (Turquie) entre mai et août 2015. Nous avons utilisé un questionnaire pour recueillir des données sur les informations sociodémographiques et les perceptions des adolescents à l'égard de la violence. Les échelles concernant la tendance à la violence et les attitudes envers les femmes ont été appliquées pour montrer les perceptions des adolescents au sujet des rôles sociaux.

**Résultats :** Un tiers des adolescents ont déclaré avoir été exposés à une forme de violence. Plus de la moitié ont été témoins de violences contre des membres de leur famille, des parents ou des amis proches. Les attitudes conservatrices et traditionnelles à l'égard des femmes étaient associées à une tendance plus élevée à la violence chez les adolescents.

**Conclusions :** Pour mettre fin à la violence à l'égard des femmes, les actions de santé publique devraient être centrées sur la population jeune et sa représentation des rôles sociaux.

## الاتجاه نحو العنف والأدوار الاجتماعية: دراسة وصفية بين طلاب المدارس الثانوية في تركيا

توجبا كالييسكان، كاندان قندير، حمزة أكيول، نيلز كير، عزيزة جولال

### الخلاصة

الخلفية: يؤثر العنف على أكثر من نصف النساء في جميع أنحاء العالم، ويساهم تصور الأدوار الاجتماعية مساهمة كبيرة في هذا الشأن. وتعد المراهقة فترة نماء حساسة في حياة الفرد. ولذلك، من المهم استيعاب كيفية تصور العنف وتغيير فكرة تقبله بين المراهقين.

الأهداف: هدفت هذه الدراسة إلى تناول تجارب المراهقين مع العنف، وعلاقة ذلك بالمواقف تجاه المرأة.

طرق البحث: أجريت هذه الدراسة الوصفية التي شملت 2321 طالبًا من طلاب المدارس الثانوية في أزمير، تركيا، في الفترة بين مايو/ أيار وأغسطس/ آب 2015. ولقد استخدمنا استبيانًا لجمع بيانات عن المعلومات الاجتماعية والسكانية، وطبقت مقاييس اتجاهات ومواقف العنف تجاه المرأة، لتوضيح تصورات المراهقين بشأن الأدوار الاجتماعية.

النتائج: أفاد ثلث المراهقين بأنهم تعرضوا لأحد أشكال العنف. وشهد أكثر من نصفهم عنفاً ضد أفراد أسرهم، أو أقاربهم، أو أصدقائهم المقربين. وارتبطت المواقف المتحفظة والتقليدية تجاه النساء بميل أكبر نحو ممارسة العنف بين المراهقين.

الاستنتاجات: حتى يتسنى القضاء على العنف ضد المرأة، يتعين أن تركز إجراءات الصحة العامة على الشباب، وعلى كيفية تمثيلهم للأدوار الاجتماعية.

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# Reported history and correlates of drug overdose among people who inject drugs in Lebanon

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## Abstract

**Background:** Opioid overdose is an issue of increasing concern, and better epidemiologic data are needed to implement effective treatment programmes. Few published reports address the frequency of fatal or non-fatal opioid overdose in countries in the Middle East and North Africa region.

**Aims:** We provide the first-ever study of the reported history and correlates of drug overdose among a broad sample of out-of-treatment people who inject drugs (PWID) in Lebanon.

**Methods:** This was a respondent-driven sampling, cross-sectional, biobehavioural study carried out in Beirut, Lebanon, between October 2014 and February 2015. Data were collected on sociodemographics, risk profiles, drug use histories, drug and sexual risk behaviours, history of substance use treatment and incarceration, and pertinent infectious disease test results.

**Results:** We recruited 382 eligible PWID. The majority were Lebanese (95.3%) men (95.5%), with an average age of 30.3 (standard deviation 9.9) years. A history of drug overdose was reported in 171 (44.8%) PWID. Around 86% reported heroin as the first drug they had ever injected. Approximately half (53.0%) reported a history of substance use treatment, and 80.1% reported a history of arrest for the injection or possession of drugs. Our analysis demonstrates that, after adjusting for relevant covariates, drug overdose is associated with a history of incarceration, drug treatment, and an increased number of arrests in one's lifetime for drug injection or possession.

**Conclusions:** The observed associations suggest overdose prevention programmes may be effective if targeted to recently incarcerated people and to those receiving drug treatment.

Keywords: PWID, opioid, overdose, risk behaviours, Lebanon

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## Introduction

Drug overdose is a public health concern that affects diverse populations across the globe (1). Nevertheless, there are few published reports on the frequency of fatal or non-fatal opioid overdose in the Middle East and North Africa (MENA) region. We therefore conducted the first study of non-fatal drug overdose in Lebanon. In recent years, increasing attention has focused on overdose related to illicit opioid consumption. Overdose deaths, which are attributable in most cases to opioids, contribute to between one-third and one-half of all drug-related deaths (2). Opioids affect the part of the brain that regulates breathing, and excessive doses—overdoses—can cause respiratory depression and death. Opioid use disorder increases the risk of overdose, particularly in context of opioid use following a period of voluntary abstinence, release from incarceration, or cessation of treatment for opioid use disorder, when opioid tolerance is diminished

(3–9). Alcohol or sedative consumption concurrent with opioid use also increases the risk of overdose.

It is estimated that mortality among people who inject drugs (PWID), which are frequently opioids, is 14 times greater than that of the general population (2). A 2012 study estimated that about 69 000 people die every year from opioid overdose globally (3), but this research relies on data prior to the recent rise in opioid-overdose deaths in North America, Europe, and Australia, which have reached crisis proportions (10–12). Drug overdose can be either intentional (in cases of attempted suicide) or unintentional (e.g. too much of a drug taken accidentally or the wrong drug or doses given or taken in error), with unintentional overdose being far more common (13). Non-fatal overdoses are a strong predictor of future fatal overdose (14,15). The National Center for Injury Prevention and Control in the United States of America is among the many organizations that argue that “drug overdose should

be treated as an injury to which prevention strategies should be applied” (16). Effective interventions, including the wide-scale distribution of naloxone, have proven to be effective strategies to reduce fatal overdoses among opioid users (15,17). Other effective interventions include continuous opioid agonist therapy, extended release or implanted opioid antagonist, treatment of co-occurring substance use, and collaboration with law enforcement to reduce the risk environment (10,18).

There is a limited understanding of the burden of drug overdose among PWID, particularly in low- and-middle income countries. The few publications that do exist, mostly from southeast Asia, reveal a significant burden of non-fatal overdose among PWID as well as a high prevalence of witnessing overdoses among drug-using peers (19,20). There are limited data on opioid use disorder and its complications in the Arab countries in the MENA region, and prior estimates may be unreliable. According to the World Health Organization, the prevalence of drug use disorder and injection drug use in the Eastern Mediterranean Region is estimated to be 3500 per 100 000 and 172 per 100 000, respectively, accounting for a loss of 4 disability-adjusted life years (DALYs) and 9 deaths per 1000 population (21). There are even fewer data on the frequency of fatal or non-fatal opioid overdose from Arab countries in the Region (22,23). Here, we provide the first-ever study of the prevalence and correlates of non-fatal opioid overdose among a broad sample of out-of-treatment PWID in Lebanon.

## Methods

### Survey

This analysis relies on data from a larger study conducted in 2014–15 by a team of Lebanese and American researchers and a local field team with staff from 4 established nongovernmental organizations working on substance use and HIV/AIDS prevention issues. The primary aims of the larger study were to estimate the population size of PWID and men who have sex with men in the greater Beirut area, and to estimate the prevalence of bloodborne infections (HIV and HCV) and associated risk factors in these 2 populations. In addition to the data needed for PWID population size and infection prevalence estimation, we collected quantitative demographic and sexual and drug use behavioural data using a structured questionnaire (see below) that included 3 questions on drug overdose: “Have you ever experienced a drug overdose when you lost consciousness or stopped breathing?” “How many overdoses have you experienced?” and “How many times have you experienced a drug overdose in the last 12 months?”

The absence of sampling frames for the random recruitment of individuals within PWID populations led us to employ respondent-driven sampling to accrue study participants (24). Respondent-driven sampling relies on a chain referral approach in which each enrolled participant was given 4 coupons to recruit others eligible to participate from within their social network

of individuals in the hidden population. The field staff, seasoned outreach workers with long histories of working with PWID, identified and recruited the first set of PWID participants, known as “seeds.” Subsequently, individuals who presented coupons to join the study were screened for eligibility using 2 qualifying criteria: the presence of injection stigmata or, if none, the self-reporting of injection in the past 3 months followed by a convincing description of the drug injection process. In our study, recruitment ended on a specific date, 4 months after the first seeds were enrolled.

In brief, our structured questionnaire followed the framework of the Integrated Bio-Behavioral Survey toolbox, a free publicly available tool available from the University of San Francisco Institute for Global Health Sciences and developed in conjunction with the HIV epidemiology section of the San Francisco Department of Public Health (25). The authors of this tool indicate that this survey was designed to produce “high-quality, user-friendly, practical, reliable and reproducible data to inform policy and programmes to improve the health of HIV-affected populations and reduce the spread of the virus” (25). This survey tool has been used in published research in at least 8 countries in Eastern Europe, Africa and Asia (26).

We added questions to collect additional details of injection drug-using behaviours. The survey was divided into major sections: sociodemographic, sexual history and current behaviours; sexual networks; drug use; social network; stigma, discrimination and violence; history of HIV and sexually transmitted infections; and for those who reported being HIV positive, HIV care experiences. The questionnaire was translated into Arabic and then back into English and finalized through pilot testing with field staff from the local agencies.

Further details on study protocol, recruitment methodology (using respondent-driven sampling), data collection instruments, and the HIV and HCV testing approach are detailed elsewhere (26). Ethical approval was obtained from the Institutional Review Board at the Lebanese American University.

### Statistical methods

Our research team analysed survey data using R, version 3.5.1, to determine the characteristics of the sample, describe the frequencies of individual risk behaviours and practices, and conduct analyses. History of drug overdose was determined by self-report. We conducted descriptive bivariate analysis using Chi-square statistic by comparing the characteristics of those with and those without histories of drug overdose. We also conducted logistic regression of the correlates of drug overdose within this sample. Missing data required for the regression analysis were imputed using a random forest algorithm via the R package *missRanger* (27).

To ensure that variance on estimates was adjusted for imputation, 100 datasets with imputed values were generated and the results were pooled using Rubin’s rule. Averages of parameter estimates were obtained

and variance was acquired by taking the average of the squared standard errors with the variance of parameter estimates across all of the imputed datasets. This resulted in inflated *P*-values and confidence intervals.

## Results

### Participants

We recruited a total of 390 participants, beginning with 16 PWID seeds, of whom 382 had recently engaged in injection drug use. The majority of the 382 PWID were men (95.5%), and the mean age was 30.3 (standard deviation 9.9) years. Almost all participants were from Lebanon (95.3%). Approximately 89% resided in greater Beirut.

Only 15.2% had completed university or some university/college education, 75.3% were never married or in a committed relationship, and 63.1% had no income/were not employed. Among the 382 study participants, 171 (44.8%) reported a history of drug overdose (Table 1).

### Drug use

Heroin was reported by 85.8% of the participants as the drug they injected the first time they used drugs (Table 2). Most individuals (92.6%) reported injecting drugs in the past month. A history of arrest or incarceration for the injection or possession of drugs was reported by 80.1% of participants. Of those who had been incarcerated, 15.3% injected drugs while in prison. Approximately half the participants (53.0%) reported prior engagement in sub-

**Table 1 Sociodemographic characteristics by overdose status among people who use drugs in Lebanon, 2014–2015**

| Factor                                       | Total                     | Experience of overdose           |                                 |
|----------------------------------------------|---------------------------|----------------------------------|---------------------------------|
|                                              | <i>n</i> = 382<br>No. (%) | Yes<br><i>n</i> = 171<br>No. (%) | No<br><i>n</i> = 211<br>No. (%) |
| <b>Sex</b>                                   |                           |                                  |                                 |
| Male                                         | 365 (95.5)                | 163 (44.7)                       | 202 (55.3)                      |
| Female                                       | 17 (4.5)                  | 8 (47.1)                         | 9 (52.9)                        |
| <b>Country of origin</b>                     |                           |                                  |                                 |
| Lebanon                                      | 364 (95.3)                | 159 (43.7)                       | 205 (56.3)                      |
| Syria                                        | 9 (2.4)                   | 5 (55.6)                         | 4 (44.4)                        |
| Other                                        | 8 (2.1)                   | 7 (87.5)                         | 1 (12.5)                        |
| Missing                                      | 1 (0.3)                   | 0 (0.0)                          | 1 (100.0)                       |
| <b>Education level</b>                       |                           |                                  |                                 |
| None                                         | 87 (22.8)                 | 36 (41.4)                        | 51 (58.6)                       |
| Primary school                               | 159 (41.7)                | 64 (40.3)                        | 95 (59.7)                       |
| Secondary school                             | 77 (20.2)                 | 40 (51.9)                        | 37 (48.1)                       |
| At least some university/college             | 58 (15.2)                 | 30 (51.7)                        | 28 (48.3)                       |
| Missing                                      | 1 (0.3)                   | 0 (0.0)                          | 1 (100.0)                       |
| <b>Employment status</b>                     |                           |                                  |                                 |
| Employed                                     | 139 (36.9)                | 61 (43.9)                        | 78 (56.1)                       |
| Unemployed                                   | 238 (63.1)                | 106 (44.5)                       | 132 (55.5)                      |
| Missing                                      | 5 (1.3)                   | 4 (80.0)                         | 1 (20.0)                        |
| <b>Marital status</b>                        |                           |                                  |                                 |
| Married                                      | 49 (12.9)                 | 23 (46.9)                        | 26 (53.1)                       |
| Separated/divorced                           | 45 (11.8)                 | 20 (44.4)                        | 25 (55.6)                       |
| Never married                                | 287 (75.3)                | 128 (44.6)                       | 159 (55.4)                      |
| Missing                                      | 1 (0.3)                   | 0 (0.0)                          | 1 (100.0)                       |
| <b>City of residence</b>                     |                           |                                  |                                 |
| Beirut                                       | 323 (88.7)                | 140 (43.3)                       | 183 (56.7)                      |
| Other city                                   | 40 (11.0)                 | 22 (55)                          | 18 (45)                         |
| Don't know/decline to answer                 | 1 (0.3)                   | 0 (0.0)                          | 1 (100.0)                       |
| Missing                                      | 18 (4.7)                  | 9 (50.0)                         | 9 (50.0)                        |
|                                              | <b>Mean (SD)</b>          | <b>Mean (SD)</b>                 | <b>Mean (SD)</b>                |
| <b>Age (years)</b>                           | 30.3 (9.9)                | 31.1 (9.4)                       | 29.6 (10.4)                     |
| <b>Duration in city of residence (years)</b> | 19.2 (13.6)               | 19.0 (12.8)                      | 19.3 (14.2)                     |

SD = standard deviation.

**Table 2 Drug use-related history and behaviour distributed by overdose status among people who use drugs in Lebanon, 2014–2015**

| Factor                                                          | Total<br>No. (%) | Experience of overdose |               | P-value            |
|-----------------------------------------------------------------|------------------|------------------------|---------------|--------------------|
|                                                                 |                  | Yes<br>No. (%)         | No<br>No. (%) |                    |
| <b>First drug ever injected</b>                                 |                  |                        |               | <b>0.424</b>       |
| Heroin                                                          | 327 (85.8)       | 148 (45.3)             | 179 (54.7)    |                    |
| Cocaine                                                         | 46 (12.1)        | 17 (37)                | 29 (63.0)     |                    |
| Methamphetamine or similar stimulant                            | 1 (0.3)          | 1 (100.0)              | 0 (0.0)       |                    |
| Pharmaceutical opioid                                           | 1 (0.3)          | 1 (100.0)              | 0 (0.0)       |                    |
| Other (specify)                                                 | 6 (1.6)          | 3 (50.0)               | 3 (50.0)      |                    |
| Missing                                                         | 1 (0.3)          | 1 (100.0)              | 0 (0.0)       |                    |
| <b>Ever arrested for drug injection or possession</b>           |                  |                        |               | <b>&lt; 0.0001</b> |
| Yes                                                             | 286 (80.1)       | 149 (52.1)             | 137 (47.9)    |                    |
| No                                                              | 71 (19.9)        | 15 (21.1)              | 56 (78.9)     |                    |
| Missing                                                         | 25 (6.5)         | 7 (28.0)               | 18 (72.0)     |                    |
| <b>Ever incarcerated for drug injection or possession</b>       |                  |                        |               | <b>&lt; 0.0001</b> |
| Yes                                                             | 288 (76.2)       | 153 (53.1)             | 135 (46.9)    |                    |
| No                                                              | 90 (23.8)        | 17 (18.9)              | 73 (81.1)     |                    |
| Missing                                                         | 4 (1.0)          | 1 (25.0)               | 3 (75.0)      |                    |
| <b>Ever entered substance dependence treatment for drug use</b> |                  |                        |               | <b>&lt; 0.0001</b> |
| Yes                                                             | 201 (53.0)       | 120 (59.7)             | 81 (40.3)     |                    |
| No                                                              | 178 (47.0)       | 50 (28.1)              | 128 (71.9)    |                    |
| Missing                                                         | 3 (0.8)          | 1 (33.3)               | 2 (66.7)      |                    |
| <b>Injection frequency</b>                                      |                  |                        |               | <b>0.037</b>       |
| Every day                                                       | 252 (66.8)       | 127 (50.4)             | 125 (49.6)    |                    |
| About every other day                                           | 69 (18.3)        | 24 (34.8)              | 45 (65.2)     |                    |
| 1–3 times per week                                              | 41 (10.9)        | 13 (31.7)              | 28 (68.3)     |                    |
| Less than once per week                                         | 15 (4.0)         | 6 (40.0)               | 9 (60.0)      |                    |
| Missing                                                         | 5 (1.3)          | 1 (20.0)               | 4 (80.0)      |                    |
| <b>Drugs used</b>                                               |                  |                        |               | <b>0.001</b>       |
| Heroin                                                          | 249 (65.9)       | 108 (43.4)             | 141 (56.6)    |                    |
| Cocaine                                                         | 64 (16.9)        | 21 (32.8)              | 43 (67.2)     |                    |
| Club drug (specify)                                             | 3 (0.8)          | 2 (66.7)               | 1 (33.3)      |                    |
| Pharmaceutical opioid                                           | 33 (8.7)         | 14 (42.4)              | 19 (57.6)     |                    |
| Other (specify)                                                 | 29 (7.7)         | 23 (79.3)              | 6 (20.7)      |                    |
| Missing                                                         | 4 (1.0)          | 3 (75.0)               | 1 (25.0)      |                    |
| <b>Injected alone or shared your drugs with another person</b>  |                  |                        |               | <b>0.068</b>       |
| Alone                                                           | 263 (69.2)       | 128 (48.7)             | 135 (51.3)    |                    |
| With one person                                                 | 78 (20.5)        | 31 (39.7)              | 47 (60.3)     |                    |
| With more than one person                                       | 39 (10.3)        | 12 (30.8)              | 27 (69.2)     |                    |
| Missing                                                         | 2 (0.5)          | 0 (0.0)                | 2 (100.0)     |                    |
| <b>Drug sharing</b>                                             |                  |                        |               | <b>0.132</b>       |
| Drugs divided prior to dissolving                               | 55 (42.3)        | 20 (36.4)              | 35 (63.6)     |                    |
| Drugs divided after dissolving                                  | 75 (57.7)        | 29 (38.7)              | 46 (61.3)     |                    |
| Missing                                                         | 252 (66.0)       | 122 (48.4)             | 130 (51.6)    |                    |
| <b>Syringe use practices</b>                                    |                  |                        |               | <b>0.176</b>       |
| Syringe with a fixed needle                                     | 337 (88.7)       | 145 (43)               | 192 (57.0)    |                    |
| Syringe with a detachable needle                                | 42 (11.1)        | 25 (59.5)              | 17 (40.5)     |                    |
| Other                                                           | 1 (0.3)          | 0 (0.0)                | 1 (100.0)     |                    |
| Missing                                                         | 2 (0.5)          | 1 (50.0)               | 1 (50.0)      |                    |

**Table 2 Drug use-related history and behaviour distributed by overdose status among people who use drugs in Lebanon, 2014–2015 (concluded)**

| <b>Use of new syringe in most recent injection</b>                  |                  |                  |                  | <b>0.007</b> |
|---------------------------------------------------------------------|------------------|------------------|------------------|--------------|
| New syringe                                                         | 259 (69.1)       | 101 (39)         | 158 (61)         |              |
| Not a new syringe                                                   | 115 (30.7)       | 66 (57.4)        | 49 (42.6)        |              |
| Don't know/decline to answer                                        | 1 (0.3)          | 1 (100.0)        | 0 (0.0)          |              |
| Missing                                                             | 7 (1.8)          | 3 (42.9)         | 4 (57.1)         |              |
|                                                                     | <b>Mean (SD)</b> | <b>Mean (SD)</b> | <b>Mean (SD)</b> |              |
| <b>Age at first injection (years)</b>                               | 19.5 (5.5)       | 18.6 (4.9)       | 20.3 (58.8)      | 0.003        |
| <b>No. of people who shared the most recent same injection site</b> | 1.8 (9.5)        | 2.5 (12.4)       | 1.2 (6.4)        | 0.184        |
| <b>No. of people who inject drugs seen in the past four weeks</b>   | 18.8 (20.3)      | 21.7 (23.4)      | 16.5 (17.2)      | 0.014        |
| <b>No. of arrests for drug injection or possession</b>              | 4.2 (5.1)        | 5.6 (5.1)        | 3.1 (4.7)        | < 0.001      |

SD = standard deviation.

stance dependence treatment. Heroin and cocaine were the 2 most common drugs injected in the past month, reported by 65.9% and 16.9% of the participants. About 69% reported injecting alone, while 30% reported injecting with one or more persons. Of those who reported sharing their drugs, 57.7% reported sharing the drugs after they were dissolved. About 89% reported using a syringe with a fixed needle for injection. In addition, those individuals who experienced overdose tended to be in contact with a greater number of PWID in the past month compared to individuals with no history of overdose (21.6 and 16.9 PWID respectively) (Table 2).

### History of overdose

Those who reported having ever experienced a drug overdose were also significantly more likely to have ever been arrested for injecting or possessing drugs, ever been incarcerated for injecting or possessing drugs, ever participated in substance dependence treatment, inject less frequently than every day, and inject alone. They were also significantly less likely to use a syringe previously used by another person than those who reported never experiencing a drug overdose (Table 2). Those who reported an experience of drug overdose were an average of 1.5 years younger than those who had not experienced an overdose when they first injected drugs. Among those who reported to have ever overdosed, 54.0% reported an overdose in the past year, and they reported 3.4 overdoses on average during their lifetimes.

We used a multivariable logistic regression to model the factors correlated with history of drug overdose among our study participants (Table 3). Those with a history of incarceration and engagement in substance dependence treatment and those with a greater number of arrests due to drug possession or injection in their lifetimes were more likely to report histories of drug overdose.

### Number of overdoses

Of those who had experienced overdoses, individuals reporting more than one overdose event (64.3%), compared with those reporting only a single event (35.7%), reported

a statistically significantly higher number of arrests for injecting or possessing drugs ( $P = 0.005$ ).

### Recentness of overdose experiences

We asked respondents how many times they had experienced a drug overdose in the year prior to the interview. We found that 60 individuals reported experiencing one overdose in the last year and 108 respondents experienced 2 or more drug overdoses in the last year (data not shown).

### Discussion

In this first study of drug overdose, drawn from the largest sample of PWID in Lebanon to date, drug overdose was reported by almost half the study population. Those who reported a history of drug overdose were slightly younger when they first injected, were more likely to have been born outside of Lebanon (mostly in Syria), were more likely to have a history of arrest, incarceration, and substance dependence treatment, were less likely to have injected less than once per week, reported less use of cocaine and more injection of “club drugs,” and were more likely to have injected with more than one person. In multivariable logistic regression analysis, 3 factors, history of incarceration, prior receipt of treatment for substance dependence, and a higher number of arrests for drug injection or possession were associated with reporting ever having experienced a drug overdose.

The proportion of our sample who reported a history of drug overdose is significantly higher than the baseline overdose prevalence reported by a study of patients in a Lebanese drug treatment programme conducted about a year before our study (22). This difference might exist because our sample was not recruited from substance use treatment programmes and may represent PWID at higher risk of drug overdose. Moreover, in our sample, a history of drug overdose was higher among non-Lebanese (mostly Syrians), who have less access to drug treatment in Lebanon. The disparity is alarming given the large population of displaced Syrians in Lebanon and their general difficulty in accessing health care services (28). Also, the proportion of non-fatal overdose

**Table 3 Logistic regression of the predictors of overdose among people who use drugs in Lebanon, 2014–2015**

| Predictor                                                        | OR (95% CI)           | P-value  |
|------------------------------------------------------------------|-----------------------|----------|
| <b>Age</b>                                                       | 1.008 (0.976–1.041)   | 0.6352   |
| Sex                                                              |                       |          |
| Male                                                             | 1                     |          |
| Female                                                           | 1.438 (0.431–4.803)   | 0.5552   |
| <b>Employment status</b>                                         |                       |          |
| Employed                                                         | 1                     |          |
| Unemployed                                                       | 0.969 (0.593–1.585)   | 0.9296   |
| <b>Marital status</b>                                            |                       |          |
| Currently married                                                | 1                     |          |
| Previously married                                               | 0.657 (0.261–1.658)   | 0.3748   |
| Never married                                                    | 0.955 (0.458–1.995)   | 0.9032   |
| Education level                                                  |                       |          |
| Some/completed university or college                             | 1                     |          |
| No primary school                                                | 0.958 (0.415–2.212)   | 0.9194   |
| Completed primary school                                         | 0.881 (0.416–1.865)   | 0.7402   |
| Completed secondary school                                       | 0.861 (0.388–1.909)   | 0.7130   |
| Injection frequency                                              |                       |          |
| Less than once a week                                            | 1                     |          |
| Everyday                                                         | 2.21 (0.68–7.187)     | 0.1884   |
| About every other day                                            | 1.915 (0.528–6.945)   | 0.3238   |
| One to three times a week                                        | 1.14 (0.299–4.349)    | 0.8479   |
| Incarcerated for drug injection or possession                    |                       |          |
| Never incarcerated                                               | 1                     |          |
| Incarcerated                                                     | 13.073 (1.972–86.654) | 0.0081   |
| <i>Prior engagement in substance dependence treatment</i>        |                       |          |
| Never in treatment                                               | 1                     |          |
| Treatment                                                        | 3.064 (1.854–5.064)   | < 0.0001 |
| Arrested for drug injection or possession                        |                       |          |
| Never arrested                                                   | 1                     |          |
| Arrested                                                         | 0.179 (0.028–1.13)    | 0.0681   |
| No. of arrests for drug injection or possession                  | 1.068 (1.01–1.129)    | 0.0209   |
| No. of people who inject drugs you have seen in the past 4 weeks | 1.012 (0.999–1.026)   | 0.0805   |
| Age of first drug injection                                      | 0.955 (0.903–1.009)   | 0.1027   |

Missing values were imputed using a random forest imputation. P-values and confidence intervals (CI) have been adjusted for imputation.  
OR = odds ratio.

in our study is consistent with the proportion reported by a systematic review published in 2019, which reported that 20.5% and 41.5% of PWID had experienced non-fatal

overdose in the previous 12 months and in their lifetimes, respectively (29).

A majority of those who reported a history of drug overdose in our study had prior experience with substance use treatment programmes, and three-quarters had been incarcerated. Our findings are consistent with other studies that found similar associations (4–9). These institutional interactions could provide important opportunities for intervention, offering individuals overdose prevention education and training programmes and access to naloxone. This intervention is particularly important for those leaving prisons, as the likelihood of drug overdose is significantly higher after release (30–33).

Lebanon can consider modelling its overdose prevention programmes after those which already exist at drug treatment centres or in prison systems in other countries (34). We presented our study findings to a group of stakeholders, including treatment and criminal justice representatives, and we plan to use our contacts with these institutions as a springboard to further disseminate our research and to discuss developing and implementing overdose prevention efforts in their systems. We are also in the process of obtaining information about the availability of naloxone and its provision in emergency department ambulances. The strong social ties that exist between those experiencing overdose episodes suggest that overdose programmes that use word-of-mouth to offer overdose prevention and response training could reach the more vulnerable, especially if naloxone was available for community-based distribution.

Our study has several limitations. We relied on self-reporting to capture history of drug overdose, which may reflect inaccurately its prevalence. Also, our findings are not necessarily applicable to larger geographic areas or to other groups of PWID. The final limitation of our study is the 5-year lag time from the recruitment of study participants to the publication of the results. However, we are not aware of any publications on this research topic and with this study population during this time period.

## Conclusion

In our sample of out-of-treatment PWID in the greater Beirut area, almost half reported a history of drug overdose and most had experienced incarceration and substance use treatment. This observed association suggests that overdose prevention programmes may be effective if targeted to recently incarcerated people and to those receiving drug treatment. Community-based interventions also have the potential to reach those at risk.

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**Competing interests:** None declared.

## Antécédents et corrélats rapportés de l'overdose d'opioïdes chez les consommateurs de drogues injectables au Liban

### Résumé

**Contexte:** Le problème de l'overdose d'opioïdes est une préoccupation croissante, et de meilleures données épidémiologiques sont nécessaires pour mettre en œuvre des programmes de traitement efficaces. Peu de rapports publiés traitent de la fréquence des overdoses d'opioïdes mortelles ou non dans les pays de la Région du Moyen-Orient et de l'Afrique du Nord.

**Objectifs:** Nous présentons la toute première étude sur les antécédents et les corrélats rapportés d'overdoses de drogues dans un large échantillon de consommateurs de drogues injectables hors traitement au Liban.

**Méthodes:** Il s'agissait d'une étude biocomportementale transversale, par échantillonnage dirigé par les répondants, réalisée à Beyrouth (Liban) entre octobre 2014 et février 2015. Des données ont été recueillies sur les caractéristiques sociodémographiques, les profils de risque, les antécédents de consommation de drogues, les comportements à risque en matière de drogues et de sexualité, les antécédents de traitement et d'incarcération liés à l'utilisation de substances psychoactives et les résultats de tests pertinents sur les maladies infectieuses.

**Résultats:** Nous avons recruté 382 consommateurs de drogues injectables éligibles. La majorité étaient des hommes (95,5 %) libanais (95,3 %), avec un âge moyen de 30,3 ans (écart type 9,9). Un antécédent d'overdoses a été rapporté pour 171 consommateurs de drogues injectables (44,8 %). Environ 86 % ont déclaré que l'héroïne était la première drogue qu'ils avaient jamais injectée. Près de la moitié (53,0 %) ont signalé des antécédents de traitement lié à l'utilisation de substances psychoactives, et 80,1 % ont rapporté des antécédents d'arrestation pour injection ou possession de drogues. Notre analyse démontre qu'après ajustement pour tenir compte des covariables pertinentes, l'overdose de drogue est associée à des antécédents d'incarcération, de traitement médicamenteux et à un nombre accru d'arrestations au cours de la vie pour injection ou possession de drogue.

**Conclusions:** Les associations observées suggèrent que les programmes de prévention des overdoses pourraient être efficaces s'ils ciblent les personnes récemment incarcérées et celles recevant un traitement médicamenteux.

## السوابق المبلغ بها والعوامل المرتبطة بتعاطي جرعة مفرطة من المخدرات بين الأشخاص الذين يتعاطون المخدرات حقناً في لبنان

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### الخلاصة

**الخلفية:** يُعد تعاطي جرعة مفرطة من الأفيونيّات من القضايا التي تُثير قلقاً متزايداً، وهناك حاجة إلى بيانات وبائية أفضل لتنفيذ برامج علاج فعالة. ويتناول عددٌ قليل من التقارير المنشورة تواتر تعاطي جرعة مفرطة مميتة أو غير مميتة من الأفيونيّات في بلدان منطقة الشرق الأوسط وشمال أفريقيا.

**الأهداف:** هدفت هذه الدراسة إلى تقديم أول دراسة عن السوابق المبلغ بها والعوامل المرتبطة بتعاطي جرعة مفرطة من المخدرات بين عينة واسعة من الأشخاص الذين انقطعوا عن العلاج، ويتعاطون المخدرات حقناً في لبنان.

**طرق البحث:** تمثلت الدراسة في أخذ العينات من المستجيبين، وإجراء دراسة مقطعية بيولوجية سلوكية في بيروت، لبنان، بين أكتوبر/ تشرين الأول 2014 و فبراير/ شباط 2015. وُجعت بيانات عن السمات الاجتماعية السكانية، ومرتسمات المخاطر، وتاريخ تعاطي المخدرات، والسلوكيات المرتبطة بمخاطر تعاطي المخدرات والمخاطر الجنسية، وتاريخ علاج تعاطي المواد والاحتجاز، ونتائج اختبارات الكشف عن الأمراض المعدية ذات الصلة.

**النتائج:** شملت الدراسة 382 شخصاً من الذين يتعاطون المخدرات حقناً. وكان معظمهم من الرجال اللبنانيين (95.3 %)، وكان متوسط أعمارهم 30.3 عاماً (الانحراف المعياري 9.9). وقد أبلغ عن سوابق تعاطي جرعة مفرطة من المخدرات في 171 (44.8 %) شخصاً من الذين يتعاطون المخدرات حقناً. وأفاد حوالي 86 % منهم بأن الميروين كان أول مُخدر تعاطوه حقناً. وأفاد نصفهم تقريباً (53.0 %) بأنه قد سبق لهم تلقي العلاج من تعاطي المواد، وأفاد 80.1 % بأنه قد سبق القبض عليهم بسبب تعاطي المخدرات حقناً أو حيازتها. ويوضح تحليلنا، بعد التكيف مع المتغيرات

المشتركة ذات الصلة، أن تعاطي جرعة مفرطة يرتبط بتاريخ سابق من الاحتجاز والعلاج من تعاطي المخدرات، وزيادة عدد الاعتقالات في حياة المرء بسبب تعاطي المخدرات حقناً أو حيازتها.

الاستنتاجات: تُشير الارتباطات التي لوحظت إلى أن برامج الوقاية من تعاطي جرعة مفرطة من المخدرات قد تصبح فعالة، إذا استهدفت الذين احتُجزوا مؤخراً، والذين يتلقون علاجاً من المخدرات.

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# Effectiveness of breast cancer screening campaigns from 2012 to 2017 by analysis of stage at diagnosis, Lebanon

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## Abstract

**Background:** Breast cancer is the most common and costly disease in Lebanon, but data on cancer stage and mortality are scarce.

**Aims:** This study aimed to assess the effect of mammography screening campaigns in reducing the breast cancer stage at diagnosis.

**Methods:** A secondary analysis was conducted of data from the Ministry of Public Health's Cancer Drug Scientific Committee database. The medical files of 3320 newly diagnosed breast cancer patients between 2012 and 2017 were reviewed. Demographic and pathology characteristics, cancer stage at diagnosis and presence of receptors were extracted and analysed.

**Results:** The median age of the patients was 53 (interquartile range 36–72) years. Most patients had positive estrogen and progesterone receptors. Patients < 35 years mostly lived in South Lebanon, had advanced stages of cancer (III and IV) at diagnosis and were more likely to have triple negative breast cancer than the older groups (31.3% versus 16.7%). Advanced stage at diagnosis was common outside Beirut (60.4% in Bekaa and 54.7% in North Lebanon). In the period 2012–2017, the trend in early stages (I and II) at diagnosis decreased from 55.6% to 41.9%, while advanced stages (III and IV) increased from 44.4% to 57.9%.

**Conclusion:** Efforts to downstage breast cancer through mammography screening in Lebanon have not succeeded. Implementation of genetic testing and tailored approaches for Lebanese women are recommended for future campaigns.

Keywords: breast cancer, neoplasm staging, hormone receptors, mammography, Lebanon

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## Introduction

Breast cancer is the most frequent cancer among women worldwide, affecting 2.1 million women annually and causing the highest number of cancer-related deaths among females (1). One in four of all newly diagnosed cases of cancer in women are breast cancer (24.2% of all female cancers) according to the GLOBOCAN 2018 report (2). Lebanon, a developing Middle Eastern country, has a high breast cancer incidence, accounting for almost 37% of cancer cases in females and 20% of all cancer cases (3).

High-income countries have a higher incidence of breast cancer than low- and middle-income countries. However, the incidence of breast cancer is rising faster in low- and middle-income countries than in high-income countries and the mortality rate is higher (4,5). In 2018, Lebanon had the sixth highest age-standardized incidence rate for breast cancer in the world – 97.6 cases per 100 000 women (6) – and the seventh highest breast cancer mortality rate – 24 per 100 000 women (7).

Implementation of screening programmes in high-income countries was followed by a decrease in advanced breast cancer and mortality rates (8): 10 years after mammography screening was introduced, breast cancer

mortality rate had fallen by 20% in high-resource settings but not in limited-resource settings with weak health systems (4).

Lebanon is one of the developing countries that most needs to promote breast cancer awareness and screening. In fact, since 2002, annual breast cancer awareness and screening campaigns have been conducted by the health ministry. These campaigns provide free mammography tests for women 40 years and older with no family history of breast cancer in all Lebanese public hospitals, and in most private medical institutions, the screening is offered at half price.

In parallel, the health ministry has renovated the National Cancer Registry (9). The registry produces yearly ongoing population-based information on cancer incidence, according to sex, age and tumour site. However, it still lacks information on cancer staging and mortality. This gap in knowledge prevents a precise evaluation of the effectiveness of screening campaigns, particularly as the stage of cancer at presentation is one of the most important prognostic factors of survival (10).

Therefore, in order to evaluate the effectiveness of breast cancer campaigns, we collected data on cancer

stage from the medical files of women receiving cancer treatment from the health ministry between 2012 and 2017. We also collected information on demographic and tumour characteristics.

## Methods

### Patients and data collection

This was a secondary analysis of data from the Cancer Drug Scientific Committee database of the health ministry. All women newly diagnosed with breast cancer between 2012 and 2017 were enrolled in the study. A total of 3320 medical files were reviewed.

The health ministry provides breast cancer drug treatment free of charge for uninsured patients, which represents over half of the caseload of breast cancer and is distributed all over the country. Therefore, the sample studied is representative of the Lebanese population.

We reviewed all laboratory, radiology and pathology reports. Information extracted from the medical records included: personal information (demographic characteristics, age at diagnosis and place of residence) and tumour characteristics (presence of estrogen, progesterone and human epidermal growth factor receptors), triple negativity (absence of estrogen, progesterone and human epidermal growth factor receptors), and disease stage at the time of diagnosis.

The patients were divided into three age groups: younger than 35 years (age group 1), 35–50 years (age group 2) and 50 years and older (age group 3).

Pathology was done at local laboratories licensed by the health ministry. Estrogen and progesterone receptors

were considered negative if staining was less than 5% positive. The presence of human epidermal growth factor receptors was considered positive if there was strong complete staining of > 30% or in the presence of the human epidermal growth factor receptor gene amplification using fluorescent in situ hybridization. The triple negative breast cancer subtype is characterized by the absence of expression of receptors for estrogen, progesterone and human epidermal growth factor.

Patients were staged according to the TNM (tumour, nodes and metastases) staging system, the most accepted classification (11). Stage at presentation was used for analysis. Clinical staging was used for all patients who had received neoadjuvant pre-operative therapy and pathological staging for all patients post-surgery.

### Statistical analysis

Data analysed using SPSS, version 24 (IBM Corp., Armonk, New York). All data were entered anonymously to ensure patient confidentiality. The chi-squared test was used to test the statistical significance of differences between categorical variables. Eight variables were included in a univariate analysis: age and cancer stage at diagnosis, governorate of residence, estrogen receptor status, progesterone receptor status, human epidermal growth factor receptor status, triple negativity status and trends in stages over the years of the study. Correlation between these variables was also explored. A *P*-value less than 0.05 was considered statistically significant.

### Ethical concerns

This study was a secondary analysis of de-identified data.

**Table 1 Demographic and pathology characteristics of the women participants, Lebanon**

| Variable                                      | Group 1<br>(< 35 years)<br><i>n</i> = 134 (4.0%) | Group 2<br>(35–< 50 years)<br><i>n</i> = 1037 (31.3%) | Group 3<br>(≥ 50 years)<br><i>n</i> = 2149 (64.7%) | Total<br>( <i>n</i> = 3320) | <i>P</i> -value <sup>a</sup> |
|-----------------------------------------------|--------------------------------------------------|-------------------------------------------------------|----------------------------------------------------|-----------------------------|------------------------------|
| <b>Median age at diagnosis (IQR), years</b>   | 31 (26–33)                                       | 44 (41–46)                                            | 59 (54–77)                                         | 53 (36–72)                  |                              |
|                                               | <b>No. (%)</b>                                   | <b>No. (%)</b>                                        | <b>No. (%)</b>                                     | <b>No. (%)</b>              |                              |
| <b>Governorate</b>                            |                                                  |                                                       |                                                    |                             | 0.001                        |
| Beirut                                        | 8 (6.0)                                          | 102 (9.8)                                             | 340 (15.8)                                         | 450 (13.5)                  |                              |
| Bekaa                                         | 20 (14.9)                                        | 187 (18.0)                                            | 265 (12.3)                                         | 472 (14.2)                  |                              |
| Mount Lebanon                                 | 21 (15.7)                                        | 187 (18.0)                                            | 584 (27.2)                                         | 792 (23.9)                  |                              |
| North Lebanon                                 | 35 (26.1)                                        | 244 (23.5)                                            | 397 (18.5)                                         | 676 (20.4)                  |                              |
| South Lebanon                                 | 50 (37.3)                                        | 317 (30.5)                                            | 563 (26.2)                                         | 930 (28.0)                  |                              |
| <b>Estrogen receptor</b>                      |                                                  |                                                       |                                                    |                             | 0.060                        |
| Positive                                      | 78 (58.2)                                        | 769 (74.0)                                            | 1605 (74.7)                                        | 2452 (73.9)                 |                              |
| <b>Progesterone receptor</b>                  |                                                  |                                                       |                                                    |                             | 0.400                        |
| Positive                                      | 74 (55.2)                                        | 705 (67.9)                                            | 1418 (66.0)                                        | 2197 (66.2)                 |                              |
| <b>Human epidermal growth factor receptor</b> |                                                  |                                                       |                                                    |                             | 0.070                        |
| Positive                                      | 31 (23.1)                                        | 233 (22.4)                                            | 461 (21.5)                                         | 725 (21.8)                  |                              |
| <b>Triple negative breast cancer</b>          |                                                  |                                                       |                                                    |                             | 0.020                        |
| Yes                                           | 42 (31.3)                                        | 204 (19.6)                                            | 310 (14.4)                                         | 556 (16.7)                  |                              |

IQR= interquartile range.

<sup>a</sup>Comparing demographic and pathology characteristics by age group.

## Results

We categorized 3320 breast cancer medical files according to age and stage of the disease at diagnosis over 6 years.

The demographic and pathology characteristics of the cases were classified into three age groups (Table 1). Median age at diagnosis for all patients was 53 years (interquartile range (IQR) 36–72 years). Age group 1 included 134 (4.0%) patients < 35 years with a median age at diagnosis of 31 (IQR 26–33) years, age group 2 included 1038 (31.2%) patients between 35 and 50 years with a median age at diagnosis of 44 (IQR 41–46) years and age group 3 included 2148 (64.8%) patients ≥ 50 years with a median age at diagnosis of 59 (IQR 54–77) years.

The greatest proportion of the cases lived in South Lebanon governorate (28.0%), while 23.9% lived in Mount Lebanon, 20.3% in North Lebanon, 14.2% in Bekaa and 13.5% in Beirut.

There was significant difference in age group between Beirut and other governorates (except for Mount Lebanon) with the lowest number of patients diagnosed younger than 50 years living in Beirut. Compared with other governorates, Bekaa had a significantly higher proportion of patients diagnosed with breast cancer younger than 50 years, and a lower proportion diagnosed older than 50 years compared to Beirut and Mount Lebanon.

Most patients had positive receptors with 73.8% positive for estrogen receptor and 66.1% positive for progesterone receptor. Human epidermal growth factor receptor was overexpressed in 21.7% of the patients. Although, hormone receptor positivity increases with age, no significant differences were found between the different age groups and positivity of the receptors for estrogen, progesterone and human epidermal growth factor. Triple negative breast cancer was present in 16.7% of patients overall, though it was significantly higher (31.3%) in age group 1 (< 35 years old) and decreased with increased patient age (14.4% in age group 3;  $P = 0.02$ ).

Of the 3320 patient records analysed, 314 patients (9.5%) had stage I disease at diagnosis, 1330 (40.1%) had stage II disease, 896 (27.0%) had stage III disease and 779 patients (23.5%) had stage IV disease (Table 2). About 35% of patients in age group 1 (< 35 years) were diagnosed at stages II and III, while 42.1% in age group 2 and 39.4% in age group 3 were diagnosed at stage II. No statistically

significance differences in staging were found between any of the age groups;  $P = 0.235$  (Table 2).

The association between stage at diagnosis and governorate of residence is shown in (Table 3). No statistically significance differences in staging were found between any of the governorates ( $P = 0.7$ ). However, advanced stages (III and IV) of cancer at diagnosis were mostly seen in areas outside of the capital, in Bekaa (60.4%) followed by North Lebanon (54.7%). On the other hand, early stages (I and II) were mostly seen in Beirut (55.1%) and Mount Lebanon (54.8%).

Distribution of tumour histological characteristics (receptors for estrogen, progesterone and human epidermal growth factor, and triple negative breast cancer) according to disease stages are summarized in Table 4. Human epidermal growth factor receptors were positive in 21.7% of all patients with no significant difference between different stages. Estrogen and progesterone receptors were positive in 73.8% and 66.1% of the patients, respectively, with statistically significant differences between stage I (85.2% positive for estrogen receptor and 78.5% positive for progesterone receptor) compared with other stages ( $P = 0.002$  for estrogen receptors and  $P = 0.001$  for progesterone receptors). However, positivity for human epidermal growth factor receptor did not change significantly by stage ( $P = 0.07$ ). In parallel, the frequency of hormone receptor negativity increased with advanced breast cancer stage.

Just 16.7% of patients in the study had triple negative breast cancer; the percentage with triple negative breast cancer was highest in stage I disease (24.7%) and lowest (8.0%) in patients diagnosed at stage IV ( $P = 0.03$ ).

compared the trends of early stage breast cancer on diagnosis to advanced stage from 2012 to 2017, early stages of breast cancer decreased from 55.6% to 41.9%, whereas advanced stages increased from 44.4% to 57.9% (Figure 1).

## Discussion

Breast cancer is the most common (9) and most costly disease (12) in Lebanon. The Lebanese health ministry is trying to eliminate the main financial barriers to breast cancer diagnosis and treatment by providing free mammography screening and free cancer drugs (13).

We evaluated the effect of breast cancer campaigns on reducing the stage of the disease at diagnosis and hence

**Table 2 Distribution of breast cancer patients according to cancer stage and age group 3320, Lebanon**

| Stage | Group 1<br>(< 35 years) | Group 2<br>(≥ 35–< 50 years) | Group 3<br>(≥ 50 years) | Total       |
|-------|-------------------------|------------------------------|-------------------------|-------------|
| I     | 11 (8.2)                | 92 (8.9)                     | 211 (9.9)               | 314 (9.5)   |
| II    | 47 (35.1)               | 437 (42.1)                   | 847 (39.4)              | 1331 (40.1) |
| III   | 48 (35.8)               | 299 (28.8)                   | 549 (25.6)              | 896 (26.9)  |
| IV    | 28 (20.9)               | 210 (20.2)                   | 541 (25.2)              | 779 (23.5)  |
| Total | 134                     | 1038                         | 2148                    | 3320        |

$P = 0.235$  (comparing cancer stages and age groups).

**Table 2 Distribution of breast cancer patients according to cancer stage and age group 3320, Lebanon**

| Stage | Group 1<br>( $< 35$ years) | Group 2<br>( $\geq 35$ – $< 50$ years) | Group 3<br>( $\geq 50$ years) | Total       |
|-------|----------------------------|----------------------------------------|-------------------------------|-------------|
| I     | 11 (8.2)                   | 92 (8.9)                               | 211 (9.9)                     | 314 (9.5)   |
| II    | 47 (35.1)                  | 437 (42.1)                             | 847 (39.4)                    | 1331 (40.1) |
| III   | 48 (35.8)                  | 299 (28.8)                             | 549 (25.6)                    | 896 (26.9)  |
| IV    | 28 (20.9)                  | 210 (20.2)                             | 541 (25.2)                    | 779 (23.5)  |
| Total | 134                        | 1038                                   | 2148                          | 3320        |

$P = 0.235$  (comparing cancer stages and age groups).

on breast cancer survival rates by analysing the trends in stage at diagnosis over 6 years.

The median age at diagnosis of our breast cancer patients was 53 years, which is lower than in the United States of America (60 years) (14). While 50% of breast cancer cases in Lebanon occur in women younger than 50 years (15), 78% of the American breast cancer patients are older than of 50 years (16). However, the median age in our study was slightly higher than that of the Arab nations (49 years) in a 2010 study (17).

A large proportion (37.3%) of young patients ( $< 35$  years old) lived in South Lebanon, outside greater Beirut (Beirut city and suburbs). This result emphasizes the importance of performing genetic mutation analysis and starting to screen women at an earlier age in this region.

In addition to patient age at diagnosis, one of the prognostic factors for breast cancer (16), other markers of prognostic and therapeutic benefits were also identified (18). We found that most patients had positive estrogen (73.8%) and progesterone (66.1%) receptors. This rate of positivity was much lower in the youngest age group – 58.2% for estrogen and 55.2% for progesterone receptors. The occurrence of breast cancer negative for estrogen receptor at earlier ages is greatly associated with tumour aggressiveness (18). In addition to estrogen receptor, human epidermal growth factor receptor, is recognized as an important prognostic factor (18). Human epidermal growth factor receptors were overexpressed in 21.7% of all patients. The most favorable outcomes were seen for hormone receptor-positive tumors followed closely by human epidermal growth factor receptor-positive tumors, with the worst outcomes observed for triple negative breast cancer (18).

Overall 16.7% of the patients had triple negative breast cancer, which is consistent with general literature estimates (19). However, we noticed a higher rate of triple negative breast cancer (31.3%) in patients younger than 35 years. Triple negative breast cancer diagnosed at a younger age has an aggressive biological behaviour with the development of metastasis within 5 years, and an increased mortality rate (20). In addition, there is a possibility of association with *BRCA1* mutations in these patients and consequently a need for genetic testing (19). Furthermore, the optimal breast imaging methods should be identified in this age group. As mammography becomes less effective at detecting breast cancer in the presence of increased breast density (21), more suitable approaches are required for screening in young patients. One of such method is the use of ultrasonography which has proven useful and cost-effective for low- and middle-income countries (21). Other new methods for breast cancer screening are also emerging, including annual breast magnetic resonance imaging in young women at high risk, particularly those carrying the *BRCA1* mutation (22).

We also found more cases with advanced stages (56.7%) than with early stages (43.3%) in age group 1 ( $< 35$  years). Breast cancer tends to be more aggressive in young patients with poorer outcomes (23). Studies have shown that a higher proportion of women aged 20–39 years have later stage and higher grade breast cancer at diagnosis than women aged 40–49 years (23). On the other hand, leading organizations and the Lebanese health ministry do not recommend mammography screening for women at average risk before the age of 40. Moreover, educational level and other sociodemographic factors vary according to residence in or outside the greater

**Table 3 Distribution of breast cancer patients in the Lebanese governorates according to stage of the disease at diagnosis**

| Governorate   | Cancer stage |            |            |            | Total       |
|---------------|--------------|------------|------------|------------|-------------|
|               | I            | II         | III        | IV         |             |
| Beirut        | 49 (10.9)    | 199 (44.2) | 104 (23.1) | 98 (21.8)  | 450 (100.0) |
| Bekaa         | 36 (7.6)     | 151 (32.0) | 168 (35.6) | 117 (24.8) | 472 (100.0) |
| Mount Lebanon | 89 (11.2)    | 346 (43.7) | 195 (24.6) | 162 (20.5) | 792 (100.0) |
| North Lebanon | 61 (9.0)     | 244 (36.1) | 188 (27.8) | 183 (27.1) | 676 (100.0) |
| South Lebanon | 79 (8.5)     | 390 (41.9) | 239 (25.7) | 222 (23.9) | 930 (100.0) |
| Total         | 314          | 1330       | 894        | 782        | 3320        |

$P$ -value = 0.70.

**Table 4 Distribution of HER2, ER & PR receptors and TNBC according to stage**

| Stage   | HER2       |             | ER          |            | PR          |             | TNBC       |             | Total             |
|---------|------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------------|
|         | +          | –           | +           | –          | +           | –           | +          | –           |                   |
| I       | 64 (20.5)  | 248 (79.5)  | 266 (85.3)  | 46 (14.7)  | 245 (78.5)  | 67 (21.5)   | 77 (24.7)  | 235 (75.3)  | 312               |
| II      | 275 (20.8) | 1048 (79.2) | 1007 (76.1) | 316 (23.9) | 913 (69.0)  | 410 (31.0)  | 298 (22.5) | 1025 (77.5) | 1323              |
| III     | 199 (22.3) | 692 (77.7)  | 625 (70.1)  | 266 (29.9) | 572 (64.2)  | 319 (35.8)  | 119 (13.4) | 772 (86.6)  | 891               |
| IV      | 184 (23.7) | 594 (76.3)  | 554 (71.2)  | 224 (28.8) | 467 (60.0)  | 311 (40.0)  | 62 (8.0)   | 716 (92.0)  | 778               |
| Total   | 722 (21.9) | 2582 (78.1) | 2452 (74.2) | 852 (25.8) | 2197 (66.5) | 1107 (33.5) | 556 (16.8) | 2748 (83.2) | 3304 <sup>a</sup> |
| P-value | 0.700      |             | 0.002       |            | 0.001       |             | 0.030      |             |                   |

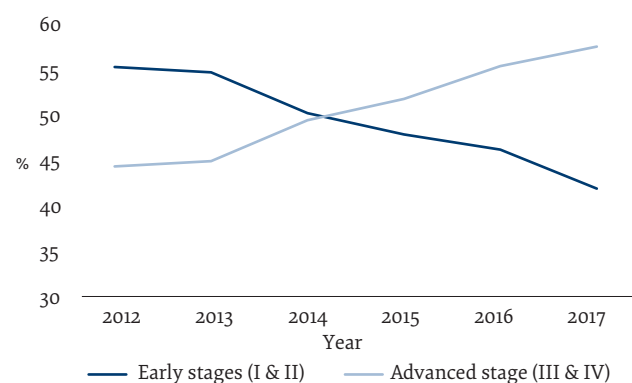
HER2= human epidermal growth factor receptor; ER= estrogen receptor; PR= progesterone receptor; TNBC= triple negative breast cancer.

<sup>a</sup>Sixteen patients were excluded from the analysis because of missing data on hormone receptors.

Beirut. Less education, lower socioeconomic status and living outside greater Beirut are associated with lower use of mammography screening (24).

Furthermore, and most importantly, our results show that from 2012 to 2017, the percentage of breast cancer cases diagnosed at an early stage decreased from 55.6% to 41.9%, whereas the percentage diagnosed at an advanced stage increased from 44.4% to 57.9%. These results were not the expected outcomes of the breast cancer campaigns. Therefore, the objective of the campaigns to lower the stage of breast cancer at diagnosis was not met and hence it can be assumed that a decrease in the breast cancer mortality rate was not achieved.

Disparities in access to information and the capacity of the health care system between different governorates are the main reasons for the lack of improvement in staging at diagnosis, and hence breast cancer care. Early stages were mostly seen in Beirut and Mount Lebanon, whereas advanced stages were mostly identified in Bekaa and North Lebanon. These two governorates are geographically far from the capital Beirut and probably the least influenced by screening campaigns. Thus, national campaigns should be scaled up to reach more women all over the country.

**Figure 1 Trends in early stage (I and II) breast cancer and advanced stage (III and IV), Lebanon, 2012–2017**

According to the World Health Organization, for a mammography screening programme to be effective in reducing mortality, it needs to cover at least 70% of the population at risk (25). Lebanon, is far off this number and only reached 45% of eligible women in 2018 (unpublished health ministry data, 2018).

Wider adoption of mammography screening requires different strategies for delivery of the screening. For instance, using mobile clinics and gathering women for a one-day locally-based mammogram in collaboration with regional municipalities may be an effective strategy to facilitate screening access in remote areas.

In parallel, promoting public education, mainly on the curability of breast cancer and the benefits of repeating mammography screening even if the previous results were negative is essential (24). Using terms appropriate to women's age and culture is helpful in conveying an accurate message about breast cancer campaigns and can result in increased uptake of mammography screening and repeat screening. Concurrently, it is important to encourage physicians of different specialties, mainly primary care physicians and gynaecologists, to routinely recommend screening to their patients and to keep their records.

One of the main limitations of our study is the lack of data from other similar socioeconomic countries which made comparison difficult.

Our results on the demographic and tumour characteristics of cases of breast cancer may help suggest new approaches in future campaigns to lower tumour stage at diagnosis, and provide a useful framework for the reallocation of the limited health ministry breast cancer budget. We hope our results will encourage the government and health care providers to do more to overcome relevant local barriers and ultimately improve the effectiveness and outcomes of breast cancer campaigns.

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**Competing interests:** None declared.

## Efficacité des campagnes de dépistage du cancer du sein de 2012 à 2017 par analyse du stade au moment du diagnostic (Liban)

### Résumé

**Contexte :** Le cancer du sein est la maladie la plus fréquente et la plus coûteuse au Liban, mais les données sur le stade du cancer et la mortalité associée sont rares.

**Objectifs :** La présente étude visait à évaluer l'effet des campagnes de dépistage par mammographie sur la réduction du stade du cancer du sein au moment du diagnostic.

**Méthodes :** Une analyse secondaire a été effectuée à partir des données de la base de données du Comité scientifique des médicaments anticancéreux du ministère de la Santé publique. Les dossiers médicaux de 3320 patientes atteintes d'un cancer du sein nouvellement diagnostiqué entre 2012 et 2017 ont été passés en revue. Les caractéristiques démographiques et pathologiques, le stade du cancer au moment du diagnostic et la présence de récepteurs ont été extraits et analysés.

**Résultats :** L'âge médian des patients était de 53 ans (intervalle interquartile 36-72). La plupart des patients présentaient des récepteurs d'œstrogènes et de progestérone positifs. Les patients de moins de 35 ans vivaient principalement au Sud-Liban, étaient à des stades avancés de cancer au moment du diagnostic (III et IV) et étaient plus susceptibles d'avoir un cancer du sein triple négatif que les groupes plus âgés (31,3 % contre 16,7 %). Le stade avancé du diagnostic était courant en dehors de Beyrouth (60,4 % dans la Bekaa et 54,7 % dans le nord du Liban). Au cours de la période comprise entre 2012 et 2017, la tendance des stades précoces (I et II) au moment du diagnostic a diminué, passant de 55,6 % à 41,9 %, tandis que les stades avancés (III et IV) ont augmenté, passant de 44,4 % à 57,9 %.

**Conclusion :** Les efforts visant à réduire le stade du cancer du sein grâce au dépistage par mammographie au Liban n'ont pas abouti. La mise en place de tests génétiques et d'approches adaptées aux femmes libanaises est recommandée pour les campagnes futures.

### فعالية حملات تحري سرطان الثدي من عام 2012 إلى عام 2017 من خلال تحليل المرحلة عند التشخيص، لبنان

فادية إلياس، حسين رباح، محمد صالح، محمد بوشناق، كريستينا سعيد

### الخلاصة

**الخلفية:** يُعتبر سرطان الثدي من أكثر الأمراض شيوعاً وتكلفةً في لبنان، ولكن لا يتوافر الكثير من البيانات عن مراحل السرطان والوفيات.

**الأهداف:** هدفت هذه الدراسة إلى تقييم تأثير حملات تحري سرطان الثدي عن طريق التصوير الشعاعي للثدي في اكتشاف سرطان الثدي في مرحلة مبكرة عند التشخيص.

**طرق البحث:** أُجري تحليل ثانوي للبيانات الواردة من قاعدة بيانات اللجنة العلمية لأدوية السرطان التابعة لوزارة الصحة العامة. وجرى مراجعة الملفات الطبية لنحو 3320 مريضة شُخصت حديثاً بالإصابة بسرطان الثدي في الفترة بين عامي 2012 و 2017. واستُخلصت وحُللت الخصائص السكانية والمرضية، ومرحلة السرطان عند التشخيص ووجود المستقبلات.

**النتائج:** كان متوسط عمر المريضات 53 عاماً (المدى بين الربعي 36-72 عاماً). وكان لدى معظم المريضات مستقبلات إستروجين وبروجسترون إيجابية. وكانت المريضات اللاتي تقل أعمارهن عن 35 عاماً، وأغلبهن يعشن في جنوب لبنان، في المرحلتين المتقدمتين من السرطان (الثالثة والرابعة) عند التشخيص، وكن أكثر عرضة للإصابة بسرطان الثدي السلبي الثلاثي، مقارنة بالفئات الأكبر سناً (31.3٪ مقابل 16.7٪). وكانت المرحلة المتقدمة عند التشخيص أمراً شائعاً خارج بيروت (60.4٪ في البقاع و 54.7٪ في شمال لبنان). وفي الفترة 2012-2017، انخفض الاتجاه في المرحلتين الأولى والثانية (الأولى والثانية) عند التشخيص من 55.6٪ إلى 41.9٪، بينما زادت المرحلتان المتقدمتان (الثالثة والرابعة) من 44.4٪ إلى 57.9٪.

**الاستنتاجات:** لم تنجح الجهود الرامية إلى اكتشاف سرطان الثدي في مرحلة مبكرة من خلال تحري سرطان الثدي عن طريق التصوير الشعاعي للثدي في لبنان. ويُوصى بتنفيذ الاختبار الجيني والنهج المصممة كي تلائم النساء اللبنانيات في الحملات المستقبلية.

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# Adherence to the Mediterranean diet and risk of functional constipation in children in Turkey: case–control study

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## Abstract

**Background:** Functional constipation is often seen in children, affecting quality of life and imposing a considerable burden on health care services. The Mediterranean diet is associated with a lower risk of functional gastrointestinal disorders.

**Aims:** This study aimed to evaluate the relationship between functional constipation and adherence to the Mediterranean diet in Turkish children aged 6–18 years.

**Methods:** In this case–control study, 221 children with functional constipation (cases) were selected from a paediatric gastroenterology clinic between May 2018 and September 2019, and 230 children without constipation (controls) were randomly selected from those attending a well-child check-up. Cases and controls were matched on sex, age and socioeconomic characteristics. Compliance with the Mediterranean diet was assessed using the KIDMED index score. Multivariable logistic regression analysis was used to analyse the data.

**Results:** KIDMED index scores in cases and controls were 4.0 (SD = 2.5) and 6.3 (SD = 2.4), respectively ( $P < 0.001$ ). Odds ratios for functional constipation were 0.23 (95% confidence interval (CI): 0.13–0.38) for KIDMED index score 4–7 and 0.05 (95% CI: 0.03–0.11) for score  $\geq 8$  compared with the lowest category (score  $\leq 3$ ;  $P < 0.001$ ). A negative correlation was observed between age and adherence to the Mediterranean diet.

**Conclusion:** Good adherence to the Mediterranean diet was associated with a lower risk of functional constipation, and adherence to the Mediterranean diet decreased with age. Education on nutrition and health is warranted to help maintain and improve the health of young people in Turkey.

Keywords: constipation, child, adolescent, Mediterranean diet, Turkey

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## Introduction

Functional constipation is often seen in children and has an estimated global prevalence of 9.5% (1). The condition affects the quality of life of children and parents and is a significant burden on health care services (2). Functional constipation is characterized by a slowing of bowel movements with no structural or biochemical disorder, painful defecation and sometimes faecal incontinence (3). Functional constipation in children is diagnosed clinically and using the Rome criteria (4). The pathophysiology of constipation in children involves many factors. The most common cause is avoidance of defecation following difficult and painful defecation. Factors also leading to functional constipation include genetic disposition, low socioeconomic status, impaired mobility and insufficient daily fibre intake (5). Studies have reported a greater disposition to constipation in children with low vegetable, fruit and cereal consumption and low fibre intake (6,7).

The Mediterranean diet is one of the most frequently described and evaluated dietary models in the scientific literature (8). This diet is very important for healthy life and has been shown to have preventative effects on

some diseases such as cardiovascular diseases, metabolic diseases, and various cancers (9,10). In addition to its high fibre and antioxidant levels and low saturated fatty acids and oligosaccharides, the Mediterranean diet may also be useful in improving functional gastrointestinal symptoms. A recent study reported a low prevalence of functional constipation in children with good adherence to the Mediterranean diet (11).

Antalya is in the Mediterranean region of Turkey in the north-east of Mediterranean. The dietary habits in the Antalya region include a high consumption of cereals, olive oil, fruits and vegetables, and water and milk products. Olives, olive oil and cereals are important in the Mediterranean dietary culture and are known to have been grown and used in the region since ancient times. The purpose of this study was to investigate the relationship between functional constipation and adherence to the Mediterranean diet in the Antalya region of Turkey. We hypothesized that constipation will be seen less frequently in children consuming a Mediterranean diet because of its high fibre content and antioxidative effect.

## Methods

### Study design and setting

We conducted a case-control study at the Pediatric Gastroenterology Department of the Antalya Education and Research Hospital, Turkey. The hospital is a tertiary health centre in the Mediterranean region of Turkey, and serves an urban area where mostly middle-income families live. The study was conducted between May 2018 and September 2019.

### Cases and controls

We recruited two groups of children aged 6–18 years. Cases (Group 1) were patients diagnosed with functional constipation ( $n = 221$ ) by our paediatric gastroenterology unit. Controls (group 2) were 230 healthy children (matched on sex, age and socioeconomic characteristics) who had no previous history of chronic health problems and organic gastrointestinal disorders; control children were randomly selected from those attending our clinic for a well-child check-up.

Functional constipation was diagnosed by questioning both parents and the patient using the Rome IV criteria (4) – constipation for at least 1 month and including at least two of the following: two or fewer defecations a week; faecal incontinence more than once a week; retentive posturing; painful or hard bowel movements; large faecal mass in rectum; and large stool diameter. Exclusion criteria were: previous diagnosis of organic causes of defecation disorders; suspected gastrointestinal obstruction; abdominal or rectal surgery that might affect constipation; or any other conditions that cause the chronic constipation. Children in both the case and control groups were also excluded if they had severe neurological or mental disorders.

The control group underwent routine clinical examinations to check their health status, after excluding the presence of a functional chronic constipation during the clinical interview. Participants were further classified into two age subgroups: children attending elementary school (age 6–12 years,  $n = 288$ ) and high-school students (age 13–18 years,  $n = 163$ ).

We recorded data on some confounding variables, namely maternal and paternal education and socioeconomic status of family. Maternal and paternal educational level was reported by the parents and categorized into three groups: primary school and below, secondary school and university. Socioeconomic status of family was evaluated using the family affluence scale, which has been used in the Turkish setting before (12,13). Socioeconomic status was categorized into three levels based on the score on the family affluence scale: level 1 low prosperity (score: 0–3), level 2 moderate prosperity (score: 4–5) and level 3 high prosperity (score: 6–7).

### Anthropometric measurements

For all cases and controls, anthropometric measurements were collected by the same trained operator. Height was measured to the nearest centimetre using a Harpenden

stadiometer (Holtain Instruments Ltd, UK). Weight was measured in underwear to the nearest 0.1 kg using a calibrated balance scale. Body mass index (BMI) was calculated using the equation: weight (kg)/height squared ( $\text{m}^2$ ). BMI values were categorized according to the World Health Organization criteria as follows:  $< 18.5 \text{ kg/m}^2$  = underweight,  $18.5\text{--}24.9 \text{ kg/m}^2$  = normal weight,  $25\text{--}29.9 \text{ kg/m}^2$  = overweight and  $\geq 30 \text{ kg/m}^2$  = obese (14).

### Adherence to the Mediterranean diet

Adherence to the Mediterranean diet was assessed using the KIDMED index (15). This index includes 16 questions that summarize the characteristics of the Mediterranean diet. Twelve questions in the KIDMED index have a positive connotation with the Mediterranean diet (e.g. consumes olive oil at home) and four have a negative connotation (e.g. consumes sweets and candy several times a day). We used the previously validated Turkish language version of the questionnaire (16). A score of +1 was given for affirmative responses to positive questions (0 for negative responses), and a score of –1 was given for affirmative responses to negative questions (0 for negative responses). The total possible score ranges between 0 and 12. A KIDMED index score of  $\geq 8$  indicates optimal adherence to the Mediterranean diet (good), scores of 4–7 indicate that adherence to the Mediterranean diet needs to be improved (moderate), and scores of  $\leq 3$  indicate low adherence to the Mediterranean diet and poor nutritional quality (low).

### Statistical analysis

We used SPSS 13.0 (SPSS Inc., Chicago, IL, USA) software for data analyses. In our descriptive analysis, categorical variables were expressed as number and percentage, and continuous variables were expressed as mean and standard deviation (SD). Normally distributed variables were compared between the cases and controls using the independent samples *t*-test. Non-normally distributed variables were compared using the Mann–Whitney *U* test. We used the chi-squared test to compare categorical variables.

The potential confounding variables were included in a final univariate and multivariable logistic regression analysis: age (years, continuous), sex (reference category: females), BMI status (reference category: obese), maternal and paternal educational level (reference category: primary school and below), and socioeconomic status of family (reference category: level 1, low prosperity). In addition, with the KIDMED index as the dependent variable regression analysis was performed with age-matching. Conditional logistic regression models were used to estimate odds ratios (ORs) and 95% confidence intervals (CI).  $P < 0.05$  was considered statistically significant.

### Ethical concerns

The study was approved by ethical committee of University of Health Sciences, Antalya Education and Research Hospital (registry url: 2019-17/2). The study was con-

**Table 1** Characteristics of the cases and controls

| Variable                                        | Cases (n = 221) | Controls (n = 230) | P-value <sup>a</sup> |
|-------------------------------------------------|-----------------|--------------------|----------------------|
| <b>Age in years, mean (SD)</b>                  | 9.0 (3.8)       | 9.1 (3.2)          | 0.247                |
| <b>Sex, female, no. (%)</b>                     | 122 (52.2)      | 118 (51.3)         | 0.487                |
| <b>BMI in kg/m<sup>2</sup>, mean (SD)</b>       | 18.8 (3.1)      | 18.3 (3.2)         | 0.835                |
| <b>BMI category, no. (%)</b>                    |                 |                    | 0.285                |
| Underweight                                     | 11 (5.0)        | 12 (5.2)           |                      |
| Normal weight                                   | 135 (61.1)      | 158 (68.7)         |                      |
| Overweight                                      | 55 (24.9)       | 47 (20.4)          |                      |
| Obese                                           | 20 (9.0)        | 13 (5.6)           |                      |
| <b>Maternal educational level, no. (%)</b>      |                 |                    | 0.301                |
| Primary school and below                        | 69 (31.2)       | 55 (23.9)          |                      |
| Secondary school                                | 117 (52.9)      | 123 (53.5)         |                      |
| University                                      | 35 (15.8)       | 52 (22.6)          |                      |
| <b>Paternal educational level, no. (%)</b>      |                 |                    | 0.235                |
| Primary school and below                        | 40 (18.1)       | 31 (13.5)          |                      |
| Secondary school                                | 86 (38.9)       | 84 (36.5)          |                      |
| University                                      | 95 (43.0)       | 115 (50.0)         |                      |
| <b>Socioeconomic status of family, no. (%)</b>  |                 |                    | 0.065                |
| Level 1 (low status)                            | 41 (18.6)       | 34 (14.8)          |                      |
| Level 2 (moderate status)                       | 141 (63.8)      | 135 (58.7)         |                      |
| Level 3 (high status)                           | 39 (17.6)       | 61 (26.5)          |                      |
| <b>KIDMED index score, mean (SD)</b>            | 4.0 (2.5)       | 6.3 (2.4)          | < 0.001              |
| <b>Adherence to Mediterranean diet, no. (%)</b> |                 |                    | < 0.001              |
| Low ( $\leq 3$ )                                | 95 (43.0)       | 25 (10.9)          |                      |
| Moderate (4–7)                                  | 108 (48.9)      | 124 (53.9)         |                      |
| High ( $\geq 8$ )                               | 18 (8.1)        | 81 (35.2)          |                      |

BMI= body mass index; SD= standard deviation;

<sup>a</sup>P < 0.05 statistically significant.

ducted in accordance with the Declaration of Helsinki. Informed consent was obtained from the parent or legal guardian and the children signed a consent form (or gave verbal consent if they could not sign).

## Results

### Participant characteristics

A total of 451 participants completed a study, 221 functional constipation cases and 230 controls. The demographic characteristics of the cases and controls are shown in Table 1. There were no statistically significant differences between cases and controls for age, sex, BMI, socioeconomic status of family, and maternal and paternal education.

### KIDMED score and constipation

KIDMED index scores in cases and controls were 4.0 (SD 2.5) and 6.3 (SD 2.4), respectively (Table 1), a statically significant difference ( $P < 0.001$ ). Adherence to the Mediterranean diet was high in only 8.1% of the cases, compared with 35.2% of the controls ( $P < 0.001$ ). The OR were 0.23 (95% CI: 0.1–0.38) for KIDMED index 4–7 and 0.06 (95%

CI, 0.03–0.11) for KIDMED index  $\geq 8$  compared with the lowest category (KIDMED index  $\leq 3$ ;  $P < 0.001$ ).

There were statistically significant differences between cases and controls in their responses to selected KIDMED questions (Table 2). For example, daily consumption of fruits and vegetables was significantly lower in cases compared with controls (40.3% versus 60.0%, and 12.2% versus 32.6%, respectively;  $P < 0.001$ ), while consumption of sweets several times a day was significantly higher in cases than controls (68.7% versus 52.1% respectively;  $P < 0.001$ ). However, in a conditional logistic regression analysis, only consumption of vegetables regularly was significantly associated with functional constipation (OR = 0.44; 95% CI: 0.24–0.81).

Analysis by age groups showed that high-school students had lower KIDMED index scores than elementary school students, although the difference was not statistically significant (Table 3). In a linear regression model with KIDMED score as the dependent variable, a negative correlation was found between age and adherence to a Mediterranean diet ( $B = -0.128$ ;  $P = 0.001$ ).

The association between adherence to a Mediterranean diet and risk of functional constipation is shown in

**Table 2 KIDMED questions among the groups and conditional logistic regression analysis of predictive factors for constipation**

| Variable                                                            | Cases (n = 221)<br>No. (%) | Controls (n = 230)<br>No. (%) | P-value <sup>b</sup> | OR (95% CI) <sup>a</sup> |
|---------------------------------------------------------------------|----------------------------|-------------------------------|----------------------|--------------------------|
| <b>Consumes fruit regularly (at least two portions a day)</b>       |                            |                               | < 0.001              |                          |
| Yes                                                                 | 89 (40.3)                  | 138 (60.0)                    |                      | 0.69 (0.45–1.05)         |
| No (Ref)                                                            | 132 (59.7)                 | 92 (40.0)                     |                      |                          |
| <b>Consumes vegetables regularly (at least two portions a day)</b>  |                            |                               | < 0.001              |                          |
| Yes                                                                 | 27 (12.2)                  | 75 (32.6)                     |                      | 0.44 (0.24–0.81)         |
| No (Ref)                                                            | 194 (87.8)                 | 155 (67.4)                    |                      |                          |
| <b>Consumes fish regularly (at least two–three portions a week)</b> |                            |                               | < 0.001              |                          |
| Yes                                                                 | 28 (12.7)                  | 63 (27.4)                     |                      | 0.64 (0.41–1.02)         |
| No (Ref)                                                            | 193 (87.3)                 | 167 (72.6)                    |                      |                          |
| <b>Consumes olive oil at home</b>                                   |                            |                               | < 0.001              |                          |
| Yes                                                                 | 158 (71.5)                 | 209 (90.9)                    |                      | 0.78 (0.53–1.10)         |
| No (Ref)                                                            | 63 (28.5)                  | 21 (9.1)                      |                      |                          |
| <b>Likes and consumes pulses (more than once a week)</b>            |                            |                               | 0.010                |                          |
| Yes                                                                 | 150 (67.9)                 | 182 (79.1)                    |                      | 0.86 (0.64–1.21)         |
| No (Ref)                                                            | 71 (32.1)                  | 48 (20.9)                     |                      |                          |
| <b>Consumes sweets several times a day</b>                          |                            |                               | < 0.001              |                          |
| Yes (Ref)                                                           | 152 (68.8)                 | 120 (52.2)                    |                      | 1.35 (0.96–1.91)         |
| No                                                                  | 69 (31.2)                  | 110 (47.8)                    |                      |                          |

OR= odds ratio; CI= confidence interval; Ref= reference category.

<sup>a</sup>Adjusted for age, sex, body mass index, maternal and paternal educational level and socioeconomic status of family.<sup>b</sup>P < 0.05 statistically significant.

Table 4. Higher adherence to a Mediterranean diet (as measured by increasing KIDMED scores) was associated with a lower risk of constipation: fully adjusted OR for constipation = 0.71 (95% CI: 0.51–1.00) for moderate KIDMED score and 0.35 (95% CI: 0.22–0.59) for a high KIDMED score compared with a low KIDMED score. The OR for an increase in 1 point in the KIDMED score was 0.84 (95% CI: 0.78–0.91).

## Discussion

In this study, we observed that the KIDMED index score was inversely associated with risk of functional constipation in children, independent of confounding variables. Thus, children with functional constipation have lower

compliance with the Mediterranean diet. In addition, adherence to the Mediterranean diet decreased with age.

Previous studies have shown that lower consumption of vegetables and fruits causes functional constipation (17,18), both of which are components of the Mediterranean diet. One of the most important causes of chronic constipation in children is insufficient dietary fibre intake (17–19). Unrefined whole cereal products and pulses are an important component of the Mediterranean diet – the Mediterranean diet provides 30–50 g/day of fibre (20). Oxidative stress has been observed in patients with constipation, as in those with colorectal cancer and other chronic illnesses (21). Oxidative stress causes intestinal dysmotility which in turn can lead to oxidative stress in a vicious circle (22). Olives and olive oil,

**Table 3 KIDMED index scores among children in the two age-related subgroups**

| Variable                             | Elementary school students<br>(n = 288) | High-school students<br>(n = 163) | P-value |
|--------------------------------------|-----------------------------------------|-----------------------------------|---------|
| <b>KIDMED index score, mean (SD)</b> | 5.2 (2.6)                               | 4.7 (2.8)                         | 0.066   |
| <b>Diet adherence, no. (%)</b>       |                                         |                                   | 0.179   |
| Low ( $\leq 3$ )                     | 77 (26.7)                               | 53 (32.5)                         |         |
| Moderate (4–7)                       | 150 (52.1)                              | 82 (50.3)                         |         |
| High ( $\geq 8$ )                    | 61 (21.2)                               | 28 (17.2)                         |         |

SD= standard deviation.

**Table 4 Association between adherence to a Mediterranean diet and functional constipation: conditional logistic regression analysis**

| Adherence                  | OR (95% CI) <sup>a</sup> | OR (95% CI) <sup>b</sup> |
|----------------------------|--------------------------|--------------------------|
| Low ( $\leq 3$ )           | Ref                      | Ref                      |
| Moderate (4–7)             | 0.74 (0.54–1.05)         | 0.71 (0.51–1.00)         |
| High ( $\geq 8$ )          | 0.38 (0.23–0.65)         | 0.35 (0.22–0.59)         |
| Continuous OR <sup>c</sup> | 0.86 (0.81–0.86)         | 0.84 (0.78–0.91)         |

OR= odds ratio; CI= confidence interval; Ref= reference category.

<sup>a</sup>Adjusted for age and sex.

<sup>b</sup>Adjusted for age, sex, body mass index, maternal and paternal educational level and socioeconomic status of family.

<sup>c</sup>For an increase of 1 point in the KIDMED score.

important components of the Mediterranean diet exhibit antioxidant, antimicrobial and anti-inflammatory effects (23). A decrease in bifidobacteria and lactobacilli levels and an increase in *Bacteroidetes* spp. have been reported in adults with constipation compared with those without constipation (24–27). Although this finding has not been confirmed in children with constipation, intestinal flora disturbances such as increased *Clostridium* spp. and Enterobacteriaceae that are rarely seen in healthy children have been reported in children with functional constipation (28). Positive effects on intestinal microbiota have been reported in parallel with adherence to a Mediterranean diet in some studies (29–31). For instance, closer adherence to a Mediterranean diet has been shown to be associated with higher faecal short-chain fatty acids and lower levels of *Firmicutes* and *Bacteroidetes* species (31). However, the evidence for a positive effect of the Mediterranean diet on the microbiome is still insufficient (32).

A previous case–control study in adult reported lower adherence to a Mediterranean diet in patients with functional gastrointestinal system disease compared with a healthy control group (33). Another study in adults showed that low adherence triggered functional gastrointestinal symptoms (34). That study observed a lower adherence to the Mediterranean diet in people with functional gastrointestinal symptoms in younger age groups (17–24 years and 24–34 years) compared with older age groups. In a paediatric cohort study, less functional gastrointestinal disease was reported in children with good adherence to a Mediterranean diet (11). Functional constipation represented a significant proportion of the functional gastrointestinal diseases in that study (66%) and KIDMED scores were significantly lower compared with the control group. However, KIDMED scores did not differ significantly between the group with functional constipation and groups with other functional gastrointestinal diseases. As a result, lack of adherence to a Mediterranean diet was identified as an independent predictor in the development of functional constipation. In our study, adherence to a Mediterranean

diet was significantly lower in children with functional constipation than in healthy children.

In our study, 35.2% of the healthy children had good compliance with the Mediterranean diet, while 10.9% showed poor compliance, while most (53.9%) had a moderate compliance. A study in Turkey with healthy adolescents aged 10–14 years reported that 17.9% of the participants had a poor compliance with the Mediterranean diet, 59.2% moderate compliance and 22.9% good compliance (35). In our study, the proportion of children with good adherence to the Mediterranean diet was higher than previously reported. This difference between the results of the two studies may be due to the difference in age groups. Indeed, in our study, adherence to the Mediterranean diet was better in the elementary school students than in the high-school students. Adolescence is a period of transition from childhood to adulthood in which physical and psychological changes occur, involving various health problems caused by environmental stressors, risky behaviour and psychosocial needs. The tendency to eat outside the home increases during adolescence and changes in eating habits, including skipping main meals and fast-food snacking between meals, also develop. Sitting for extended periods and snacking while watching the television and using the computer is widely observed in adolescents. Children in this age group are therefore irregularly nourished, consume far less than the recommended portions of fruit and vegetables and consume high levels of saturated fat and sodium (36–38).

Our study has some limitations. The first is the relatively small sample size. Furthermore, the sample represented Turkish families with a moderate income. The results therefore cannot be generalized to other populations. Second, we did not evaluate the physical activities of the children taking part in the study.

In conclusion, we found a decrease in the development of functional constipation in children as adherence to the Mediterranean diet increased. The Mediterranean diet is an inexpensive regimen with protective health benefits. It can also be a therapeutic option in children with functional constipation, particularly in regions where its components of the Mediterranean diet are widely produced and consumed. Adherence to the Mediterranean diet among children in our study also decreased with age. With its psychological, physiological and social characteristics, adolescence is an important time of transition between childhood and adulthood that results in changes in feeding habits. The provision of education on nutrition and health in schools and particularly in the family is warranted to help maintain and improve the health of young people in Turkey.

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## Observance du régime méditerranéen et risque de constipation fonctionnelle chez les enfants en Turquie : étude cas-témoins

### Résumé

**Contexte :** Une constipation fonctionnelle est souvent observée chez les enfants, ce qui affecte la qualité de vie et impose une charge considérable aux services de soins de santé. Le régime méditerranéen est associé à un risque plus faible de troubles gastro-intestinaux fonctionnels.

**Objectifs :** La présente étude visait à évaluer la relation entre la constipation fonctionnelle et l'observance du régime méditerranéen chez des enfants turcs âgés de 6 à 18 ans.

**Méthodes :** Dans cette étude cas-témoins, 221 enfants souffrant de constipation fonctionnelle (cas) ont été sélectionnés dans une clinique de gastro-entérologie pédiatrique entre mai 2018 et septembre 2019. En outre, 230 enfants sans constipation (témoins) ont été sélectionnés aléatoirement parmi ceux qui effectuaient une visite de contrôle. Les cas et les témoins étaient appariés sur la base du sexe, de l'âge et des caractéristiques socio-économiques. L'observance du régime méditerranéen a été évaluée à l'aide du score KIDMED. Une analyse de régression logistique multivariée a été utilisée pour analyser les données.

**Résultats :** Les scores KIDMED chez les cas et les témoins étaient de 4,0 (écart type (ET) 2,5) et 6,3 (ET 2,4), respectivement ( $p < 0,001$ ). Les odds ratios pour la constipation fonctionnelle étaient de 0,23 (intervalle de confiance (IC) à 95 % : 0,13-0,38) pour le score KIDMED 4-7 et de 0,05 (IC à 95 % : 0,03-0,11) pour le score supérieur ou égal à 8 par rapport à la catégorie la plus faible (score  $\leq 3$  ;  $p < 0,001$ ). Une corrélation négative a été observée entre l'âge et l'observance du régime méditerranéen.

**Conclusion :** Une bonne observance du régime méditerranéen était associée à un risque plus faible de constipation fonctionnelle, et cette observance diminuait avec l'âge. L'éducation nutritionnelle et sanitaire est nécessaire pour aider à maintenir et à améliorer la santé des jeunes en Turquie.

### الالتزام بالنظام الغذائي المتوسطي، وخطر الإصابة بالإمساك الوظيفي لدى الأطفال في تركيا: دراسة حالات فردية مقترنة بحالات ضابطة

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#### الخلاصة

الخلفية: يُلاحظ الإمساك الوظيفي عادةً في الأطفال، وهو ما يؤثر على جودة الحياة، ويفرض عبئاً كبيراً على خدمات الرعاية الصحية. ويرتبط النظام الغذائي المتوسطي بمخاطر أقل من حيث الاضطرابات المعدية المعوية الوظيفية.

الأهداف: هدفت هذه الدراسة إلى تقييم العلاقة بين الإمساك الوظيفي والالتزام بالنظام الغذائي المتوسطي بين الأطفال الأتراك الذين تتراوح أعمارهم بين 6 و18 عاماً.

طرق البحث: في هذه الدراسة، اختبر 221 طفلاً مصاباً بإمساك وظيفي (الحالات) من إحدى عيادات الأطفال للأمراض المعدية المعوية في الفترة بين مايو/ أيار 2018 وسبتمبر/ أيلول 2019، واختبر عشوائياً 230 طفلاً غير مصاب بالإمساك (الحالات الضابطة) من بين الأطفال الأصحاء الذين يجرون فحصاً. وقورنت الحالات والحالات الضابطة بناءً على نوع الجنس والعمر والخصائص الاجتماعية والاقتصادية. وقيم الالتزام بالنظام الغذائي المتوسطي باستخدام درجة مؤشر جودة النظام الغذائي المتوسطي. واستُخدم أيضاً تحليل الانحدار اللوجستي المتعدد المتغيرات لتحليل البيانات.

النتائج: كانت درجات مؤشر جودة النظام الغذائي المتوسطي في الحالات والحالات الضابطة 4.0 (بانحراف معياري 2.5) و6.3 (بانحراف معياري 2.4)، على التوالي (القيمة الاحتمالية  $> 0.001$ ). وكانت نسب الأرجحية للإمساك الوظيفي 0.23 (بفاصل ثقة 95%: 0.13-0.38) لدرجات مؤشر جودة النظام الغذائي المتوسطي (KIDMED) التي تتراوح بين 4-7، و0.05 (بفاصل ثقة 95%: 0.03-0.11) للدرجات  $\geq 8$ ، مقارنة بأدنى فئة (الدرجة  $\geq 3$ ؛ القيمة الاحتمالية  $> 0.001$ ). ولوحظ أن هناك ارتباطاً سلبياً بين العمر والالتزام بالنظام الغذائي المتوسطي.

الاستنتاجات: ارتبط الالتزام الجيد بالنظام الغذائي المتوسطي بانخفاض خطر الإصابة بالإمساك الوظيفي، ولكن انخفاض الالتزام بالنظام الغذائي المتوسطي مع تقدم العمر. وهناك حاجة إلى التثقيف بشأن التغذية والصحة للمساعدة في الحفاظ على صحة الشباب في تركيا وتحسينها.

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# Oral health status of 12- and 15-year-old Lebanese school children

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## Abstract

**Background:** Studies addressing the oral health status among Lebanese school children are scarce.

**Aims:** To assess the oral health status of Lebanese school children, and to provide epidemiological data for planning and evaluation of oral health care programmes.

**Methods:** We selected 7902 schoolchildren aged 12–15 years from the 6 governorates of Lebanon, using a multistage probability sampling method. Data were obtained by self-administered structured questionnaires and clinical examinations (World Health Organization methodology and criteria). Dental caries was recorded using the Decayed, Missing, and Filled Teeth (DMFT) index. Periodontal status was evaluated using the Community Periodontal Index (CPI).

**Results:** The mean (standard deviation) number of decayed, missing and filled teeth was 3.01 (2.927), 0.05 (0.245) and 2.14 (2.071), respectively, and the mean DMFT score was 5.20 (3.549). Among the whole tested population, the prevalence of caries was 89.5% and only 10.5% of the children were completely free of caries. Age, geographic location and school sector were the most significant risk factors for caries prevalence. Periodontal disease (CPI score > 0) was seen in 7633 participants (96.6%). In contrast to the shallow periodontal pockets that showed a low prevalence, calculus was the most frequently detected periodontal condition in both ages (50.9% at 12 years old and 50.2% at 15 years old). Age, sex, school sector and smoking status were significantly associated with occurrence of periodontal disease.

**Conclusion:** Preventive and restorative public health campaigns are highly recommended to improve oral health status among Lebanese schoolchildren.

Keywords: dental caries, Lebanon, periodontal status, risk factors, school children

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## Introduction

Dental caries and periodontal disease are among the major public health problems and the most prevalent oral diseases, especially in children and adolescents (1,2). Their worldwide adverse impacts on well-being, quality of life and systemic health are well documented (3). The World Health Organization (WHO) states that oral health is part of a person's health and general well-being and it is important for a good and consistent quality of life (4). Epidemiology in oral health is a crucial area of knowledge for scientific research, providing a tool that combines clinical models and optimal protocols. Moreover, it deepens discussions about oral diseases, their synergic relationship with overall wellness, and their potential association with biopsychosocial factors. Therefore, epidemiological studies that can provide predictive significance to clinical data are becoming important in implementing preventive strategies to reduce the incidence of dental problems (5). In developing countries, the evolutionary trend in the prevalence of oral health status is not clear. Some authors suggest that the prevalence of dental caries and periodontal diseases tends to decrease in parallel with the implementation of preventive oral care programmes and with the emergence

of new lifestyles (6). The situation in Lebanon is alarming, and dental caries index (decayed, missing, and filled tooth; DMFT) in children aged 12 years has worsened from 1.2 in 1961 to 3.43 in 2018 (7). A recent study reported that the 12- and 15-year-old children and adolescents had a higher prevalence of caries history in permanent teeth of 80.38% and 90.57%, respectively, and 77.16% and 81.55% of patients were untreated (8). Unfortunately associated risk factors were never seriously investigated.

Oral health prevention programmes have traditionally focused on dental caries. However, in Lebanon periodontal diseases are widespread too, but unfortunately there is a lack of national studies in this field; especially studies that can be compared with epidemiological studies in other countries. In this context, a study conducted in 1996 highlighted a bad situation regarding the prevalence of periodontal disease among adolescents aged 15 years in Lebanon (94.5%), which was one of the highest in the Eastern Mediterranean Region (9). The lack of national epidemiological studies in Lebanon means that an accurate overview of oral health status is needed (10). These findings emphasize the importance of exploring oral health status in Lebanon, especially among adolescents, in whom diagnosis of periodontal disease

and caries status and evaluation of risk factors are crucial because these diseases may progress to severe or even irreversible complications.

The aim of this epidemiological study was to evaluate oral health status of Lebanese 12- and 15-year-old school children in Lebanon, to provide reliable data to plan and evaluate national oral health care programmes.

## Methods

### Study sample and design

This school-based cross-sectional study was conducted from September 2018 to June 2019, among school children aged 12 ( $n = 3985$ ) and 15 ( $n = 3917$ ) years, selected from public and private secondary schools in the urban, suburban and rural areas of the 6 Lebanese governorates (Beirut, South Lebanon, North Lebanon, Nabatiyeh, Bekaa and Mount Lebanon). This study was approved by the ethics committee of the Azm Center for Research in Biotechnology and Its Applications, Lebanese University (document no. CE-EDST-1-2021). Informed consent was obtained from the institutional officials and participants' parents. The study sample was drawn from a larger sample representative of school children aged 12–15 years among the Lebanese population, which was derived using a stratified multistaged randomized cluster sampling method, based on information provided by the Lebanese Ministry of Education and following WHO guidelines (11). In a second stage, all high schools (clusters) in the each governorate were listed, and the number of schools selected by simple random sampling was determined proportionally to the number of schools in the selected area. In the third stage, classes from the selected schools were chosen. The number of students to be recruited in the private or public sector in each governorate was calculated proportionally to the total number of students in each sector. A random list was prepared for public and private schools separately, and schools were selected and asked for permission to recruit participants. Examination proceeded from the first school to the next until the required sample was gathered from the location. No more than 100 participants were recruited from a single school. The same procedure was followed in both public and private schools. When a school did not give permission to recruit participants, the next school in the list was approached. The procedure used in a multicentre oral health survey (12) for the selection of classrooms within each school was also followed in the current study. If there was only 1 section for that age group, that class was included in the survey. If  $> 1$  section was in the required age group, a random selection method was used to further select the section to be examined. In some schools, the head teacher decided the classes and sections to be examined depending on the work load in the curriculum at the time of the survey.

All surveyed students received a clinical examination in accordance with the WHO methodology and criteria (11). In the questionnaire section, the following information was registered: sex, age, location (urban,

suburban and rural), smoking status, private/public sector, and presence/absence of systemic disease. Oral examinations were performed in daylight using plane mouth mirrors. Participants were examined in the classrooms by 7 calibrated examiners. Examiners were calibrated and an interexaminer agreement ( $k$  level) of  $\geq 85\%$  was reached, as recommended by WHO (11). To evaluate dental caries status, the following indices were used: decayed teeth (DT) missing teeth (MT), filled teeth (FT), and decayed, missing due to caries, and filled teeth (DMFT). The percentage of students with DMFT  $> 0$  corresponded to the prevalence of dental caries.

The periodontal status was assessed using Community Periodontal Index (CPI) component of the Community Periodontal Index of Treatment Needs (13). The index teeth (11,16,17,26,27,31,36,37,46 and 47) were examined at mesial and distal proximal sites on buccal and lingual/palatal sides during daylight using plane mouth mirrors and WHO-recommended periodontal probes (11). The mouth cavity was divided into 6 sextants following WHO guidelines (11). Bleeding status, presence/absence of supra- or subgingival calculus and pocket depths were then determined (13). The participants were classified as: 0 = healthy periodontium; 1 = gingival bleeding after gentle probing; 2 = supra- or subgingival calculus; and 3 = pathological pockets 3.5–5.99 mm deep. Periodontitis corresponded to CPI = 3, indicating that  $> 1$  site had a 3.5-mm or larger pocket in the index teeth. The study parameters were analysed upon considering periodontitis (CPI = 3) and nonperiodontitis (CPI  $\leq 2$ ).

### Statistical analysis

SPSS version 24.0 was used for statistical analysis. The  $\alpha$  error was set at 0.05. Descriptive statistics were generated for distribution of the school children across the various backgrounds, health characteristics and oral health indicators. Analyses were performed to evaluate the relative effect of sociobehavioural and sociodemographic characteristics (age, sex, location, school type and smoking) on oral health parameters and dental caries. Four continuous outcomes and 1 categorical variable were selected as dependent variables for univariate and multivariate analyses to explore the effects of potential predictors. The continuous dependent variables were DMFT index, DT, FT, MT and CPI. Binary logistic regression was used to assess the presence of dental caries and periodontal diseases. Univariate followed by multivariate analyses were performed to explore the effects of explanatory variables on CPI and DMFT scores. Student's  $t$  tests and analysis of variance followed by Tukey's post hoc tests were performed to compare continuous variables between groups.  $\chi^2$  and Fisher's exact tests were used to compare categorical variables between groups. Odds ratio with 95% confidence interval was used to assess the association between the study variables and prevalence of dental caries. Multiple linear regression for continuous dependent outcomes and logistic regression analyses for the categorical dependent outcome were carried out. All covariates associated with the outcomes at  $P < 0.200$

at the univariate level were included in the multivariate analyses. Since the variables were measured in different units, standardized coefficients were used to compare the strength of the effect of each individual independent variable (age, sex, school type, smoking status and location) with the dependent variable (DMFT and CPI scores). Collinearity among independent variables was also tested using the variance inflation factor and variables highly correlated were not included in the same model. Since the variable governorate and location area were correlated, they were not included in the same model.

## Results

### Univariate analysis

The sociodemographic characteristics of the participants are summarized in Table 1. In the overall sample, the mean (standard deviation; SD) number of decayed, missing and filled teeth was 3.01 (2.927), 0.05 (0.245) and 2.14 (2.071), respectively, and the mean DMFT score was 5.20 (3.549). The prevalence of decay was 89.5% and only 10.5% of the children were completely free of dental caries. For all age groups, the D-component constituted most of the caries index. The highest DMFT index was found in Bekaa (6.82) and the lowest in Beirut (4.10). Univariate analysis showed that the number of decayed teeth was significantly related to governorate, school, age and location. The number of missing teeth was significantly related to governorate and location area. The number of filled teeth was significantly related to governorate, age, sex and location. The DMFT index was significantly related to governorate, school, age and location. Univariate analysis also showed that prevalence of decay differed significantly according to governorate, school, age and location.

The CPI scores associated with the different risk factors are summarized in Table 2. Only 3.4% of participants had healthy periodontal condition (CPI = 0). In contrast, 44.0% of participants showed gingival bleeding (CPI = 1), 50.5% had calculus with bleeding (CPI = 2), whereas only 2% were characterized by shallow periodontal pockets (4–5 mm; CPI = 3).

Univariate analysis of the association between sociodemographic characteristics and periodontal status is displayed in Table 3. Mean and SD of each dependent variable were used for statistical comparisons. The number of teeth with healthy periodontal condition (CPI = 0) varied significantly according to age, school, sex, smoking, governorate and location (Table 3). The number of teeth with gingival bleeding (CPI = 1) differed significantly according to age, school, governorate and location. The number of teeth with calculus and bleeding (CPI = 2) was significantly associated with age, school, sex, governorate, smoking and location. The number of teeth with periodontal pockets (CPI = 3) was significantly related to age, sex, governorate and smoking.

### Multivariate analysis

The multivariate analyses of the association between sociodemographic characteristics of the children and each

component of the DMFT index are illustrated in Table 4. The number of decayed teeth was significantly elevated in children from public compared to private schools. The number of decayed teeth was also elevated in children living in a rural compared to urban and suburban areas; however, it was not significantly related to age. The number of missing teeth was significantly elevated in children living in urban compared to rural and suburban areas. It was also significantly elevated in girls compared to boys. The number of filled teeth was significantly elevated in girls compared to boys, in children aged 15 years compared to 12 years, and in children living in rural compared to urban and suburban areas. DMFT was significantly elevated in children from public schools, living in rural areas, and aged 15 years compared to 12 years. Multivariate analysis also revealed that children from public schools were 3.845 times more likely to have caries compared to children from private schools. Children from urban and suburban areas were less likely to have caries compared to children from rural areas. Children from rural areas were 1.326 times more likely to have caries compared to children from urban/suburban areas.

The multivariate analyses of the association between sociodemographic characteristics and CPI index are illustrated in Table 5. The number of teeth with healthy periodontal condition was significantly elevated for boys, children from private schools, children aged 12 years, nonsmokers and living in suburban areas. The number of teeth with gingival bleeding (CPI = 1) was significantly elevated for children from public schools, children aged 15 years and living in suburban areas. The number of teeth with calculus and bleeding (CPI = 2) was significantly elevated for girls, children from public schools, aged 15 years and smokers; however, it was significantly lower for children living in suburban areas. The multivariate analyses also showed that the number of teeth with periodontal pockets (CPI = 3) was significantly elevated for girls, children aged 15 years and smokers.

Three percent of missing data related to all the recorded variables was found, but this was considered insignificant and did not alter the final results.

## Discussion

WHO encourages epidemiological studies to address the prevalence of different oral diseases and their associated risk factors to assist healthcare planners to design effective preventive programmes, thus improving the oral health status. The aim of the present cross-sectional study was to investigate the oral health status among 12- and 15-year-old school children in Lebanon, to achieve a better understanding of the oral health situation and help to plan new policies and programmes.

In the present study, a WHO pathfinder approach was chosen, which involved investigation of the 6 governorates of Lebanon to ensure the participation of all the population subgroups that may have different disease status and need dental care. Two ages were chosen (12 and 15 years), allowing a time trend analysis

**Table 1** Prevalence of dental caries indices in children classified according to school sector, sex, age, systemic disease, location and smoking

| Variable                        | Frequency<br>Total = 7902<br>(100%) | Prevalence<br>(%) | Decayed teeth     | Missing<br>teeth  | Filled teeth      | DMFT              |
|---------------------------------|-------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <b>Governorate</b>              |                                     |                   |                   |                   |                   |                   |
| Beirut                          | 8.0                                 | 545(86.4%)        | 1.57 <sup>a</sup> | 0.09 <sup>d</sup> | 2.43 <sup>c</sup> | 4.10 <sup>a</sup> |
| Beqaa                           | 14.6                                | 1065(92.5%)       | 4.14 <sup>d</sup> | 0.06 <sup>b</sup> | 2.62 <sup>c</sup> | 6.82 <sup>d</sup> |
| South of Lebanon                | 10.9                                | 791(92.1%)        | 4.28 <sup>d</sup> | 0.07 <sup>c</sup> | 1.84 <sup>a</sup> | 6.19 <sup>c</sup> |
| North of Lebanon                | 23.6                                | 1695(90.9%)       | 3.44 <sup>c</sup> | 0.06 <sup>b</sup> | 1.76 <sup>a</sup> | 5.25 <sup>b</sup> |
| Mount Lebanon                   | 35.5                                | 2428(86.5%)       | 2.16 <sup>b</sup> | 0.03 <sup>a</sup> | 2.17 <sup>b</sup> | 4.37 <sup>a</sup> |
| Nabatiyeh                       | 7.5                                 | 551(93.4%)        | 3.16 <sup>c</sup> | 0.06 <sup>b</sup> | 2.42 <sup>c</sup> | 5.63 <sup>b</sup> |
| P value                         | —                                   | <0.001            | <0.001            | <0.001            | <0.001            | <0.001            |
| <b>School</b>                   |                                     |                   |                   |                   |                   |                   |
| Private                         | 56.1                                | 3750(84.6%)       | 2.07              | 0.05              | 2.12              | 4.23              |
| Public                          | 43.9                                | 3325(95.9%)       | 4.22              | 0.06              | 2.17              | 6.44              |
| P value                         | —                                   | <0.001            | <0.001            | 0.503             | 0.224             | <0.001            |
| <b>Sex</b>                      |                                     |                   |                   |                   |                   |                   |
| Male                            | 48.2                                | 3401(89.4%)       | 3.02              | 0.05              | 2.08              | 5.15              |
| Female                          | 51.8                                | 3674(89.7%)       | 2.99              | 0.06              | 2.20              | 5.26              |
| P value                         | —                                   | 0.623             | 0.654             | 0.056             | 0.007             | 0.170             |
| <b>Age</b>                      |                                     |                   |                   |                   |                   |                   |
| 12 years                        | 50.4                                | 3528(88.6%)       | 2.83              | 0.06              | 2.01              | 4.90              |
| 15 years                        | 49.6                                | 3547(90.5%)       | 3.19              | 0.05              | 2.27              | 5.51              |
| P value                         | —                                   | 0.004             | <0.001            | 0.056             | <0.001            | <0.001            |
| <b>General disease</b>          |                                     |                   |                   |                   |                   |                   |
| Presence                        | 1.0                                 | 70(89.7%)         | 3.28              | 0.05              | 2.15              | 5.49              |
| Absence                         | 99.0                                | 7005(89.5%)       | 3.01              | 0.05              | 2.14              | 5.20              |
| P value                         | —                                   | 0.952             | 0.408             | 0.942             | 0.960             | 0.480             |
| <b>Type of general diseases</b> |                                     |                   |                   |                   |                   |                   |
| Asthma                          | 23.1                                | 17(94.4%)         | 3.11              | .00               | 2.17              | 5.28              |
| Diabetes                        | 57.7                                | 39(86.7%)         | 3.51              | .07               | 2.07              | 5.64              |
| Epilepsy                        | 6.4                                 | 5(100.0%)         | 2.20              | .00               | 3.00              | 5.20              |
| Hearing trouble                 | 5.1                                 | 4(100.0%)         | 2.75              | .00               | 1.75              | 4.50              |
| Haemophilia                     | 5.1                                 | 3(75.0%)          | 2.25              | .00               | 2.50              | 4.75              |
| Hypertension                    | 2.6                                 | 2(100.0%)         | 5.50              | .50               | 2.00              | 8.00              |
| P value                         | —                                   | 0.685             | 0.801             | 0.256             | 0.946             | 0.932             |
| <b>Location</b>                 |                                     |                   |                   |                   |                   |                   |
| Rural                           | 22.9                                | 1710(94.4%)       | 3.96 <sup>c</sup> | 0.05 <sup>a</sup> | 2.36 <sup>c</sup> | 6.37 <sup>c</sup> |
| Urban                           | 14.1                                | 944(85.0%)        | 1.79 <sup>a</sup> | 0.08 <sup>b</sup> | 1.96 <sup>a</sup> | 3.84 <sup>a</sup> |
| Suburban                        | 63.0                                | 4421(88.8%)       | 2.93 <sup>b</sup> | 0.05 <sup>a</sup> | 2.10 <sup>b</sup> | 5.09 <sup>b</sup> |
| P value                         | —                                   | <0.001            | <0.001            | <0.001            | <0.001            | <0.001            |
| <b>Smoking status</b>           |                                     |                   |                   |                   |                   |                   |
| Yes                             | 11.6                                | 816(88.9%)        | 3.11              | 0.05              | 2.18              | 5.34              |
| No                              | 88.4                                | 6259(89.6%)       | 3.00              | 0.05              | 2.14              | 5.19              |
| P value                         | —                                   | 0.497             | 0.282             | 0.321             | 0.525             | 0.234             |

For each column different lower case letters indicate significant differences ( $P < 0.05$ ) as measured by one-way analysis of variance followed by Tukey post hoc tests.  
DMFT = decayed, missing, and filled teeth.

of the evaluated diseases. This is useful in a population for which there are no previous data, as is the case in Lebanon. In light of the coverage of urban, suburban and rural areas and public and private schools, the study

results may be considered relevant at a national level. The sample age groups were chosen and data were collected based on WHO methodology and criteria so the results can be compared with international studies. We used a

global recording system that provided reliable data on the occurrence of oral diseases. Dental caries and periodontal diseases were evaluated because they are the most prevalent oral diseases and serve as a basis for oral health prevention programmes. The present survey provided a valid overview of the oral health status of Lebanese school children. WHO-recommended interexaminer reliability in clinical examination was obtained but examination under daylight may have underestimated the real situation and was a limitation of this study. The present study is the first national survey to assess the oral health status of Lebanese school children.

According to WHO criteria, high levels of dental caries were found for both ages in our study. A mean (SD) DMFT score of 4.90 (3.484) and 5.51 (3.589) was found for children aged 12 and 15 years, respectively. It is noteworthy that dental caries could be even more frequent because interdental caries could not be detected during clinical examination using the DMFT index. A time trend analysis has highlighted the absence of any effective improvement plan since 1996 when the situation was alarming (DMFT scores of 5 for age 12 years and 7.7 for age 15 years) (9). Our results are in agreement with the latest study conducted in Lebanon that showed DMFT scores of 3.42 and 5.44 for children aged 12 and

**Table 2** Number of subjects as per CPI codes for different risk factors

|                          | No. (%)      | CPI score             |              |                    |           | P       |
|--------------------------|--------------|-----------------------|--------------|--------------------|-----------|---------|
|                          | 0 (healthy)  | 1 (gingival bleeding) | 2 (calculus) | 3 (pockets 4–5 mm) |           |         |
| Governorate              |              |                       |              |                    |           |         |
| Beirut                   | 631 (8.0%)   | 31(4.9%)              | 213(33.8%)   | 362(57.4%)         | 25(4.0%)  | < 0.001 |
| Beqaa                    | 1151 (14.6%) | 44(3.8%)              | 409(35.5%)   | 666(57.9%)         | 32(2.8%)  |         |
| South                    | 859 (10.9%)  | 34(4.0%)              | 276(32.1%)   | 525(61.1%)         | 24(2.8%)  |         |
| North                    | 1865 (23.6%) | 51(2.7%)              | 308(16.5%)   | 1480(79.4%)        | 26(1.4%)  |         |
| Mount Lebanon            | 2806 (35.5%) | 89(3.2%)              | 2176(77.5%)  | 493(17.6%)         | 48(1.7%)  |         |
| Nabatiyeh                | 590 (7.5%)   | 20(3.4%)              | 93(15.8%)    | 467(79.2%)         | 10(1.7%)  |         |
| Age                      |              |                       |              |                    |           |         |
| 12 years                 | 3984 (50.4%) | 145(3.6%)             | 1809(45.4%)  | 2026(50.9%)        | 4(0.1%)   | < 0.001 |
| 15 years                 | 3918 (49.6%) | 124(3.2%)             | 1666(42.5%)  | 1967(50.2%)        | 161(4.1%) |         |
| School                   |              |                       |              |                    |           |         |
| Private                  | 4434 (56.1%) | 181(4.1%)             | 2335(52.7%)  | 1834(41.4%)        | 84(1.9%)  | < 0.001 |
| Public                   | 3468 (43.9%) | 88(2.5%)              | 1140(32.9%)  | 2159(62.3%)        | 81(2.3%)  |         |
| Sex                      |              |                       |              |                    |           |         |
| Male                     | 3806 (48.2%) | 120(3.2%)             | 1768(46.5%)  | 1861(48.9%)        | 57(1.5%)  | < 0.001 |
| Female                   | 4096 (51.8%) | 149(3.6%)             | 1707(41.7%)  | 2132(52.1%)        | 108(2.6%) |         |
| General disease          |              |                       |              |                    |           |         |
| Presence                 | 78 (1.0%)    | 1(1.3%)               | 31(39.7%)    | 42(53.8%)          | 4(5.1%)   | 0.270   |
| Absence                  | 7824 (99.0%) | 268(3.4%)             | 3444(44.0%)  | 3951(50.5%)        | 161(2.1%) |         |
| Type of general diseases |              |                       |              |                    |           |         |
| Asthma                   | 18 (23.1%)   | 0(0.0%)               | 5(27.8%)     | 13(72.2%)          | 0(0.0%)   | 0.626   |
| Diabetes                 | 45 (57.7%)   | 1(2.2%)               | 21(46.7%)    | 20(44.4%)          | 3(6.7%)   |         |
| Epilepsy                 | 5 (6.4%)     | 0(0.0%)               | 0(0.0%)      | 4(80.0%)           | 1(20.0%)  |         |
| Hearing trouble          | 4 (5.1%)     | 0(0.0%)               | 1(25.0%)     | 3(75.0%)           | 0(0.0%)   |         |
| Haemophilia              | 4 (5.1%)     | 0(0.0%)               | 3(75.0%)     | 1(25.0%)           | 0(0.0%)   |         |
| Hypertension             | 2 (2.6%)     | 0(0.0%)               | 1(50.0%)     | 1(50.0%)           | 0(0.0%)   |         |
| Smoking                  |              |                       |              |                    |           |         |
| Yes                      | 918 (11.6%)  | 27(2.9%)              | 381(41.5%)   | 480(52.3%)         | 30(3.3%)  | 0.022   |
| No                       | 6984 (88.4%) | 242(3.5%)             | 3094(44.3%)  | 3513(50.3%)        | 135(1.9%) |         |
| Location                 |              |                       |              |                    |           |         |
| Rural                    | 1811 (22.9%) | 55(3.0%)              | 749(41.4%)   | 958(52.9%)         | 49(2.7%)  | < 0.001 |
| Urban                    | 1111 (14.1%) | 52(4.7%)              | 378(34.0%)   | 654(58.9%)         | 27(2.4%)  |         |
| Suburban                 | 4980 (63.0%) | 162(3.3%)             | 2348(47.1%)  | 2381(47.8%)        | 89(1.8%)  |         |

CPI = Community Periodontal Index.

**Table 3 Univariate analyses of factors associated with CPI scores**

| Variable               | CPI = 0             | CPI = 1             | CPI = 2             | CPI = 3             |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| <b>Governorate</b>     |                     |                     |                     |                     |
| Beirut                 | 0.52 <sup>b</sup>   | 2.36 <sup>a,b</sup> | 2.93 <sup>c</sup>   | 0.06 <sup>b</sup>   |
| Beqaa                  | 0.38 <sup>a,b</sup> | 2.48 <sup>a,b</sup> | 3.06 <sup>c,d</sup> | 0.03 <sup>a,b</sup> |
| South                  | 0.46 <sup>a,b</sup> | 2.23 <sup>a</sup>   | 3.23 <sup>d</sup>   | 0.04 <sup>a,b</sup> |
| North                  | 0.33 <sup>a</sup>   | 2.66 <sup>b</sup>   | 2.99 <sup>c,d</sup> | 0.02 <sup>a</sup>   |
| Mount Lebanon          | 2.34 <sup>d</sup>   | 2.72 <sup>b</sup>   | 0.91 <sup>a</sup>   | 0.04 <sup>a,b</sup> |
| Nabatiyeh              | 0.94 <sup>c</sup>   | 3.23 <sup>c</sup>   | 1.82 <sup>b</sup>   | 0.02 <sup>a</sup>   |
| P value                | <0.001              | <0.001              | <0.001              | 0.022               |
| <b>Age</b>             |                     |                     |                     |                     |
| 12 years               | 1.19                | 2.76                | 2.02                | 0.00                |
| 15 years               | 1.06                | 2.49                | 2.37                | 0.07                |
| P value                | <0.001              | <0.001              | <0.001              | <0.001              |
| <b>School</b>          |                     |                     |                     |                     |
| Private                | 1.29                | 2.55                | 2.09                | 0.03                |
| Public                 | 0.90                | 2.72                | 2.33                | 0.04                |
| P value                | <0.001              | <0.001              | <0.001              | 0.152               |
| <b>Sex</b>             |                     |                     |                     |                     |
| Male                   | 1.17                | 2.67                | 2.11                | 0.03                |
| Female                 | 1.08                | 2.58                | 2.27                | 0.04                |
| P value                | 0.008               | 0.075               | 0.003               | 0.007               |
| <b>General disease</b> |                     |                     |                     |                     |
| Presence               | 1.05                | 2.41                | 2.46                | 0.06                |
| Absence                | 1.12                | 2.63                | 2.19                | 0.04                |
| P value                | 0.701               | 0.357               | 0.339               | 0.353               |
| <b>Smoking</b>         |                     |                     |                     |                     |
| Yes                    | 0.92                | 2.63                | 2.37                | 0.06                |
| No                     | 1.15                | 2.62                | 2.17                | 0.03                |
| P value                | <0.001              | 0.906               | 0.021               | 0.013               |
| <b>Location</b>        |                     |                     |                     |                     |
| Rural                  | 0.92 <sup>b</sup>   | 2.59 <sup>a,b</sup> | 2.42 <sup>b</sup>   | 0.05                |
| Urban                  | 0.48 <sup>a</sup>   | 2.44 <sup>a</sup>   | 2.93 <sup>c</sup>   | 0.04                |
| Suburban               | 1.34 <sup>c</sup>   | 2.68 <sup>b</sup>   | 1.95 <sup>a</sup>   | 0.03                |
| P value                | <0.001              | <0.001              | <0.001              | 0.071               |

For each column different lower case letters indicate significant differences ( $P < 0.05$ ) as measured by one-way analysis of variance followed by Tukey post hoc tests. CPI = Community Periodontal Index.

15 years, respectively (8). Remarkably, the obtained DMFT scores were even higher than those found in children of the same age in nearby Arab countries (14–19) and other developing countries (20–22). This indicates that dental caries prevalence and severity among Lebanese children are alarming and that preventive and oral health promotion must be implemented.

CPI is a well-established method for assessing the periodontal status because of its simplicity, reproducibility and international uniformity. Consistent with the results obtained in 1996, the present national study showed prevalence of periodontal disease of 96.4% and 96.8% among children aged 12 and 15 years, respectively. Only 3.4% of children exhibited healthy periodontal status (CPI = 0), 44% showed gingival bleeding (CPI = 1), 50.5%

exhibited calculus with bleeding (CPI = 2), whereas only 2% exhibited shallow periodontal pockets (CPI = 3). The prevalence of periodontal disease among Lebanese school children (96.6%) appeared to be among the highest in the Eastern Mediterranean Region (18,23).

This is believed to be the first study to address the risk factors associated with dental caries and periodontal disease prevalence among the Lebanese population. Higher DMFT score, gingival bleeding, calculus and shallow pockets were observed in children aged 15 years compared with 12 years. This result is not surprising since caries and periodontal disease are cumulative processes that increase with age. Additionally, we observed that DMFT scores as well as gingival bleeding and calculus levels were significantly higher among students

**Table 4 Multiple regression and logistic regression analyses of factors associated with dental caries prevalence**

| Dependent variables          | Explanatory variables | Multiple regression analyses |       |                           | t      | P     | 95% CI for B  |        |
|------------------------------|-----------------------|------------------------------|-------|---------------------------|--------|-------|---------------|--------|
|                              |                       | Unstandardized coefficients  |       | Standardized coefficients |        |       |               |        |
|                              |                       | B                            | SE    |                           |        |       |               |        |
| Decayed teeth                | Age 15 years          | 0.018                        | 0.021 | 0.009                     | 0.887  | 0.375 | -0.022        | 0.059  |
|                              | Public school         | 1.948                        | 0.067 | 0.330                     | 29.184 | 0.000 | 1.817         | 2.079  |
|                              | Location (ref: rural) |                              |       |                           |        |       |               |        |
|                              | Urban area            | 1.002                        | 0.111 | 0.119                     | 9.007  | 0.000 | 0.784         | 1.220  |
|                              | Suburban area         | 0.279                        | 0.079 | 0.046                     | 3.555  | 0.000 | 0.125         | 0.434  |
| Missing teeth                | Age 15 years          | -0.003                       | 0.002 | -0.017                    | -1.533 | 0.125 | -0.006        | 0.001  |
|                              | Sex                   | 0.015                        | 0.006 | 0.031                     | 2.762  | 0.006 | 0.004         | 0.026  |
|                              | Location (ref: rural) |                              |       |                           |        |       |               |        |
|                              | Urban area            | -0.030                       | 0.009 | -0.042                    | -3.156 | 0.002 | -0.048        | -0.011 |
|                              | Suburban area         | 0.008                        | 0.007 | 0.015                     | 1.160  | 0.246 | -0.005        | 0.021  |
| Filled teeth                 | Age 15 years          | 0.075                        | 0.016 | 0.055                     | 4.809  | 0.000 | 0.045         | 0.106  |
|                              | Sex                   | 0.112                        | 0.047 | 0.027                     | 2.395  | 0.017 | 0.020         | 0.203  |
|                              | Location (ref: rural) |                              |       |                           |        |       |               |        |
|                              | Urban                 | 0.342                        | 0.079 | 0.057                     | 4.301  | 0.000 | 0.186         | 0.497  |
|                              | Suburban              | 0.248                        | 0.057 | 0.058                     | 4.376  | 0.000 | 0.137         | 0.359  |
| DMFT                         | Age 15 years          | 0.093                        | 0.026 | 0.039                     | 3.624  | 0.000 | 0.043         | 0.143  |
|                              | Sex                   | 0.112                        | 0.076 | 0.016                     | 1.473  | 0.141 | -0.037        | 0.260  |
|                              | Public school         | 1.891                        | 0.083 | 0.264                     | 22.919 | 0.000 | 1.729         | 2.053  |
|                              | Location (ref: rural) |                              |       |                           |        |       |               |        |
|                              | Urban                 | 1.346                        | 0.137 | 0.132                     | 9.793  | 0.000 | 1.077         | 1.616  |
|                              | Suburban              | 0.556                        | 0.097 | 0.076                     | 5.719  | 0.000 | 0.365         | 0.747  |
| Logistic regression analysis |                       |                              |       |                           |        |       |               |        |
| Dependent variables          | Independent variables | B                            | SE    | Wald                      | P      | OR    | 95% CI for OR |        |
| Prevalence of caries         | Age 15 years          | -0.021                       | 0.025 | 0.663                     | 0.416  | 0.979 | Lower         | Upper  |
|                              | Public school         | 1.347                        | 0.100 | 179.597                   | 0.000  | 3.845 | 0.932         | 1.030  |
|                              | Location (ref: rural) |                              |       | 7.176                     | 0.028  |       | 3.158         | 4.682  |
|                              | Urban area            | -0.375                       | 0.142 | 7.000                     | 0.008  | 0.687 | 0.521         | 0.907  |
|                              | Suburban area         | -0.262                       | 0.118 | 4.922                     | 0.027  | 0.769 | 0.610         | 0.970  |

CI = confidence interval; DMFT = decayed, missing, and filled teeth; OR = odds ratio; SE = standard error.

attending public than private schools. This could be attributed to the low level of oral health practices among public school students. DMFT scores were significantly higher in rural than urban regions. This findings could be explained by the poor oral hygiene habits in rural regions and the greater opportunities for urban students to attend dental care services. Calculus and shallow pockets levels were significantly higher among smokers. Smoking is known to exert a significant effect on periodontal status, which might predispose individuals to the development of periodontal disease (24). Calculus and shallow pockets were more frequent in girls than in boys. The association between sex and periodontal disease prevalence is still debatable. Several studies have reported higher prevalence in male than in female participants (25), but

others have indicated no significant effect of sex on periodontal health (26,27).

## Conclusion

This study showed that dental caries and periodontal disease levels in school children aged 12 and 15 years in Lebanon are extremely high, thus highlighting a critical oral health issue. School-based preventive campaigns encouraging a healthier lifestyle for those at high risk and regular dental follow-up should be supported and conducted for Lebanese school children.

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**Competing interests:** None declared.

Table 5 Multiple regression analysis using CPI scores as dependent variables

| Dependent variables            | Explanatory variables | Unstandardized coefficients |       | Standardized coefficients | t       | P     | 95% CI for B |        |
|--------------------------------|-----------------------|-----------------------------|-------|---------------------------|---------|-------|--------------|--------|
|                                |                       | B                           | SE    | b                         |         |       | Lower        | Upper  |
| Healthy periodontal conditions | Age 15 years          | -0.049                      | 0.012 | -0.044                    | -3.978  | 0.000 | -0.073       | -0.025 |
|                                | Public School         | -0.453                      | 0.040 | -0.135                    | -11.403 | 0.000 | -0.531       | -0.375 |
|                                | Sex                   | -0.131                      | 0.037 | -0.039                    | -3.574  | 0.000 | -0.203       | -0.059 |
|                                | Smoking               | 0.217                       | 0.057 | 0.042                     | 3.810   | 0.000 | 0.105        | 0.329  |
|                                | Location (ref: rural) |                             |       |                           |         |       |              |        |
|                                | Urban                 | 0.749                       | 0.066 | 0.157                     | 11.313  | 0.000 | 0.619        | 0.879  |
|                                | Suburban              | -0.240                      | 0.047 | -0.070                    | -5.120  | 0.000 | -0.332       | -0.148 |
| Gingival bleeding on probing   | Age 15 years          | -0.100                      | 0.016 | -0.073                    | -6.415  | 0.000 | -0.131       | -0.070 |
|                                | Public school         | 0.221                       | 0.051 | 0.053                     | 4.371   | 0.000 | 0.122        | 0.320  |
|                                | Sex                   | -0.064                      | 0.046 | -0.016                    | -1.381  | 0.167 | -0.155       | 0.027  |
|                                | Location (ref: rural) |                             |       |                           |         |       |              |        |
|                                | Urban                 | 0.093                       | 0.084 | 0.016                     | 1.101   | 0.271 | -0.072       | 0.258  |
|                                | Suburban              | -0.153                      | 0.060 | -0.036                    | -2.572  | 0.010 | -0.270       | -0.036 |
| Calculus on bleeding           | Age 15 years          | 0.126                       | 0.019 | 0.076                     | 6.740   | 0.000 | 0.089        | 0.163  |
|                                | Public school         | 0.267                       | 0.060 | 0.053                     | 4.433   | 0.000 | 0.149        | 0.385  |
|                                | Sex                   | 0.182                       | 0.056 | 0.037                     | 3.279   | 0.001 | 0.073        | 0.291  |
|                                | Smoking               | -0.178                      | 0.086 | -0.023                    | -2.064  | 0.039 | -0.348       | -0.009 |
|                                | Location (ref: rural) |                             |       |                           |         |       |              |        |
|                                | Urban                 | -0.766                      | 0.100 | -0.107                    | -7.633  | 0.000 | -0.963       | -0.570 |
|                                | Suburban              | 0.350                       | 0.071 | 0.068                     | 4.920   | 0.000 | 0.210        | 0.489  |
| Periodontal pockets 4–5 mm     | Age 15 years          | 0.023                       | 0.002 | 0.131                     | 11.513  | 0.000 | 0.019        | 0.027  |
|                                | Public school         | -0.001                      | 0.007 | -0.002                    | -0.126  | 0.900 | -0.014       | 0.012  |
|                                | Sex                   | 0.012                       | 0.006 | 0.023                     | 2.039   | 0.041 | 0.000        | 0.024  |
|                                | Smoking               | -0.018                      | 0.009 | -0.022                    | -1.955  | 0.050 | -0.037       | -0.022 |
|                                | Location (Ref: rural) |                             |       |                           |         |       |              |        |
|                                | Urban                 | -0.004                      | 0.011 | -0.005                    | -0.346  | 0.730 | -0.025       | 0.018  |
|                                | Suburban              | 0.013                       | 0.008 | 0.024                     | 1.747   | 0.081 | -0.002       | 0.029  |

CI = confidence interval; CPI = Community Periodontal Index; SE = standard error.

## État de santé bucco-dentaire des écoliers libanais âgés de 12 à 15 ans

### Résumé

**Contexte :** Les études portant sur l'état de santé bucco-dentaire des écoliers libanais sont rares.

**Objectifs :** Évaluer l'état de santé bucco-dentaire des enfants d'âge scolaire libanais et fournir des données épidémiologiques pour la planification et l'évaluation des programmes de soins de santé bucco-dentaire.

**Méthodes :** Nous avons sélectionné 7902 écoliers âgés de 12 à 15 ans dans les six gouvernorats du Liban, en utilisant une méthode d'échantillonnage probabiliste à plusieurs degrés. Les données ont été obtenues au moyen de questionnaires structurés auto-administrés et d'examen clinique (méthodologie et critères de l'Organisation mondiale de la Santé). Les caries dentaires ont été enregistrées en utilisant l'indice CAO (dents cariées, absentes ou obturées). Le statut parodontal a été évalué à l'aide de l'indice communautaire parodontal (CPI).

**Résultats :** Le nombre moyen (écart type) de dents cariées, manquantes et obturées était de 3,01 (2,927), 0,05 (0,245) et 2,14 (2,071), respectivement, et le score CAO moyen était de 5,20 (3,549). Dans l'ensemble de la population testée, la prévalence des caries était de 89,5 % et seuls 10,5 % des enfants n'avaient aucune carie. L'âge, l'emplacement géographique et le secteur scolaire constituaient les facteurs de risque les plus importants pour la prévalence des caries. Une parodontopathie (score CPI > 0) a été observée chez 7633 participants (96,6 %). Contrairement aux poches parodontales peu profondes qui montraient une faible prévalence, le tartre était l'affection parodontale la plus

fréquemment détectée dans les deux âges (50,9 % à 12 ans et 50,2 % à 15 ans). L'âge, le sexe, le secteur scolaire et le tabagisme étaient fortement associés à la survenue de parodontopathies.

**Conclusion :** Des campagnes de santé publique à des fins préventives et réparatrices sont fortement recommandées pour améliorer l'état de santé bucco-dentaire chez les écoliers libanais.

## حالة صحة الفم لتلاميذ المدارس الذين تتراوح أعمارهم بين 12 و 15 عامًا في لبنان

شيرين عبد الملك، كارول شكر، آلان رومانوس، سمر رشدي

### الخلاصة

الخلفية: لا يتوافر الكثير من الدراسات التي تتناول حالة صحة الفم بين تلاميذ المدارس في لبنان.

الأهداف: هدفت هذه الدراسة إلى تقييم حالة صحة الفم بين تلاميذ المدارس في لبنان، وتوفير البيانات الوبائية لتخطيط البرامج المعنية برعاية صحة الفم وتقييمها.

طرق البحث: اخترنا 7902 تلميذاً من تلاميذ المدارس الذين تتراوح أعمارهم بين 12 و 15 عامًا من 6 محافظات في لبنان، باستخدام طريقة أخذ العينات الاحتمالية المتعددة المراحل. تم الحصول على البيانات عن طريق الاستبيانات المصممة لتُستكمل ذاتياً والفحوص السريرية (منهجية منظمة الصحة العالمية ومعاييرها). وسُجلت حالات تسوس الأسنان باستخدام مؤشر معدل الأسنان المنخورة أو المقلوعة أو المحشوة (DMFT). وخضعت حالة الأمراض التي تصيب دواعم الأسنان للتقييم باستخدام المؤشر المجتمعي للأمراض التي تصيب دواعم الأسنان (CPI).

النتائج: كان متوسط عدد الأسنان المنخورة أو المقلوعة أو المحشوة 3.01 (2.927)، و 0.05 (0.245) و 2.14 (2.071) على التوالي، وبلغ متوسط درجة مؤشر معدل الأسنان المنخورة أو المقلوعة أو المحشوة (DMFT) 5.20 (3.549). ومن بين الفئة السكانية التي خضعت للاختبار، كان معدل انتشار التسوس 89.5٪، بينما كانت نسبة الأطفال الذين لا يعانون على الإطلاق من التسوس 10.5٪. وتضمنت أهم عوامل الخطر المرتبطة بمعدل انتشار التسوس: العمر، والموقع الجغرافي، والقطاع المدرسي. ولوحظت الأمراض التي تصيب دواعم الأسنان (مؤشر CPI < 0) في 7633 مشاركاً (96.6٪). وعلى النقيض من جيوب دواعم الأسنان الضحلة التي تبين انخفاض معدل انتشارها، كان الجير أكثر الحالات المكتشفة في الأمراض التي تصيب دواعم الأسنان في كلا العمرين (50.9٪ في عمر 12 عامًا و 50.2٪ في عمر 15 عامًا). وارتبط العمر ونوع الجنس والقطاع المدرسي والتدخين ارتباطاً كبيراً بحدوث الأمراض التي تصيب دواعم الأسنان.

الاستنتاجات: يُوصى بشدة بتنظيم حملات وقائية وترميمية في مجال الصحة العامة لتحسين حالة صحة الفم بين تلاميذ المدارس في لبنان.

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# Apport de la dixième révision de la Classification internationale des maladies dans le codage de la mortalité médico-légale

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## Résumé

**Contexte :** les rapports de mortalité en Tunisie n'incluent pas les causes de décès médico-légaux.

**Objectif :** établir les statistiques sur les causes de décès médico-légaux au nord de la Tunisie en 2015 en se basant sur la Dixième Révision de la Classification internationale des maladies (CIM-10).

**Méthodes :** il s'agissait d'une étude transversale et descriptive portant sur tous les décès autopsiés au nord de la Tunisie en 2015. Les caractéristiques socio-démographiques ont été identifiées, ainsi que les formes médico-légales et les causes de décès. Celles-ci ont été codées selon la CIM-10.

**Résultats :** notre échantillon était composé de 1957 cas. Il y avait une prédominance masculine avec un *sex ratio* de 3,5. L'âge moyen était de 47,2 (écart type [ET] 20,6) ans. Les morts violentes ont représenté 57,4 % de la mortalité globale, suivies du groupe des maladies de l'appareil circulatoire (24,5 %) et de celui des maladies de l'appareil respiratoire (6,5 %). Les causes de décès les plus fréquentes étaient les accidents de transport terrestre (33,7 %) et les cardiopathies ischémiques (17,9 %). Les accidents de la voie publique étaient à l'origine de 56,1 % des morts accidentelles. La pendaison était le mode suicidaire le plus fréquent (51,5 %). Les homicides étaient le plus souvent secondaires à des plaies par arme blanche (35,8 %).

**Conclusion :** la CIM-10 a permis de mettre en avant la part de la mort violente et ses caractéristiques dans la mortalité médico-légale au nord de la Tunisie, ce qui témoigne de son efficacité dans la standardisation des conclusions des rapports d'autopsie.

Mots clés : CIM-10, Tunisie, codage, mortalité, médico-légale.

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## Introduction

En Tunisie, le rapport de mortalité établi par l'Institut National de Santé Publique (INSP) n'inclut pas les causes de décès médico-légaux (1). Cette statistique peut être préjudiciable aux stratégies de prévention primaire du fait de l'absence de données fiables et officielles concernant les morts violentes ainsi que de celles relatives aux morts subites (2,3).

En effet, la rédaction de certificats médicaux de décès (CMD) par les médecins légistes après établissement des rapports d'autopsie n'est pas systématique en Tunisie. Dans la littérature scientifique, des facteurs expliquant cette « attitude » ont pu être mis en évidence, tels que la non-compréhension de la pertinence de cette pratique, la réticence par rapport au fait de refaire un acte médico-administratif, le refus de lever l'obstacle médico-légal, la méconnaissance de l'intérêt en santé publique ou le manque de temps (4).

D'autre part, les rapports d'autopsie médico-légale en Tunisie ne se basent pas sur une classification telle que la dixième révision de la Classification

internationale des maladies (CIM-10). Cela ne permet pas d'utiliser ces données de façon optimale et comparable dans l'établissement des rapports de mortalité. D'où l'importance d'établir un rapport de mortalité des décès médico-légaux en utilisant la CIM-10.

L'objectif de notre étude était d'établir les statistiques sur les causes de décès médico-légaux au nord de la Tunisie en 2015 en se basant sur la CIM-10.

## Méthodes

Nous avons réalisé une étude transversale et descriptive portant sur tous les décès autopsiés au service de Médecine légale de l'hôpital Charles Nicolle de Tunis, survenus durant l'année 2015. Notre service couvre l'activité médico-légale de dix gouvernorats parmi les onze du nord de la Tunisie (à l'exception du gouvernorat de Nabeul), soit une population générale d'environ 4,56 millions d'habitants (5). La population de Nabeul représente 17,3 % de notre population d'étude et présente les mêmes caractéristiques démographiques que le reste des dix gouvernorats du Nord (5), nous

permettant de supposer que nos résultats peuvent être représentatifs du nord de la Tunisie. Les données ont été recueillies à partir de celles de la réquisition judiciaire, de la copie du rapport d'autopsie médico-légale et, dans certains cas, des documents médicaux.

Dans ce travail, on s'est intéressé essentiellement aux caractéristiques socio-démographiques des défunts, à la forme médico-légale et à l'enchaînement causal du décès tel que défini dans le certificat médical de décès tunisien, similaire à celui du modèle international élaboré par l'Organisation mondiale de la Santé (OMS). Dans un deuxième temps, les causes de décès ont été codées selon la dixième révision de la Classification internationale des maladies (CIM-10). Les statistiques de mortalité ont porté sur la cause initiale.

Nous avons choisi que le codage soit réalisé par un médecin légiste. La cause de décès a été établie en se basant sur la synthèse des éléments relevés des documents médicaux ainsi que de l'autopsie médico-légale. Dans le cas où l'autopsie ne permettait pas de conclure avec certitude par rapport à la cause de décès, celle-ci était codée R99 « Autres causes de mortalité mal définies et non précisées ».

Les données ont été traitées à l'INSP à l'aide du logiciel Microsoft Excel 2007 et du logiciel SPSS version 20.0 pour Windows.

## Résultats

En 2015, 65 743 décès sont survenus en Tunisie. Notre échantillon était composé de 1957 cas représentant un ratio de mortalité médico-légale de 6,6 %. Il y avait une prédominance masculine avec un *sex ratio* de 3,5. L'âge moyen était de 47,2 (ET 20,6) ans, avec des extrêmes d'un jour et de 95 ans. Ces cas étaient principalement mariés (52,3 %) ou célibataires (39,3 %). La majorité des défunts étaient décédés à Tunis (41,6 %). Toutes les

causes de décès étaient documentées par les données de l'autopsie et des documents médico-légaux. Au total 5,4 % des cas sont restés sans cause de décès exacte (Figure 1).

Le groupe des « causes externes de morbidité et de mortalité » (V01-Y98) était le premier groupe de causes de mortalité dans notre échantillon avec 1018 cas (52,0 %), suivi des « maladies de l'appareil circulatoire » (I00-I99) (24,5 %). Les « lésions traumatiques, empoisonnements et certaines autres conséquences de causes externes » (S00-T98) sont classés en quatrième position (5,4 %). Ainsi, les morts violentes ont représenté 57,4 % de la mortalité globale (Figure 2).

Les dix premières causes de mortalité formaient à elles seules 70,1 % des causes de mortalité avec 1372 cas. Les causes les plus fréquentes étaient les accidents de transport terrestre (V01-V89) (33,7 %) et les cardiopathies ischémiques (I20-I25) (17,9 %) (Figure 1).

Les morts accidentelles étaient la forme médico-légale la plus fréquente (41,7 %), suivie des morts naturelles (31,6 %) et des formes médico-légales indéterminées (13 %). Les suicides et les homicides représentaient respectivement 8,3 % et 5,4 % des décès. Les accidents de la voie publique étaient responsables de 56,1 % des morts accidentelles ; les piétons étaient les victimes les plus atteintes (44,4 %). Parmi les huit modes suicidaires qui ont été observés, la pendaison était responsable à elle seule de 51,5 % du total des suicides. Il y avait 106 cas d'homicide, le plus souvent secondaire à des plaies par arme blanche (35,8 %) et à des blessures par objet contondant (27,4 %). Nous avons colligé aussi 13 décès secondaires à un *blast* à haute énergie (explosion) (12,3 %) et neuf cas de blessure par arme à feu à issue fatale (8,5 %) en rapport avec des attentats terroristes.

**Tableau 1** Distribution des groupes causes de décès selon le sexe

| Principaux groupes de maladies ou causes extérieures (Code CIM-10)                                            | Hommes |      | Femmes |       |
|---------------------------------------------------------------------------------------------------------------|--------|------|--------|-------|
|                                                                                                               | Nbre   | %    | Nbre   | %     |
| Causes externes de morbidité et de mortalité (V01-Y98)                                                        | 821    | 53,7 | 197    | 46,1  |
| Maladies de l'appareil circulatoire (I00-I99)                                                                 | 384    | 25,1 | 95     | 22,2  |
| Maladies de l'appareil respiratoire (J00-J99)                                                                 | 97     | 6,3  | 30     | 7,0   |
| Symptômes, signes et résultats anormaux d'examens cliniques et de laboratoire, non classés ailleurs (R00-R99) | 65     | 4,3  | 34     | 8,0   |
| Lésions traumatiques, empoisonnements et certaines autres conséquences de causes externes (S00-T98)           | 78     | 5,1  | 27     | 6,3   |
| Maladies de l'appareil digestif (K00-K93)                                                                     | 22     | 1,4  | 8      | 1,8   |
| Tumeurs (C00-D48)                                                                                             | 18     | 1,2% | 8      | 1,9 % |
| Maladies endocriniennes, nutritionnelles et métaboliques (E00-E90)                                            | 11     | 0,7  | 11     | 2,6   |
| Maladies du système nerveux (G00-G99)                                                                         | 12     | 0,8  | 5      | 1,2   |
| Autres causes                                                                                                 | 22     | 1,4  | 12     | 2,8   |
| Total                                                                                                         | 1530   | 100  | 427    | 100   |

Tableau 2 Distribution des causes de décès selon les tranches d'âge (n = 1928)\*

| Causes                                                                                                        | Âge (ans)         |                    |                    |                    |                    |                    |                   |
|---------------------------------------------------------------------------------------------------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|
|                                                                                                               | < 15<br>(n = 115) | 15-24<br>(n = 163) | 25-34<br>(n = 280) | 35-44<br>(n = 269) | 45-54<br>(n = 337) | 55-64<br>(n = 358) | ≥ 65<br>(n = 406) |
| Causes externes de morbidité et de mortalité (V01-Y98)                                                        | 62,6 %            | 73,0 %             | 70,4 %             | 58,7 %             | 42,1 %             | 35,5 %             | 45,6 %            |
| Maladies de l'appareil circulatoire (I00-I99)                                                                 | 1,7 %             | 9,9 %              | 11,4 %             | 11,9 %             | 31,8 %             | 41,3 %             | 35,0 %            |
| Maladies de l'appareil respiratoire (J00-J99)                                                                 | 9,6 %             | 0,6 %              | 2,5 %              | 8,2 %              | 6,5 %              | 7,8 %              | 8,1 %             |
| Symptômes, signes et résultats anormaux d'examens cliniques et de laboratoire, non classés ailleurs (R00-R99) | 10,4 %            | 1,8 %              | 2,5 %              | 6,3 %              | 6,8 %              | 5,3 %              | 2,5 %             |
| Lésions traumatiques, empoisonnements et certaines autres conséquences de causes externes (S00-T98)           | 6,2 %             | 9,8 %              | 8,6 %              | 8,2 %              | 3,0 %              | 3,6 %              | 3,2 %             |
| Maladies de l'appareil digestif (K00-K93)                                                                     | 2,6 %             | 0,6 %              | 0,0 %              | 1,1 %              | 2,4 %              | 1,4 %              | 2,5 %             |
| Tumeurs (C00-D48)                                                                                             | 0,0 %             | 0,6 %              | 0,0 %              | 1,5 %              | 2,6 %              | 2,0 %              | 1,2 %             |
| Maladies endocriniennes, nutritionnelles et métaboliques (E00-E90)                                            | 1,7 %             | 0,6 %              | 1,4 %              | 0,7 %              | 1,8 %              | 1,1 %              | 0,7 %             |
| Maladies du système nerveux (G00-G99)                                                                         | 0,9 %             | 0,6 %              | 1,8 %              | 1,5 %              | 1,5 %              | 0,3 %              | 0,0 %             |
| Autres causes                                                                                                 | 4,3 %             | 2,5 %              | 1,4 %              | 1,9 %              | 1,5 %              | 1,7 %              | 1,2 %             |
| Total                                                                                                         | 100 %             | 100 %              | 100 %              | 100 %              | 100 %              | 100 %              | 100 %             |

\*L'information relative à l'âge était manquante chez 29 cas.

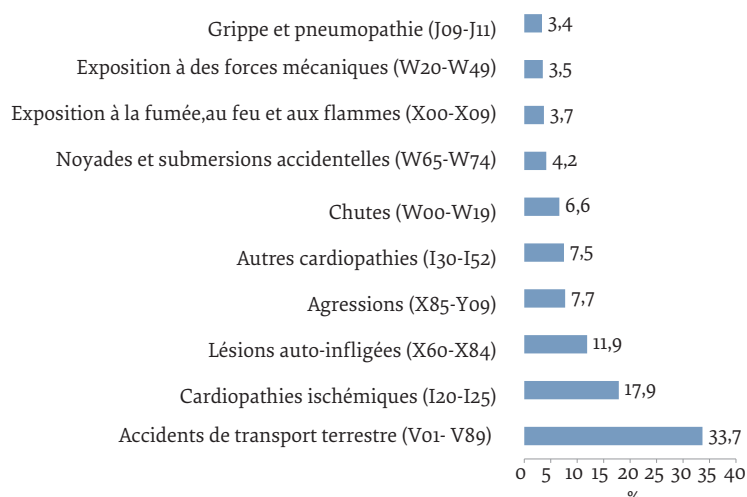
Les « causes externes de morbidité et de mortalité » représentaient le groupe de mortalité le plus fréquent chez les deux sexes (53,7 % des hommes et 46,1 % des femmes) et les « maladies de l'appareil circulatoire » étaient la deuxième cause de mortalité (25,1 % des hommes et 22,2 % des femmes) (Tableau 1). La mort violente était la première cause de décès pour toutes les tranches d'âge à l'exception de celle des 55-64 ans (Tableau 2).

## Discussion

Dans notre étude, la mort violente explorée par les chapitres XIX et XX de la CIM-10 représentait à elle seule plus de la moitié des causes de décès (57,4 %). Cependant, elle ne représentait que 6,3 % de la mortalité totale sur tout le territoire tunisien si on se référait au rapport national de mortalité de 2013 élaboré par l'INSP (1) et 3,8 % par rapport à la mortalité totale dans les gouvernorats inclus dans notre étude (5). La mortalité en rapport avec les maladies de l'appareil circulatoire était observée au deuxième rang (24,5 %). Cependant, ce groupe de causes de décès représentait le groupe le plus fréquent à l'échelle nationale dans le rapport national de mortalité de 2013 (29,1 %) (1). La mortalité relative à la mort violente se rapprochait de celle d'une étude réalisée à Alger en 2014 (44,2 %) (3). Elle était responsable de 63 % des décès dans l'étude réalisée à Toulouse (6). Au Canada, la mort violente était la deuxième cause de mortalité après les causes médicales (35,5 %) (7). Les maladies cardio-circulatoires représentaient la deuxième cause de décès après la mort violente. Dans le contexte médico-légal, ce groupe de cause de décès

est essentiellement observé dans le cadre de la mort subite d'origine cardiaque (MSC). Dans notre étude, la cardiopathie ischémique était la cause de décès la plus fréquente parmi les maladies cardio-vasculaires, suivie des « autres formes de cardiopathies » en référence principalement aux cardiomyopathies hypertrophiques, aux cardiomyopathies dilatées et aux dysplasies arythmogènes du ventricule droit. Nos résultats sont similaires aux résultats d'autres études médico-légales internationales (8,9). Cette prédominance peut être expliquée par les mauvaises habitudes de vie, les facteurs de risque cardio-vasculaires mais aussi souvent par une négligence de la part des patients des signes fonctionnels pourvoyeurs de crise angineuse dont principalement la douleur thoracique, tous responsables d'un retard voire d'une absence de consultation et de prise en charge à temps (10).

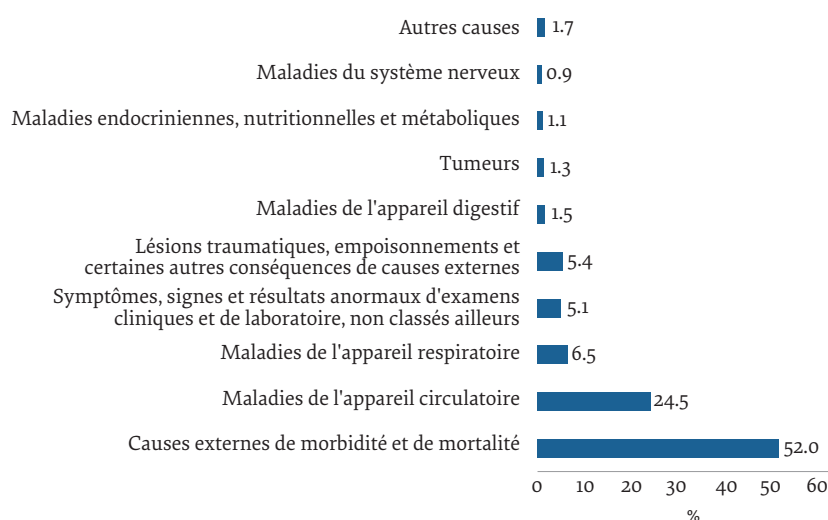
Les piétons étaient les victimes les plus atteintes par les accidents de la circulation mortels dans notre étude. Selon l'Observatoire National de Sécurité Routière tunisien, ils étaient classés en troisième position (25,87 %) et les occupants d'une automobile étaient au premier rang (56,15 %) (11). À l'échelle internationale, les piétons venaient en deuxième position (23 %) après les occupants d'une automobile (28 %). En Afrique, 43 % des victimes sont des piétons et des cyclistes, et dans le Sud-Est de l'Asie et sur la côte ouest du Pacifique, les motocyclistes et les conducteurs de véhicules à trois roues représentent la plus grande proportion (12). En effet, l'OMS définit les piétons, les cyclistes et les motocyclistes comme des utilisateurs de la route « vulnérables » à cause du manque de stratégies et d'outils de protection destinés à cette population contre une « favorisation » des

**Figure 1 Les dix principales causes de décès (n = 1372)**

utilisateurs de véhicules à moteur dans l'usage de l'infrastructure et l'existence de moyens de protection dans les véhicules comme les airbags, la ceinture de sécurité, la stabilité du véhicule et la notification de dépassement d'une certaine vitesse (13). De plus, elle explique cette différence de répartition des victimes d'une région à une autre par la différence de recours aux différents moyens de transport et par le niveau socio-économique du pays. Par exemple, dans les pays à revenu faible ou moyen, le développement économique s'accompagne d'une croissance des moyens de transport motorisés mais l'infrastructure, les modalités de protection et de prise en charge des victimes des accidents de la voie publique, la législation et l'éducation routière ne se sont pas améliorées en parallèle (13,14).

De nos résultats il ressort que la pendaison est le premier mode de suicide. Elle est aussi le mode suicidaire le plus fréquent dans les études traitant du suicide en Tunisie chez les adultes et les enfants (15,16). À Ankara également, elle est le mode le plus recouru chez les sujets âgés de plus de 65 ans (56,6 %) (17). À Alger, elle est en deuxième position (25,96 %), légèrement dépassée par les précipitations (28,84 %) (3). Aux États-Unis d'Amérique, le suicide par asphyxie était classé deuxième après le suicide par arme à feu en 2014 et la pendaison était la méthode de suicide par asphyxie la plus utilisée dans 16 États de 2005 à 2014 (18).

Les plaies par arme blanche étaient les premières responsables de décès criminels en 2015 (35,8 %), suivies par les homicides secondaires à des agressions par objet contondant (27,4 %). Ce résultat rejoint celui

**Figure 2 Distribution des cas médico-légaux selon les groupes de décès**

de deux études tunisiennes analysant cette forme médico-légale (19,20). La particularité en 2015 dans notre étude était représentée par une augmentation des homicides par arme à feu et par *blast* à haute énergie (explosion d'engin), mais cette augmentation est à relativiser étant donné que ces cas étaient majoritairement survenus dans le cadre d'attentats terroristes ne reflétant pas un changement de modèle des homicides dans le cadre du droit commun. Il est plus fait usage d'armes à feu dans les homicides dans les pays occidentaux, en particulier aux États-Unis d'Amérique (21). Ce constat peut être expliqué par la différence d'accès aux armes dans les différents pays. En Tunisie, la législation régissant le port et l'usage des armes à feu est extrêmement restrictive, limitant l'accès aux armes à feu et privilégiant l'usage des armes blanches du fait de la facilité de se les procurer et de les utiliser tout en garantissant une issue fatale à l'agression.

Le choix qu'un médecin légiste fasse le codage était à notre avis utile afin de limiter les biais. Les données extraites des documents médico-légaux ne seraient pas disponibles aux codeurs du fait de leur caractère confidentiel et du contexte médico-judiciaire. Nous recommandons de garder cette démarche en pratique quotidienne afin de limiter les risques de codage non concluant.

Ce travail a aussi mis en évidence certaines difficultés et certaines limites en rapport avec la CIM-10 elle-même. En effet, l'usage de causes de décès fonctionnelles dont les dysfonctions vitales telles que « insuffisance respiratoire aiguë », « insuffisance cardiaque aiguë », « œdème pulmonaire », sans pour autant remonter à la cause initiale bien qu'importante pour la pratique médico-légale, ne permettrait pas d'avoir un usage à visée épidémiologique. D'ailleurs, dans ce sens, l'OMS avait qualifié ces causes non spécifiques dans la CIM-10 de *garbage codes* puisqu'elles ne seront d'aucune utilité ni aux statistiques, ni dans l'élaboration des stratégies de prévention. En revanche, dans certains cas, le médecin légiste pourra identifier le mécanisme de décès ou éliminer d'autres mécanismes sans pour autant déterminer la cause exacte de décès. Exemple : « la mort est la conséquence d'un œdème pulmonaire. Elle

n'est ni de cause traumatique ni de cause toxique ». L'essentiel est donc de garantir la qualité des rapports d'autopsie au sens médico-légal tout en gardant la possibilité d'utiliser ces rapports (ou les CMD remplis *a posteriori*) dans les travaux visant à protéger la santé publique.

Une autre limite de l'usage de la CIM-10 était son caractère mono-axial ne permettant pas de coder plus d'une cause initiale. En effet, même le système de dague ou d'astérisque garantissant une double classification n'était pas efficace dans le contexte médico-légal. On peut citer l'exemple d'une agression avec de multiples agresseurs où le légiste devrait s'efforcer d'identifier les différents traumatismes ayant pu aboutir au décès et de discuter l'imputabilité de chacune des lésions provoquées par chacun des agresseurs. Au moment de coder la cause initiale de décès, le médecin légiste devrait choisir laquelle des causes/lequel des mécanismes à retenir, qui est à l'origine de l'enchaînement causal. Dissocier les données du rapport d'autopsie médico-légale destiné à l'autorité judiciaire d'une part, du certificat médical de décès rempli *a posteriori* et délivré seulement à l'autorité sanitaire responsable du codage d'autre part, s'avère ainsi primordial. Le médecin légiste pourrait procéder lui-même au codage afin d'adapter le message à chacune des parties prenantes.

En conclusion, notre étude a permis d'établir les statistiques sur les causes de décès médico-légaux, en particulier la part de la mort violente et ses caractéristiques. La CIM-10 s'est avérée un moyen utile de standardisation des conclusions des rapports d'autopsie. Nos résultats pourraient représenter les prémices d'une rubrique au titre de « Mortalité médico-légale » dans le rapport de mortalité de la population générale des dix gouvernorats du nord de la Tunisie couverts par notre service. L'usage de la CIM-10 pouvait présenter des difficultés, d'où l'importance d'un entraînement préalable et d'une proposition d'une version de la CIM-10 adaptée à l'activité médico-légale permettant d'optimiser le codage et donc l'usage dans les interventions visant la santé publique.

**Conflits d'intérêt :** aucun

**Financements :** aucun

## Contribution of 10th Revision of the International Classification of Diseases to the Coding of Medico-Legal Mortality

### Abstract

**Background:** Tunisian official mortality reports do not include causes of medico-legal death.

**Aims:** Establish the medico-legal death statistics of Northern Tunisia according to the 10th version of the International Classification of Diseases (ICD-10).

**Methods:** A cross-sectional descriptive review, including all medico-legal deaths investigated in Northern Tunisia in 2015. Data related to the sociodemographic features were collected. Causes and manner of death were coded according to the ICD-10.

**Results:** We included 1957 cases. Victims were mainly males. Sex ratio (M/F) was 3.5 with a mean age of  $47.2 \pm 20.6$  years. Violent death represented 57.4% of the total sample, diseases of the circulatory system and of the respiratory systems counted respectively for 24.5% and 6.5%. Road traffic accidents were the cause of 56.1% of accidental deaths. Hanging was the most frequent suicidal mode (51.5%). Homicides were most frequently caused by sharp force (35.8%).

**Conclusion:** ICD-10 was a useful tool to code medico legal death and to highlight violent death causes in the population mortality report in Northern Tunisia. This would be helpful to enable a standardization of autopsy reports aligned with a public health use of these data.

## مساهمة المراجعة العاشرة للتصنيف الدولي للأمراض في ترميز الوفيات التي ينظر فيها الطب الشرعي

أنس حمادي، مهدي بن خليل، نهى زغلامي، هاجر سخيري، منصف حمدون

### الخلاصة

الخلفية: لا تتضمن تقارير الوفيات الرسمية التونسية أسباب الوفيات التي ينظر فيها الطب الشرعي.

الأهداف: هدفت هذه الدراسة الى وضع إحصاءات بالوفيات التي ينظر فيها الطب الشرعي في شمال تونس، وفقاً للمراجعة العاشرة للتصنيف الدولي للأمراض.

طرق البحث: إجراء مراجعة وصفية مقطعية، تتضمن جميع الوفيات التي ينظر فيها الطب الشرعي، والتي جرى التحقيق بشأنها في شمال تونس في عام 2015. وقد جُمعت البيانات المرتبطة بالسّمات الاجتماعية والسكانية. وصُنفت أسباب وطرق الوفاة وفقاً للمراجعة العاشرة للتصنيف الدولي للأمراض.

النتائج: شملت الدراسة 1957 حالة. وكان الضحايا أساساً من الرجال. وكانت نسبة الذكور إلى الإناث 3.5، وبلغ متوسط أعمارهم  $47.2 \pm 20.6$  عاماً. وشكلت الوفيات الناجمة عن العنف 57.4% من مجموع العينة، بينما شكلت أمراض الجهاز الدوري وأمراض الجهاز التنفسي 24.5% و6.5%، على التوالي. وكانت الوفيات الناجمة عن حوادث المرور على الطرق السبب في 56.1% من الوفيات الناجمة عن حوادث. وكان الشنق أكثر الطرق الشائعة للانتحار (51.5%). وغالباً ما كانت تعزى جرائم القتل إلى استخدام القوة المفرطة (35.8%).

الاستنتاجات: كانت المراجعة العاشرة للتصنيف الدولي للأمراض أداة مفيدة لترميز الوفيات التي ينظر فيها الطب الشرعي، وتبسيط الضوء على أسباب الوفيات الناجمة عن العنف في تقرير الوفيات الخاص بالسكان في شمال تونس. وسيساعد ذلك في توحيد تقارير تشريح الجثث، بما يتماشى مع استخدام الصحة العامة لهذه البيانات.

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# Prevalence of cigarette smoking in Iranian adolescents and young adults: a systematic review and meta-analysis

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## Abstract

**Background:** Cigarette smoking is a shared risk factor for a variety of health conditions.

**Aims:** To estimate the prevalence of cigarette smoking among Iranian adolescents and young adults.

**Methods:** In this systematic review and meta-analysis, we searched PubMed, Web of Science, Embase, Scopus and domestic databases from January 2001 to December 2018. Cross-sectional studies that reported the prevalence of cigarette smoking among high school students, university students or general population aged 14–30 years were eligible. Data on prevalence of smoking, age and gender of subjects, sample size, date, and location of studies were extracted by 2 independent reviewers.

**Results:** We included 99 studies in the analysis. For high school students, the pooled life-time prevalence of cigarette smoking was 13% in girls and 23% in boys. For university students, the life-time prevalence was 11% in women and 33% in men. The pooled prevalence of current and regular smoking among high school boys was 9% and 5%, respectively, compared with 3% and 1% in girls. The pooled prevalence of current and regular smoking among male university students was 22% and 11%, respectively, compared with 5% and 1% among female students. The prevalence of current smoking among the general population aged 15–24 years was 3.3–13.9%. The prevalence of regular smoking among this population was 1.0–10.2%.

**Conclusion:** Cigarette smoking is notable among Iranian young adults especially boys and university students. Our findings call for reinforcement of tobacco prevention and control policies across Iranian schools and universities.

Keywords: cigarette smoking, adolescents, young adults, prevalence, Islamic Republic of Iran

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## Introduction

Cigarette smoking is one of the most important causes of death and disability worldwide. The World Health Organization (WHO) has estimated that tobacco causes about 8 million deaths annually worldwide (1). Smoking imposes a heavy economic burden globally, especially in developing countries. The diseases attributed to smoking accounted for around 6% of global health expenditure in 2012 (2). In the WHO Eastern Mediterranean Region, the age-standardized prevalence of smoking in men aged > 15 years is estimated to be around 40% (3).

Cigarette smoking usually begins at an early age of adolescence. The early onset of smoking is associated with early incidence of noncommunicable diseases (4) as well as infectious diseases (5). Furthermore, tobacco dependence is more severe in people who start smoking at younger ages, and quitting smoking is more difficult in this group (6–8). The prevalence of adolescent and young adult smoking varies in different regions of the world. In the United States of America (USA), 16% of young adults aged 18–24 years (9) and 12.5% of adolescents smoked cigarettes at least once a month (10). A recent estimate

indicates that around 10% of adolescents aged 12–15 years in low- and middle-income countries smoke cigarettes (11). In the Islamic Republic of Iran, the prevalence of monthly smoking among high school students varies from 2.7% to 20% (12–16).

Policy-making requires that we take into account the public health importance of cigarette smoking, and provide timely and comprehensive information on current status of cigarette smoking among adolescents and young adults. In this systematic review, we provided a nationwide estimate of current, regular and life-time cigarette smoking among Iranian adolescents and young adults aged 18–30 years. Furthermore, we reported the gender-specific prevalence of smoking in various subgroups including high school and university students as well as the general population.

## Methods

### Study design

This systematic review was conducted according to the Meta-analysis Of Observational Studies in Epidemiology

(MOOSE) guidelines. We used the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) for detailing the identification and selection of studies for inclusion in the review.

### Study selection

Studies were eligible for inclusion if they were cross-sectional; conducted among adolescents aged 14–18 years or young adults aged 18–30 years; and published in either English or Farsi languages. Studies were excluded if they used nonrandom sampling; the sample size was not clearly declared; the prevalence was not reported or could not be calculated from the data; and the prevalence was reported based on the level of nicotine.

### Search strategy

We searched PubMed, Web of Science, Embase and Scopus to identify English-language articles. To capture Farsi-language articles, databases of SID, Iran Medex, MagIran, Medlib and IranDoc were searched. The search was restricted to January 2001 to December 2018. The searches were adapted for each database, using combinations of the following keywords: (1) prevalence OR epidemiology OR frequency OR cigarette smoking OR occurrence OR incidence OR survey; (2) tobacco smoking OR cigar smoking OR smoking OR smoking behave\* OR smoking habit\*; and (3) Iran OR Persia\*

### Article screening

Two independent reviewers (MA and ZKh) carefully scanned the titles, abstracts and keywords of each article for their relevancy and eligibility. Any disagreements between the reviewers were resolved by further investigation and discussion among the authors. If the information in the title or abstract was insufficient, the full text was reviewed.

### Data extraction

The following information was extracted from each eligible article by 2 independent reviewers, and if there was any discrepancy between the reviewers, the decision was based on negotiation with the third reviewer. The extracted data included: study location and setting, publication year, participants' characteristics (gender and age), sampling source (high school, university, or general population), sample size, reported prevalence of cigarette smoking and its confidence intervals (CIs) by type (life-time vs current and regular).

### Definitions

Life-time smoking was defined as whether a person had ever smoked cigarettes in their life-time. Cigarette smoking during the previous month was considered as current smoking. Regular smoking was defined as smoking  $\geq 1$  cigarette every day or every other day during the previous month. We categorized the prevalence of smoking by level of education, gender, and type of smoking. Furthermore, to increase the generalization of the results, we estimated the prevalence based on the time of the study and type of city. As the prevalence of smoking may vary

by time, we estimated the pooled prevalence in 2001–2010 and 2011–2018. We categorized cities based on their population: small cities with the population  $< 1$  million and large cities with a population  $\geq 1$  million. We calculated the pooled prevalence in subgroups with at least 3 related articles.

### Quality assessment

The quality of studies was examined by two authors (ZKh and MA) based on the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist for cross-sectional studies.

### Statistical analysis

The pooled prevalence was calculated using the metaprop command in Stata version 14. The standard error of prevalence,  $E = \sqrt{\frac{p(1-p)}{n}}$ , for each study was calculated based on the binomial distribution formula. The heterogeneity of studies was evaluated using  $I^2$  statistics. For  $I^2 > 50\%$ , which depicted heterogeneity between studies, the random effects model was used to estimate the pooled measures and 95% CIs. A forest plot was used to display the results of the meta-analysis. A funnel plot of log odds versus study size was constructed (17).

## Results

### Literature search

Our search identified 3456 articles, and 1477 of them were excluded because they were duplicates. Title/abstract screening of the remaining 1979 articles resulted in the selection of 475. Further screening of full-text articles led to the inclusion of 99 eligible articles in the meta-analysis.

Forty-six studies were conducted in high school students and included 51 943 girls and 74 476 boys. The number of studies on male, female and both genders was 17, 1 and 28, respectively. Twenty-four studies reported current smoking and 33 the lifetime prevalence of cigarette smoking. Daily or regular smoking was reported in 22 studies (12–14,18–60). Thirty-seven studies were conducted among university students; 4 among men and 33 among both genders. There were 37 169 female and 25 647 male students. Twenty-eight studies reported the current prevalence and 13 the life-time prevalence of smoking. Daily or regular smoking was reported in 10 studies (16,61–96). Finally, 16 studies were conducted in the general population; 1 among women and 15 among both genders. These studies recruited 29 676 women and 36 587 men. The current and life-time prevalence of smoking was reported in 7 and 1 studies, respectively. Regular smoking was reported in 13 studies (97–112).

### Meta-analysis of smoking prevalence

#### High school students

The characteristics of the studies included in the systematic review and meta-analysis of cigarette smoking prevalence in Iranian high school students are presented in

Table 1. The pooled prevalence (95% CI) of life-time smoking was 13% (10–16%) in girls (Figure 1A) and 23% (20–26%) in boys (Figure 1D). The overall (combining both genders) pooled prevalence of life-time smoking was 18% (14–23%) (Figure 2A). The pooled prevalence of current smoking was 3% (2–4%) among girls (Figure 1B) and 9% (7–11) among boys (Figure 1E). The overall pooled prevalence of current smoking was 7% (5–8%) (Figure 2B). The pooled prevalence of regular smoking was 1% (0–1%) in girls (Figure 1C) and 5% (4–7%) in boys (Figure 1F). The overall pooled prevalence of regular smoking was 3% (2–4) (Figure 2C). The pooled prevalence of current smoking in both genders was higher in 2011–2018 than in 2001–2010 (4% vs 3% among girls and 10% vs 9% among boys) (Figure 3B and 3E). However, the pooled prevalence of life-time smoking was lower in 2011–2018 than in 2001–2010 (10% vs 17% among girls and 23% vs 25% among boys) (Figure 3A and 3D). For regular smoking, there was a decrease in smoking prevalence within the more recent period among girls (0.0% vs 1%) but an increase among boys (6% vs 5%) (Figure 3C and 3F). Furthermore, the pooled prevalence of all types of smoking in both genders was higher in large cities than in small cities (Figure 4, see Appendix online).

#### University students

The characteristics of the studies included in the systematic review and meta-analysis of cigarette smoking prevalence in Iranian university students are presented in Table 2. The pooled life-time prevalence of smoking was 11% (7–14%) in women (Figure 5A, see Appendix online) and 33% (23–44%) in men (Figure 5D, see Appendix online). The overall pooled prevalence of life-time smoking was 18% (12–24%) (Figure 2D). The pooled prevalence of current smoking was 5% (3–6%) in women (Figure 5B, see Appendix online) and 22% (16–28%) in men (Figure 5E, see Appendix online). The overall pooled prevalence of current smoking was 12% (10–15%) (Figure 2E). The pooled prevalence of regular smoking was 1% (1–2%) in women (Figure 5C, see Appendix online) and 11% (7–15%) in men (Figure 5F, see Appendix online). The overall pooled prevalence of regular smoking was 5% (3–7%) (Figure 2F). The pooled prevalence of current smoking in both genders was higher in 2011–2018 than in 2001–2010 (2% vs 1% among women and 24% vs 20% among men) (Figure 6B and 6D, see Appendix online). However, the pooled prevalence of life-time smoking was lower within the more recent period than in the previous years. This increase was greater among men (10% vs 13% among women and 29% vs 49% among men) (Figure 6A and 6C, see Appendix online). We did not perform the subgroups analysis for regular smoking because of the insufficient number of studies. The pooled prevalence of all types of smoking in both genders was higher in large cities than in small cities (Figure 7, see Appendix online). The only exception was a higher prevalence of current smoking among men in small cities than in large cities (Figure 7E, see Appendix online).

#### General population

The studies on smoking prevalence in the general population were heterogeneous (Table 3, see Appendix online); therefore, we could not estimate the pooled prevalence. The prevalence of current smoking among the age group 15–24 years was reported to be 3.3–13.9%. The prevalence of regular smoking among this age group varied from 1.0% to 10.2%. The asymmetry in the funnel plots was indicative of some degree of publication bias (Figures 8 and 9, see Appendix online).

## Discussion

The current systematic review and meta-analysis indicated that the prevalence of cigarette smoking was high among Iranian adolescents and young adults. The pattern of smoking differed among different age groups. The prevalence of smoking among male university students was markedly higher than among male high school students, whereas in female students, the difference between the 2 groups was negligible. In both age groups, male students had a higher prevalence of smoking than female students had. Furthermore, the prevalence of smoking was higher in large cities compared to small cities. Around 25% of Iranian male high school students experienced smoking during their life time. The prevalence of current and regular smoking was 9% and 5%, respectively, among male high school students. In male university students, a third had experienced life-time smoking; more than 20% of students were current smokers and 10% were regular smokers. Around 13% of female high school students and 11% of university students had ever smoked cigarettes. The prevalence of current smoking in female university students was only 2% more than among high school students (5% vs 3%), and regular smoking in both age groups was similar (1%).

According to the findings of a nationwide approach to surveillance (STEPS) survey in the Islamic Republic of Iran in 2016, the prevalence of current smoking among adults aged 18–24 years was estimated to be 14% for men and 2% for women. In the current study, we showed that among university students, 22% of men and 5% of women currently smoked cigarettes. Comparison of our findings with those of the STEPS survey indicate that the prevalence of current smoking among university students is higher than in the general population. Furthermore, a meta-analysis in the Islamic Republic of Iran in 2013 indicated that 19.8% of male and 2.2% of female university students smoked cigarettes (113). However, the main drawback of that meta-analysis is the lack of a clear definition for smoking, which limits any comparison. The prevalence of current smoking in young adults varies in different regions of the world. For instance, in Western Cape, South Africa, the prevalence for men and women was 22% and 14.8%, respectively (114). According to the 2013 National Health Interview Survey in the USA, the prevalence of current cigarette smoking in men and women aged 18–25 years was approximately 22% and 15%, respectively (115). Furthermore, in the

**Table 1** Characteristics of studies included in systematic review and meta-analysis of cigarette smoking prevalence in Iranian high school students categorized by type of use

| Author              | Year of publication | City                      | Sample size |        |      | Current smoking prevalence (%) |        |      |
|---------------------|---------------------|---------------------------|-------------|--------|------|--------------------------------|--------|------|
|                     |                     |                           | Total       | Female | Male | Total                          | Female | Male |
| Ziaee               | 2001                | Tehran                    | 4023        | 2018   | 2005 | 4.1                            | 1.0    | 7.2  |
| Ahmadi              | 2003                | Shiraz                    | 397         | 200    | 197  | 8.3                            | 1.5    | 15.2 |
| Kelishadi           | 2004                | Isfahan, Najaf Abad, Arak | 1950        | 1004   | 946  | 8.7                            | 4.0    | 12.5 |
| Mojahed             | 2004                | Zahedan                   | 475         | 259    | 216  | 1.3                            | 0.4    | 2.3  |
| Vafaei              | 2004                | Tabriz                    | 1000        | —      | —    | 28.6                           | —      | —    |
| Yazdani             | 2008                | Tehran                    | 502         | 242    | 260  | 3.5                            | 2.0    | 5.0  |
| Namkin              | 2008                | Birjand                   | —           | —      | 1233 | —                              | —      | 3.9  |
| Ramezankhani        | 2010                | Tehran                    | 2340        | 1079   | 1216 | 11.4                           | 10.1   | 13.1 |
| Rahmanian           | 2010                | Jahrom                    | 1145        | 456    | 689  | 9.9                            | 3.3    | 14.2 |
| Mohammadkhani       | 2010                | 10 provinces              | 2538        | 1255   | 1283 | 4.4                            | 1.3    | 7.4  |
| Karimy              | 2012                | Zarand                    | —           | —      | 250  | —                              | —      | 14.7 |
| Habib E             | 2012                | Tehran                    | 4591        | 2499   | 2092 | 8.3                            | 5.3    | 12.1 |
| Moeini              | 2012                | Hamedan                   | 1161        | 573    | 588  | 10.2                           | 6.8    | 13.4 |
| Shahnazi            | 2012                | Isfahan                   | —           | —      | 382  | —                              | —      | 7.2  |
| Mohammadi           | 2014                | Babolsar                  | —           | —      | 450  | —                              | —      | 7.4  |
| Karimy              | 2014                | Zarandieh                 | —           | —      | 350  | —                              | —      | 15.1 |
| Reisi               | 2014                | Isfahan                   | —           | —      | 382  | —                              | —      | 32.0 |
| Meysamie            | 2015                | Tehran                    | 2877        | 1320   | 1557 | 4.4                            | 1.4    | 7.0  |
| Alizadeh-Charandabi | 2015                | Sanandaj                  | 1524        | 760    | 764  | 9.9                            | 6.4    | 13.1 |
| Roohafza            | 2015                | Isfahan                   | 5362        | 2641   | 2681 | 5.8                            | 1.9    | 9.7  |
| Mohammadi           | 2017                | Marivan                   | —           | —      | 470  | —                              | —      | 6.4  |
| Rezaei              | 2017                | Jahrom                    | 630         | 315    | 315  | 2.7                            | 1.6    | 3.8  |
| Bashirian           | 2018                | Hamedan                   | —           | —      | 730  | —                              | —      | 13.2 |
| Sabzmakan           | 2018                | Noshahr                   | —           | —      | 440  | —                              | —      | 11.8 |
| Author              | Year of publication | City                      | Sample size |        |      | Lifetime prevalence            |        |      |
|                     |                     |                           | Total       | Female | Male | Total                          | Female | Male |
| Ziaee               | 2001                | Tehran                    | 4023        | 2018   | 2005 | 30.9                           | 26.9   | 35.0 |
| Ahmadi              | 2003                | Shiraz                    | 397         | 200    | 197  | 25.4                           | 11.5   | 39.5 |
| Mojahed             | 2004                | Zahedan                   | 475         | 259    | 216  | 15.6                           | 7.8    | 25.2 |
| Mojahed             | 2004                | Zahedan                   | 475         | 259    | 216  | 1.6                            | 1.6    | 0.8  |
| Mohammadpoorasl     | 2007                | Tabriz                    | —           | —      | 1779 | —                              | —      | 18.2 |
| Mohtasham Amiri     | 2008                | Rasht                     | —           | —      | 1297 | —                              | —      | 28.2 |
| Namkin              | 2008                | Birjand                   | —           | —      | 1233 | —                              | —      | 21.3 |
| Pasharosh           | 2009                | Kermanshah                | —           | 3163   | —    | —                              | 15.0   | —    |
| Rahmanian           | 2010                | Jahrom                    | 1145        | —      | —    | 21.9                           | —      | —    |
| Ramezankhani        | 2010                | Tehran                    | 2340        | 1079   | 1216 | 36.3                           | 36.5   | 37.6 |
| Momtazi             | 2010                | Zanjan                    | 537         | 273    | 264  | 21.8                           | 10.3   | 33.7 |
| Mohammadkhani       | 2010                | 10 province               | 2538        | 1255   | 1283 | 14.7                           | 6.1    | 23.1 |
| Mohammadpoorasl     | 2011                | Tabriz                    | —           | —      | 1785 | —                              | —      | 14.3 |
| Shamshiri Milani    | 2011                | Tehran                    | —           | 2313   | —    | —                              | 12.9   | —    |
| Mohammadkhani       | 2011                | National                  | 2538        | 1255   | 1238 | 14.7                           | 6.1    | 23.1 |
| Karimy              | 2012                | Zarand                    | —           | —      | 250  | —                              | —      | 43.7 |
| Mohammadpoorasl     | 2012                | Tabriz                    | 4903        | 2775   | 2099 | 16.4                           | 11.2   | 22.5 |
| Shahnazi            | 2012                | Isfahan                   | —           | —      | 382  | —                              | —      | 32.7 |
| Nazarzadeh          | 2013                | Zanjan                    | —           | —      | 1064 | —                              | —      | 23.4 |
| Pirdehghan          | 2013                | Yazd                      | 460         | 187    | 273  | 23.3                           | 12.8   | 30.8 |
| Mohammadi           | 2014                | Babolsar                  | —           | —      | 450  | —                              | —      | 30.1 |
| Barati              | 2014                | Hamedan                   | —           | —      | 810  | —                              | —      | 17.2 |

**Table 1** Characteristics of studies included in systematic review and meta-analysis of cigarette smoking prevalence in Iranian high school students categorized by type of use (concluded)

| Author       | Year of publication | City            | Sample size |        |      | Lifetime prevalence |        |      |
|--------------|---------------------|-----------------|-------------|--------|------|---------------------|--------|------|
|              |                     |                 | Total       | Female | Male | Total               | Female | Male |
| Khajehdaluae | 2014                | Sarakhs         | 943         | 436    | 507  | 19.2                | 13.8   | 23.9 |
| Bidel        | 2014                | Ilam            | —           | —      | 1000 | —                   | —      | 11.4 |
| Meysamie     | 2015                | Tehran          | 2877        | 1320   | 1557 | 12.1                | 9.9    | 13.8 |
| Roohafza     | 2015                | Isfahan         | 5362        | 2641   | 2681 | 11.6                | 6.8    | 16.5 |
| Chaman       | 2015                | Shahrour        | —           | —      | 450  | —                   | —      | 12.8 |
| Ayubi        | 2017                | Zanjan          | —           | —      | 958  | —                   | —      | 23.4 |
| Karimi       | 2017                | Shiraz          | —           | —      | 900  | —                   | —      | 19.7 |
| Khayyati     | 2017                | East Azerbaijan | 4422        | 1990   | 2432 | 8.9                 | 5.5    | 11.8 |
| Mohammadi    | 2017                | Marivan         | —           | —      | 470  | —                   | —      | 34.7 |
| Pirdehghan   | 2017                | Yazd            | 704         | 256    | 448  | 17.4                | 9.8    | 21.9 |
| Bashirian    | 2018                | Hamedan         | —           | —      | 730  | —                   | —      | 27.2 |

| Author          | Year of publication | City       | Sample size |        |      | Regular |        |      |
|-----------------|---------------------|------------|-------------|--------|------|---------|--------|------|
|                 |                     |            | Total       | Female | Male | Total   | Female | Male |
| Heidari         | 2004                | Tehran     | 1119        | —      | —    | 3.4     | —      | —    |
| Mojahed         | 2004                | Zahedan    | 475         | 259    | 216  | 1.2     | 0.4    | 2.3  |
| Heydari         | 2007                | Tehran     | 1095        | 381    | 712  | 5.0     | 2.0    | 6.0  |
| Mohammadpoorasl | 2007                | Tabriz     | —           | —      | 1779 | —       | —      | 4.4  |
| Mohtasham Amiri | 2008                | Rasht      | —           | —      | 1297 | —       | —      | 6.7  |
| Pasharosh       | 2009                | Kermanshah | —           | 3163   | —    | —       | 1.1    | —    |
| Rahmanian       | 2010                | Jahrom     | 1145        | —      | —    | 14.2    | —      | —    |
| Ramezankhani    | 2010                | Tehran     | 2340        | 1079   | 1216 | 3.3     | 2.1    | 4.2  |

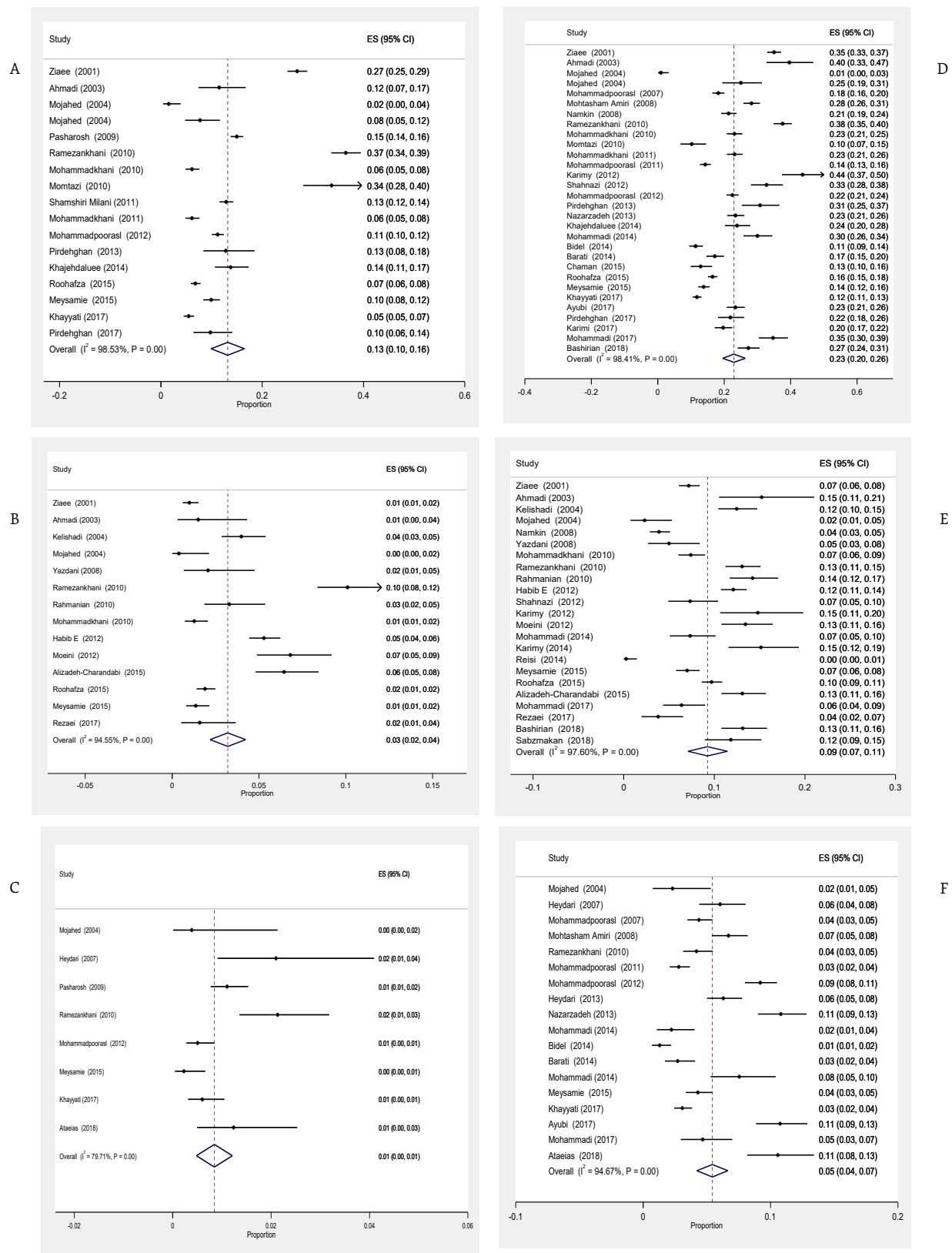
  

| Author          | Year of publication | City            | Sample size |        |      | Regular |        |      |
|-----------------|---------------------|-----------------|-------------|--------|------|---------|--------|------|
|                 |                     |                 | Total       | Female | Male | Total   | Female | Male |
| Mohammadpoorasl | 2011                | Tabriz          | —           | —      | 1785 | —       | —      | 2.8  |
| Mohammadpoorasl | 2012                | Tabriz          | 4903        | 2775   | 2099 | 4.0     | 0.5    | 9.2  |
| Nazarzadeh      | 2013                | Zanjan          | —           | —      | 1064 | —       | —      | 10.8 |
| Heydari         | 2013                | Tehran          | —           | —      | 1271 | —       | —      | 6.3  |
| Bidel           | 2014                | Ilam            | —           | —      | 1000 | —       | —      | 1.3  |
| Mohammadi       | 2014                | Babolsar        | —           | —      | 450  | —       | —      | 7.5  |
| Mohammadi       | 2014                | Babolsar        | —           | —      | 450  | —       | —      | 2.3  |
| Barati          | 2014                | Hamedan         | —           | —      | 810  | —       | —      | 2.7  |
| Meysamie        | 2015                | Tehran          | 2877        | 1320   | 1557 | 2.4     | 0.2    | 4.3  |
| Mohammadi       | 2017                | Marivan         | —           | —      | 470  | —       | —      | 4.7  |
| Khayyati        | 2017                | East Azerbaijan | 4422        | 1990   | 2432 | 2.0     | 0.6    | 3.1  |
| Ayubi           | 2017                | Zanjan          | —           | —      | 958  | —       | —      | 10.8 |
| Ataeias         | 2018                | Tabriz          | 1161        | 566    | 567  | 5.9     | 1.2    | 10.6 |

Eastern Mediterranean Region, the prevalence of current cigarette smoking in university students was 11% in Pakistan (116), 18% in Palestine (32.8% in men vs 3.6% in women) (117) and 24.7% in the Syrian Arab Republic (39.82% in men vs 5.54% in women) (118). The global estimates in health profession students showed that the prevalence of smoking varies by region. The highest prevalence was reported in Europe, where the prevalence in men ranged from 36% among nursing students to 55.8% among pharmacy students. In the Eastern Mediterranean Region, the prevalence varied from 3% to 6% in women

and 20% to 28% in men (119). Compared with these national reports, in our study, the prevalence of smoking among Iranian students, especially women, seems to be lower than in European countries, but similar to most Eastern Mediterranean countries. One explanation for the lower prevalence of cigarette smoking in the Eastern Mediterranean Region, including the Islamic Republic of Iran, may be the increasing tendency of young adults to try other types of tobacco, mainly water pipe smoking. In the Islamic Republic of Iran, the prevalence of life-time and current water-pipe smoking among students was

**Figure 1** Forest plot of studies included in meta-analysis of cigarette smoking prevalence in high school students: Left: life time (A), current (B) and regular (C) smoking prevalence in girls. Right: life time (D), current (E), regular (F) smoking prevalence in boys.



**Figure 2** Forest plot of studies included in meta-analysis of total (both sexes) cigarette smoking prevalence in high school and university students. Left: life time (A), current (B) and regular (C) smoking prevalence in high school students. Right: life time (D), current (E) and regular (F) smoking prevalence in university students.



**Table 2 Characteristics of studies included in systematic review and meta-analysis of cigarette smoking prevalence in Iranian university students**

| Author              | Year of publication | City        | Sample size |        |      | Life-time prevalence |        |      |
|---------------------|---------------------|-------------|-------------|--------|------|----------------------|--------|------|
|                     |                     |             | Total       | Female | Male | Total                | Female | Male |
| Ahmadi              | 2004                | Shiraz      | 400         | 343    | 57   | 25.3                 | 19.4   | 59.3 |
| Pour ali            | 2005                | Ardebil     | 1106        | 779    | 327  | 13.9                 | 3.7    | 38.3 |
| Zarrabi             | 2005-2006           | Gilun       | 827         | —      | —    | 26.4                 | —      | —    |
| Shamsi Meymandi     | 2010                | Kerman      | 1677        | 872    | 805  | 31.0                 | 15.0   | 51.0 |
| Amin-Esmaeili       | 2013                | Tehran      | 1761        | 1162   | 599  | 34.0                 | 16.4   | 43.8 |
| Amin-Esmaeili       | 2013                | Tehran      | 1741        | 1107   | 629  | 32.7                 | 15.4   | 42.8 |
| Amin-Esmaeili       | 2013                | Tehran      | 1755        | 1159   | 591  | 29.6                 | 12.5   | 38.5 |
| Amin-Esmaeili       | 2013                | Tehran      | 1568        | 1043   | 518  | 31.7                 | 10.0   | 39.1 |
| Mohammadpoorasl     | 2014                | Tabriz      | 1837        | 1100   | 737  | 15.6                 | 4.2    | 11.4 |
| Fajani              | 2015                | Isfahan     | 1512        | 765    | 747  | 33.7                 | 22.8   | 44.9 |
| Jalilian            | 2016                | Kermanshah  | 620         | —      | —    | 11.6                 | —      | —    |
| Kabir               | 2016                | Karaj       | 1959        | 1301   | 658  | 7.2                  | 6.3    | 9.1  |
| Mozafarinia         | 2017                | Tehran      | 422         | —      | —    | 26.3                 | —      | —    |
| Sahebihagh          | 2017                | Qazvin      | 521         | 357    | 164  | 8.6                  | 3.0    | 20.7 |
| Tarrahi             | 2017                | Khorramabad | 1131        | 701    | 430  | 1.6                  | 0.9    | 2.8  |
| Abbasi-Ghahramanloo | 2018                | Tehran      | 1985        | 1376   | 609  | 17.6                 | 10.6   | 33.5 |
| Author              | Year of publication | City        | Sample size |        |      | Regular prevalence   |        |      |
|                     |                     |             | Total       | Female | Male | Total                | Female | Male |
| Nakhaee             | 2009                | Kerman      | 833         | —      | —    | 4.5                  | —      | —    |
| Mohtasham-Amiri     | 2011                | Guilan      | 3700        | —      | —    | 16.0                 | —      | —    |
| Amin-Esmaeili       | 2013                | Tehran      | 1761        | 1162   | 599  | 5.9                  | 0.6    | 8.7  |
| Amin-Esmaeili       | 2013                | Tehran      | 1741        | 1107   | 629  | 6.2                  | 0.9    | 9.3  |
| Amin-Esmaeili       | 2013                | Tehran      | 1755        | 1159   | 591  | 5.3                  | 0.4    | 7.9  |
| Amin-Esmaeili       | 2013                | Tehran      | 1568        | 1043   | 518  | 3.9                  | 0.1    | 5.4  |
| Mohammadpoorasl     | 2013                | Tabriz      | 1837        | 1100   | 734  | 15.8                 | 7.1    | 28.5 |
| Taheri              | 2015                | Mashhad     | 936         | 519    | 417  | 9.8                  | 2.5    | 18.9 |
| Kabir               | 2016                | Karaj       | 1959        | 1301   | 658  | 4.8                  | 1.2    | 11.9 |
| Menati              | 2016                | Ilam        |             |        | 1824 |                      |        | 16.6 |
| Mozafarinia         | 2017                | Tehran      | 422         | —      | —    | 8.5                  | —      | —    |
| Tarrahi             | 2017                | Khorramabad | 1131        | 701    | 430  | 0.8                  | 0.3    | 1.6  |
| Abbasi-Ghahramanloo | 2018                | Tehran      | 1985        | 1376   | 609  | 1.9                  | 0.2    | 5.7  |
| Author              | Year of publication | City        | Sample size |        |      | Current prevalence   |        |      |
|                     |                     |             | Total       | Female | Male | Total                | Female | Male |
| Ahmadi              | 2004                | Shiraz      | 400         | 343    | 57   | 3.3                  | 1.2    | 15.3 |
| pour ali            | 2005                | Ardebil     | 1106        | 779    | 327  | 7.4                  | 1.2    | 32.0 |
| Zarrabi             | 2005-2006           | Guilan      | 827         | —      | —    | 9.6                  | —      | —    |
| Nojomi              | 2006                | Tehran      | 1000        | —      | —    | 5.6                  | —      | —    |
| Rahimi Rad          | 2007                | Urmia       | 1500        | 908    | 592  | 8.1                  | 2.3    | 17.1 |
| Mohtasham-Amiri     | 2009                | Astara      | 1226        | —      | —    | 19.5                 | —      | —    |
| Shoja               | 2010                | Gorgan      | 538         | 362    | 176  | 6.1                  | 0.8    | 17.3 |
| Shamsi Meymandi     | 2010                | Kerman      | 1677        | 872    | 805  | 11.0                 | 2.0    | 21.5 |
| Nazary              | 2010                | Semnan      | —           | —      | 320  | —                    | —      | 14.4 |
| Kasiri              | 2011                | Ahvaz       | —           | —      | 745  | —                    | —      | 15.0 |
| Jafari              | 2011                | Tehran      | 400         | 201    | 199  | 30.0                 | 15.9   | 44.7 |
| Tavakolizadeh       | 2011                | Gonabad     | 279         | 125    | 154  | 9.8                  | 4.1    | 14.4 |
| Jafari              | 2011                | Tehran      | 400         | 143    | 257  | 27.3                 | 12.6   | 35.4 |
| Mohtasham-Amiri     | 2011                | Guilan      | 3700        | 1870   | 1800 | 19.5                 | 6.5    | 33.0 |

**Table 2 Characteristics of studies included in systematic review and meta-analysis of cigarette smoking prevalence in Iranian university students (concluded)**

| Author              | Year of publication | City    | Sample size |        |      | Current prevalence |        |      |
|---------------------|---------------------|---------|-------------|--------|------|--------------------|--------|------|
|                     |                     |         | Total       | Female | Male | Total              | Female | Male |
| Ghodsí              | 2012                | Guilan  | —           | —      | 222  | —                  | —      | 23.0 |
| Ghodosí             | 2012                | Isfahan | 537         | 292    | 245  | 18.6               | 4.5    | 35.5 |
| Jamali              | 2013                | Tehran  | 1086        | —      | —    | 11.9               | —      | —    |
| Amin-Esmaeili       | 2013                | Tehran  | 1761        | 1162   | 599  | 12.4               | 3.8    | 16.8 |
| Amin-Esmaeili       | 2013                | Tehran  | 1741        | 1107   | 629  | 11.9               | 2.4    | 17.4 |
| Amin-Esmaeili       | 2013                | Tehran  | 1755        | 1159   | 591  | 11.2               | 2.0    | 14.1 |
| Amin-Esmaeili       | 2013                | Tehran  | 1568        | 1043   | 518  | 10.5               | 1.3    | 15.1 |
| Machowicz           | 2013                | Tehran  | 170         | —      | —    | 3.5                | —      | —    |
| Nasirian            | 2013                | Kerman  | 772         | —      | —    | 15.8               | —      | —    |
| Seghatoleslam       | 2014                | Tehran  | 500         | —      | —    | 27.0               | —      | —    |
| Shojaa              | 2014                | Gorgan  | 538         | 362    | 176  | 6.1                | 0.8    | 17.0 |
| Babaei Heydarabadi  | 2015                | Tehran  | 604         | —      | —    | 10.4               | —      | —    |
| Fajani              | 2015                | Isfahan | 1512        | 765    | 747  | 32.8               | 27.4   | 38.2 |
| Mozafarinia         | 2017                | Tehran  | 422         | —      | —    | 3.8                | —      | —    |
| Poorolajal          | 2017                | Hamedan | 1259        | 765    | 494  | 16.2               | 6.3    | 31.6 |
| Abbasi-Ghahramanloo | 2018                | Tehran  | 1985        | 1376   | 609  | 5.3                | 1.5    | 14.0 |
| Rahimi Pordanjani   | 2018                | Yazd    | 250         | —      | —    | 19.2               | —      | —    |

42% and 19%, respectively (120). Lack of awareness of the negative effects of water-pipe smoking and lower stigma toward its use are factors that explain this pattern (121).

In male high school students, the prevalence of current cigarette smoking was lower than among university students (9% vs 22%). However, for girls and women, the prevalence was similar among high school and university students (3% vs 5%). A meta-analysis of 12–15-year-old adolescents of 68 low- and middle-income countries indicated that 13.3% of boys and 6% of girls currently smoked cigarettes (11). The highest prevalence for boys was for the Western Pacific Region (17.5%) followed by the Eastern Mediterranean Region (13.3%), whereas for girls, the highest prevalence was reported in the Western Pacific Region (10.0%) and Region of the Americas (8.7%). The corresponding prevalence in the Eastern Mediterranean Region for girls was estimated at 3.8%, which was close to our estimate (11), while the prevalence of current smoking among Iranian high school boys (9%) seems to be lower than the overall estimate in the Eastern Mediterranean Region (13.3%).

We showed that in both age groups, male students smoked cigarettes more than female students smoked. The sex ratio varied from 2 (for life-time smoking in high school) to 11 (for regular smoking among university students). Global estimates indicate that men smoke 5 times as much as women smoke (124). A variety of national studies have confirmed the higher prevalence of smoking in Iranian men (122, 123). The lower prevalence of cigarette smoking among women may be due to greater stigma that exists toward smoking among women.

We found that the prevalence of smoking was higher in large cities compared to small cities. Despite a slight increase in prevalence of smoking within more recent years, the prevalence of life-time smoking decreased. This decrease may have been due to several factors including increasing awareness of young people about tobacco hazards, tendency to use other drugs, including hookah, and success of tobacco control programmes. In the Islamic Republic of Iran, it is culturally inappropriate for girls to smoke (124). Around 15% of the 80 million Iranian population is aged 15–24 years and half of them are men. Among > 2 million high school students and ~4 million university students, more than half are male (125,126). Extrapolating our results to these populations reflects the alarming rate of cigarette smoking among Iranian adolescents. A growing body of evidence indicates that smoking initiation at lower ages is strongly related to subsequent smoking behaviour, including regular and heavy smoking in adulthood, which highlights the importance of early interventions for smoking prevention (127). According to the World Health Organization report on the national tobacco control programme, the Islamic Republic of Iran has performed well compared to other countries in the Eastern Mediterranean Region in many aspects of smoking control (including monitoring and smoke-free policies, smoking cessation programmes, health warnings on cigarette packages, and mass media and advertising bans for tobacco use). However, more action is needed in the field of taxation and affordability of tobacco, especially in large cities (128,129). The nature of the tobacco epidemic requires a comprehensive prevention and intervention plan focusing on the community as well as schools. A variety of strategies should be reinforced

**Table 3 Characteristics of studies included in systematic review of cigarette smoking prevalence in Iranian young people aged 14–30 years**

| Author          | Year of publication | City                                           | Age group, yr  | Sample size |        |      | Current prevalence   |        |      |
|-----------------|---------------------|------------------------------------------------|----------------|-------------|--------|------|----------------------|--------|------|
|                 |                     |                                                |                | Total       | Female | Male | Total                | Female | Male |
| Mosavi-Jarrahi  | 2004                | National                                       | (15–24)        | 7984        | 5016   | 2968 | 5.5                  | 0.7    | 13.5 |
| Sadeghi         | 2004                | Isfahan, Najafabad and Arak                    | (26–35)        | 3786        | 1969   | 1817 | 18.5                 | 2.1    | 36.5 |
| Sadeghi         | 2004                | Isfahan Province (Isfahan, Najafabad and Arak) | (19–25)        | 3786        | 1969   | 1817 | 11.8                 | 0.5    | 24.2 |
| Mosavi-Jarrahi  | 2004                | National                                       | (15–24)        | 12 060      | 6761   | 5299 | 3.3                  | 0.3    | 7.2  |
| Fotouhi         | 2009                | Tehran                                         | (15–24)        | 1043        | 654    | 389  | 3.4                  | 0.9    | 6.1  |
| Fotouhi         | 2009                | Tehran                                         | (15–24)        | 618         | 384    | 234  | 13.9                 | 3.2    | 23   |
| Nadimi          | 2009                | Rafsanjan                                      | (20–29)        | 140         | 71     | 69   | 19.3                 | 8.5    | 30.4 |
| Baheiraei       | 2013                | Tehran                                         | (15–18)        | 1201        | 609    | 592  | 11.4                 | 7.2    | 15.7 |
| Abdollahifard   | 2013                | Shiraz                                         | (18–36)        | 483         | —      | —    | 5.2                  | —      | —    |
| Shuja           | 2017                | Isfahan Province                               | (25–34)        | 2902        | —      | —    | 15.8                 | —      | —    |
| Shuja           | 2017                | Isfahan Province                               | (19–24)        | 1874        | —      | —    | 11.5                 | —      | —    |
| Author          | Year of publication | City                                           | Age group, yr  | Sample size |        |      | Life-time prevalence |        |      |
|                 |                     |                                                |                | Total       | Female | Male | Total                | Female | Male |
| Baheiraei       | 2013                | Tehran                                         | (15–18)        | 1201        | 609    | 592  | 26.2                 | 22.2   | 30.2 |
| Author          | Year of publication | City                                           | Age group      | Sample size |        |      | Regular prevalence   |        |      |
|                 |                     |                                                |                | Total       | Female | Male | Total                | Female | Male |
| Mehrabi         | 2007                | National                                       | (15–24)        | 16 948      | 8330   | 8618 | 3.7                  | 0.7    | 6.8  |
| Mehrabi         | 2007                | National                                       | (25–34)        | 16 934      | 8380   | 8554 | 14.0                 | 2.5    | 25.3 |
| Yunesian        | 2008                | Tehran                                         | (13–19)        | 4249        | 2614   | 1635 | 0.9                  | 0.4    | 1.7  |
| Moghimbeigi     | 2009                | Northwest provinces of Iran                    | (15–20)        | 1745        | 935    | 809  | 10.2                 | 4.9    | 12.3 |
| Meysamie        | 2010                | National                                       | (25–34)        | 12760       | —      | —    | 11.3                 | —      | —    |
| Meysamie        | 2010                | National                                       | (15–24)        | 17710       | —      | —    | 5.8                  | —      | —    |
| Baheiraei       | 2013                | Tehran                                         | (15–18)        | 1201        | 609    | 592  | 2.5                  | 0.4    | 4.5  |
| Baheiraei       | 2013                | Tehran                                         | (15–18)        | 1201        | 609    | 592  | 3.16                 | 0.82   | 5.5  |
| Nekoei Moghadam | 2013                | Hormozgan                                      | (15–24)        | 200         | 100    | 100  | 1.0                  | 0.0    | 2.0  |
| Nekoei Moghadam | 2013                | Hormozgan                                      | (25–34)        | 200         | 100    | 100  | 8.5                  | 0.0    | 17.0 |
| Baheiraei       | 2014                | Tehran                                         | Female (25–34) | —           | 468    | —    | —                    | 2.8    | —    |
| Baheiraei       | 2014                | Tehran                                         | Female (15–24) | —           | 350    | —    | —                    | 2.6    | —    |
| Hassanzadeh     | 2015                | Tehran                                         | (20–30)        | 7350        | —      | —    | 3.7                  | —      | —    |
| Salimzadeh      | 2016                | Kerman                                         | (15–19)        | 1000        | 500    | 500  | 0.3                  | 0.0    | 0.5  |
| Salimzadeh      | 2016                | Kerman                                         | (20–24)        | 1000        | 500    | 500  | 2.8                  | 0.0    | 5.4  |
| Hoseini         | 2016                | Tehran                                         | (15–24)        | 39          | —      | —    | 7.7                  | —      | —    |
| Salimzadeh      | 2016                | Kerman                                         | (20–24)        | 1000        | 500    | 500  | 2.0                  | 0.7    | 3.3  |
| Kassani         | 2016                | Tehran                                         | (20–30)        | —           | 14 347 | 6.21 | —                    | —      | —    |
| Salimzadeh      | 2016                | Kerman                                         | (25–34)        | 1000        | 500    | 500  | 8.9                  | 0.1    | 16.5 |
| Salimzadeh      | 2016                | Kerman                                         | (25–34)        | 1000        | 500    | 500  | 2.3                  | 0.3    | 4.2  |

to reduce the prevalence and health effects of cigarette smoking in adolescents. Existing laws to restrict access to tobacco products by banning sales to minors should be reinforced. Effective and comprehensive educational programmes on the health risks of tobacco consumption and exposure to tobacco smoke should be established in schools and universities. Additionally, tobacco cessation facilities should be extended to all areas. Involvement of nongovernmental organizations and parents in tobacco control programmes as well as licensing the distribution of tobacco products in order to decrease availability are other strategies that should be strengthened by policy-makers.

Our findings should be interpreted by taking into consideration the limitations of the study. There were high variability and heterogeneity among studies regarding the sampling method, study instruments and reporting of variables. For example, despite the use of random sampling in all recruited studies, the variations in the sampling approach among studies were indicative of possible selection bias. Similarly, the different instruments used in the studies were suggestive of some degree of information bias. While definitions regarding life-time smoking were consistent among the included

studies, there was some degree of heterogeneity regarding the definition of current and regular smoking. For example, in most studies, an exact definition of current smoking was not used, but in a small number of studies, it was measured objectively. Therefore, our results should be interpreted with caution. Furthermore, due to the lack of comprehensive databases, we did not have access to grey literature. Nevertheless, this review is important as it provides a comprehensive picture regarding the prevalence of smoking among Iranian young people that could serve as the foundation for policy-makers to develop and implement effective smoking prevention and intervention programmes.

## Conclusion

Cigarette smoking is notable among Iranian young adults in a way that boys and university students are affected more. Prevention programmes in high schools and universities should focus on information, education and communication, and current policies on tobacco control should be reinforced.

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**Competing interests:** None declared.

## Prévalence du tabagisme par cigarettes chez les adolescents et les jeunes adultes iraniens : revue systématique et méta-analyse

### Résumé

**Contexte :** Le tabagisme par cigarettes est un facteur de risque partagé pour un grand nombre de maladies.

**Objectifs :** Estimer la prévalence du tabagisme chez les adolescents et les jeunes adultes iraniens.

**Méthodes :** Dans la présente revue systématique et méta-analyse, nous avons effectué des recherches dans PubMed, Web of Science, Embase, Scopus et des bases de données nationales de janvier 2001 à décembre 2018. Les études transversales rapportant la prévalence du tabagisme par cigarettes chez les lycéens, les étudiants ou dans la population générale âgée de 14 à 30 ans étaient éligibles. Des données sur la prévalence du tabagisme, l'âge et le sexe des sujets, la taille de l'échantillon, la date et le lieu des études ont été extraites par deux analystes indépendants.

**Résultat :** Nous avons inclus 99 études dans notre analyse. Pour les lycéens, la prévalence globale vie entière du tabagisme était de 13 % chez les filles et de 23 % chez les garçons. Pour les étudiants universitaires, la prévalence vie entière était de 11 % chez les filles et de 33 % chez les garçons. La prévalence cumulée du tabagisme actuel et régulier chez les garçons du secondaire était de 9 % et 5 %, respectivement, contre 3 % et 1 % chez les filles. La prévalence cumulée du tabagisme actuel et régulier chez les étudiants universitaires de sexe masculin était de 22 % et 11 %, respectivement, contre 5 % et 1 % chez les étudiantes. La prévalence du tabagisme actuel dans la population générale âgée de 15 à 24 ans était comprise entre 3,3 % et 13,9 %, La prévalence du tabagisme régulier au sein de cette population était de 1,0 % à 10,2 %.

**Conclusion :** Le tabagisme par cigarettes est très répandu parmi les jeunes adultes iraniens, en particulier les garçons et les étudiants. Nos conclusions appellent au renforcement des politiques de prévention et de lutte antitabac dans l'ensemble des écoles et des universités iraniennes.

## انتشار تدخين السجائر بين المراهقين والشباب في إيران: استعراض منهجي وتحليل تلوي

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### الخلاصة

الخلفية: يُعتبر تدخين السجائر من عوامل الخطر المشتركة لمجموعة من الحالات المرضية، مثل أمراض القلب والأوعية الدموية وبعض أنواع السرطان. ويبدأ أغلب المدخنين التدخين قبل أن يبلغوا 18 عامًا.

الأهداف: هدفت هذه الدراسة إلى تقدير معدل انتشار التدخين بين المراهقين والشباب في إيران.

طرق البحث: في هذا الاستعراض المنهجي والتحليل التلوي، بحثنا في قواعد بيانات كل من (PubMed) و (Web of Science) و (Embase) و (Scopus) وقواعد البيانات المحلية في الفترة من يناير/ كانون الثاني 2001 إلى ديسمبر/ كانون الأول 2018. وكانت الدراسات المقطعية التي أفادت انتشار تدخين السجائر بين طلاب المدارس الثانوية وطلاب الجامعة أو عموم السكان الذين تتراوح أعمارهم بين 14 و30 عامًا، دراسات صالحة للاستخدام. واستُخلصت بيانات عن انتشار التدخين وأعمار المشاركين ونوعهم، وحجم العينة، وتاريخ الدراسات وموقعها عن طريق اثنين من المراجعين المستقلين. وحُسب الانتشار المجمع لتدخين السجائر باستخدام نموذج تأثيرات عشوائي.

النتائج: أدرجنا في هذا التحليل 99 دراسة. أما طلاب المدارس الثانوية، فقد بلغ معدل انتشار تدخين السجائر المجمع طيلة العمر 13٪ بين الفتيات و23٪ بين الفتيان. وأما طلاب الجامعات، فكان معدل الانتشار طيلة العمر 11٪ في النساء و33٪ في الرجال. وبلغ معدل الانتشار المجمع للتدخين الحالي والمنتظم بين طلاب المدارس الثانوية من الفتيان 9٪ و5٪ على التوالي مقابل 3٪ و1٪ على التوالي من الفتيات. وبلغ معدل الانتشار المجمع للتدخين الحالي والمنتظم بين طلاب الجامعات من الذكور 22٪ و11٪، على التوالي مقابل 5٪ و1٪ على التوالي، بين الطالبات. وبلغ معدل انتشار التدخين الحالي بين عموم السكان الذين تتراوح أعمارهم بين 15 و24 عامًا 3.3-13.9٪ وكان معدل انتشار التدخين المنتظم بين هذه الفئة من السكان 1.0-10.2٪.

الاستنتاجات: يُعد تدخين السجائر أمرًا ملحوظًا بين الشباب الإيرانيين، خاصة الفتيان وطلاب الجامعات. وتدعو النتائج التي توصلنا إليها إلى تعزيز سياسات الوقاية من تعاطي التبغ ومكافحته في جميع المدارس والجامعات الإيرانية.

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# A conceptual framework for socializing the Iranian health system

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## Abstract

**Background:** Socializing the health system is a new approach to participatory governance that aims to promote community health and enhance sustainable health equity in the community. This approach is a part of health system reform in the Islamic Republic of Iran.

**Aims:** This study aimed to develop a conceptual framework for socializing the health system in the Islamic Republic of Iran as a theoretical basis for this reform.

**Methods:** Data were gathered through a review of the literature, in-depth interviews, focus group discussions, and panel discussions. Participants were experts in the field of health systems within the health ministry and medical universities. Content analysis was used to analyse the data and identify core values, principles, and approaches for socializing the health system.

**Results:** The core values identified included human dignity, equity, ethics, and trust. The principles were participation, empowerment, human rights, and responsiveness. The approaches identified were good governance, a health-oriented focus, capacity-building, a process-oriented method, and improvement in the social determinants of health. A strong political will was considered essential for socializing the health system.

**Conclusions:** The conceptual framework outlines requirements for socializing the Iranian health system. As this is a new approach in health system governance, however, it needs to be refined and redefined through implementation and evaluation.

Key words: participatory governance, public health, health systems, health equity, Iran.

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## Introduction

“Complexity defines health” in the age of globalization (1). Around the world, health systems are trying to cope with this complexity to ensure a balance between improving health and promoting equity by adopting different policies and actions. Health in all policies (2,3), all for health (4) and good governance in health systems (5) are examples of these different initiatives. Socializing the health system, a new approach to participatory governance in the health system in the Islamic Republic of Iran, is an initiative to address this complexity and to fulfill the duties of the health system across the country. Socializing the health system refers to a series of systematic actions to promote community health and enhance health equity in the community by identifying all the existing capacities and resources for health preservation and promotion, empowering the human resources, and organizing these resources to improve health system management.

The health care system in the Islamic Republic of Iran has achieved much in the past 5 decades (6–8). However, more recently, certain issues – such as the epidemiological transition towards lifestyle diseases

(9,10), shifts in the demographic pattern (11) and achieving health equity (6) – have concerned policy-makers in the health system. In addition to these issues, other factors have motivated health system policy-makers to plan a new approach in governance of the health system. These factors include: corruption and unethical or irresponsible behaviour of health service providers around the country (12–14), a better understanding of the importance of life settings and neighbourhood climate to the health of individuals (15,16), gravitation towards people power among the general population and a better understanding of the important role of social determinants of health on public health (17). This new approach is a paradigm shift in the health system of the Islamic Republic of Iran towards socializing the health system and is a part of the health system reform in the country. Socializing the health system can be considered either as a radical idea in the governance of the health system or as an essential need for health improvement in the current situation of the Islamic Republic of Iran. An Iranian study on the meaning of socialization of health to Iranian policy-makers emphasized the gaps in agreement among different stakeholders about the definition and

conceptual framework of socializing the health system in the country (18).

The first step to socializing the health system is developing a conceptual framework. At the request of the Social Deputy of the Ministry of Health in the Islamic Republic of Iran, this study, therefore aimed to develop a conceptual framework for socializing the health system to create a unity of vision among all stakeholders. This conceptual framework defines the theoretical aspects, values and principles, and approaches of this process.

## Methods

### Study design

To conceptualize socializing the health system in the Islamic Republic of Iran, we used a mixed-method that integrated an extensive review of the literature and qualitative methods. This method allowed us to gain a deeper understanding of the perspective of and dialogue between key informants and policy-makers on this issue at the national level, as well as the international context and evidence. As we collected ideas and developed a consensus on socializing the health system, we used a content analysis technique to analyse the data. This study follows COREQ (consolidated criteria for reporting qualitative research) guidelines (19).

### Research team

The research team included high-ranking personnel of the Ministry of Health and Medical Education including the Social Deputy of the ministry, the Secretariat of the Supreme Council of Health and Food Security and experts in the Supreme Council of Health and Food Security, as well as a research consultant. The team, together with two note-takers, undertook in-depth interviews, focus group discussions, and panel discussions.

### Participants and data collection

All the participants in this study were key informants and experts in the field of health care systems who held high positions in the Ministry of Health and Medical Education or medical universities and were very familiar with the concept and importance of socializing health. All participants were approached through a formal letter from the Secretariat of Supreme Council of Health and Food Security. The in-depth interviews were done at the Ministry of Health and Medical Education or at the personal offices of participants who were retired or working outside the ministry. The focus group and panel discussions were done at the Ministry of Health and Medical Education. We used purposive sampling to select all participants for the interviews and discussions.

#### *In-depth interviews*

To have a clear definition of the meaning of socializing the health system, in-depth interviews were held with six experts (all male): the health deputy, social deputy, and food and drug deputy of the Ministry of Health and Medical Education and key informants who had worked for

a long time at the ministerial level. Each interview took 60–90 minutes. Different aspects of socializing of the health system were discussed in the interviews including the definition and theoretical issues, and the advantages and possibilities of socializing the health system. The interviews were audio-recorded, transcribed, and evaluated by content analysis.

#### *Focus groups discussions*

After gathering the basic information on the definition and conceptual aspects of socializing the health system through review of the literature, two focus groups discussions were conducted with 16 participants (two women and 14 men) including experts from the Ministry of Health and Medical Education, the Iranian Academy of Medical Sciences, members of the Secretariat of Supreme Council for Health and Food Security and the heads of the three medical universities in Tehran. The purpose of these focus groups discussions was to discuss the finding of the above-mentioned in-depth interviews and further expand and explore the definition and theoretical and practical aspects of socializing the health system. The focus groups discussions were conducted by one facilitator, who was a member of the Secretariat of Supreme Council for Health and Food Security, and one note taker. The discussions lasted 150–180 minutes. The discussions were audio-recorded, transcribed, and evaluated by content analysis.

#### *Literature review*

An extensive review of relevant national and international literature was undertaken using the following keywords: socializing, governance, participat\*, health care system, service, community-based, social determinant of health, ethics, values, the conceptual framework”, participatory medicine, medical education, coherence, social engagement, community involvement, cohesion, and integrity. Grey literature and non-peer-reviewed papers were not included. We searched Google Scholar, PubMed, and Scopus databases for articles published from 1998 to 2018. In addition, the serial document search method was used to find relevant documents. The search yielded 1660 documents. We reviewed the title of the documents and in some cases the abstract to select the eligible documents. We included all documents that addressed any concept or approach relevant to people participation in health system governance. More than 150 documents were included and studied carefully and relevant concepts, values, principles, and approaches to socializing the health system were recorded.

### *Drafting a conceptual framework and panel discussions*

Based on the results of the literature review, in-depth interviews and focus group discussions, the first draft of the conceptual framework was developed by the research consultant.

This first draft of the conceptual framework on socializing health was shared and modified in the four panel discussions with 52 experts (eight women and

44 men) including: the Minister of Health and Medical Education; different deputies of the ministry and representative of different governmental organizations (Ministry of Agriculture, State Welfare Organization, Ministry of Youth Affairs and Sports, Ministry of Roads and Urban Development, Ministry of Industry, Mine and Trade, Ministry of Cooperatives, Labour and Social Welfare, Ministry of Education); social deputies of 23 of 28 universities of medical education around the country; and representative of non-governmental organizations and civil societies. The reason for selecting many experts for the panel discussion from different fields and organizations was to have the opinion and participation of representatives of different stakeholders and to create a unified vision among the main stakeholders.

The draft conceptual framework was sent by email to the panel members before the panel sessions and was presented in the panel discussions. The experts could send their views and comments by email, and also give their views in the panel discussions. The panel discussions lasted 180–240 minutes.

The comments and views of the panel members were analysed using content analysis and the draft of the conceptual framework was modified based on the discussions in five revisions. The framework was finalized after approval by the panel members and all the experts involved.

### Data analysis

We undertook a content analysis of the in-depth interviews and focus group discussions. Two experts manually coded the data; in case of discrepancy, a third expert reviewed the data and made the final decision. Themes (core values, principles and approaches) were identified in advance based on defining the core values, principles and approaches.

We undertook a narrative analysis of the results of panel discussions, using a deductive approach. The results were used to modify and revise the first draft of the conceptual framework.

### Ethical considerations

We explained the purpose of the study to the participants and assured them of the confidentiality of their contribution. Verbal consent was obtained from all the participants.

### Results

The first draft of the conceptual framework provided the definition for socializing the health system, identified the main players and described the core values, principles and approaches of socializing the health system. This draft was modified and unanimously agreed upon by the participants in the focus group discussions and panel discussions.

### Definition of socializing the health system

Based on the consensus of the experts in the field, socializing of the health system was defined as, “A series of systematic actions to promote community health and enhance sustainable health equity in the community by identifying all the existing capacities and resources (within and outside the health sector), empowering them and organizing them in order to participate in the health system management (policy-making, implementation and monitoring).” Four groups need to be involved to promote health and sustainable health equity: non-health sector players through intersectoral collaboration; the private sector through public–private partnership; non-governmental organizations, associations, civil societies, volunteers and charities which represent the organized and formal form of people’s participation; and local communities.

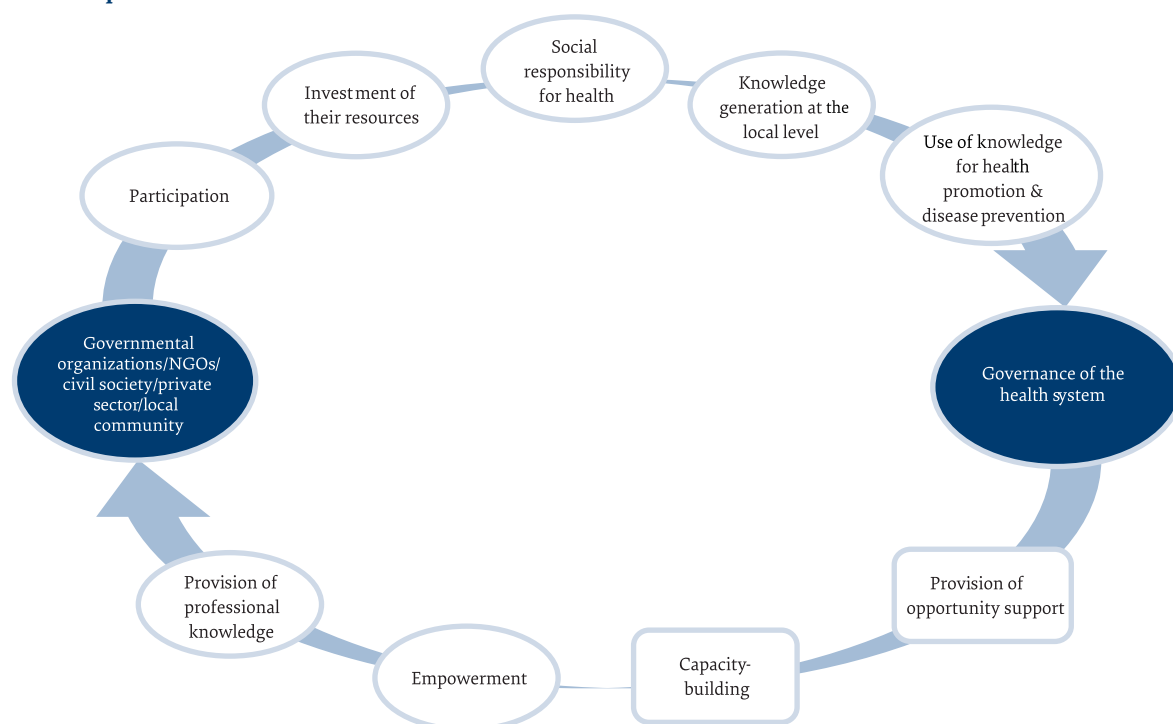
The systematic actions could refer to any endeavours or measures by health system governance to create opportunities for meaningful participation of people and communities, such as: involving and engaging the four main players in health affairs; nurturing and empowering them; providing the required data and information such as health status and health needs; creating a platform for collaboration; providing financial and technological support; and creating a sense of ownership and responsibility for the health of self and others. Through this meaningful participation, the four main groups will use their resources and capacities to preserve and promote health, generate knowledge relevant to their own health needs and demands, and use this knowledge to preserve and promote their health. Figure 1 shows the model of this relationship and participation among the different player groups in socializing the health system.

### Core values

Participation was identified as the explicit value for socializing the health system, which is linked to implicit values such as human dignity, equity and social justice, ethics and trust. Human dignity is a universal core value that lays the foundation for the participation of people in decision-making related to their own affairs, and for a system to value the health and well-being of each individual. Equity is another core value identified for socializing the health system. Equity is not just the equitable distribution of services or determinants of health, but more broadly the ability of people to access knowledge, critically analyse the available knowledge and information, make a sound decision for their own health and safety and act upon their decisions. The participants expressed the importance of health equity and justice as for example: “everyone has a right to be healthy”, “people have equal right to access health services”, “health must be for all”, and “everyone should be covered by good-quality health services”.

Trust is necessary for participation; without trust, people will not participate and socializing the health system would face failure. In the context of socializing the health system, ethics has a broader spectrum than

**Figure 1 Conceptual model of the relationship between health governance and other main players in socializing the health system in the Islamic Republic of Iran**



just professional ethics and integrity. It also covers the responsibility of the health system to promote social justice and equity, and reduce discrimination, vulnerability and marginalization in the society. Furthermore, socializing the health system is an ethical approach itself. The participants indicated the importance of ethics through statements such as: “ethics must be strengthened in medical education”, and “the values of the Patient Rights Charter must be considered in all health services.”

Materialism (money-centred focus) in today’s society, in its hidden or apparent forms, governs many health-related affairs, from research to priority setting (prioritizing highly specialized interventions over simple useful interventions), to budget allocation (for the benefit of the minority rich strata of society), to policy-making (that preserves the control of a minority). Therefore, moving towards socializing of health is an ethical approach that enables people to prevent policies and actions that increase health inequity and limit healthy choices. In addition, ethics should be the driving force of all decision-making to ensure maximum good for the maximum number of people.

### Principles

Participation is not only a core value, but also the main principle of socializing the health system. One of the participants indicated that “the people must participate in the production of health services, delivery of health services and overall for all their own health services”. Participation of people can give them control over their health and whatever affects their health. However, a higher lev-

el of participation is necessary for socializing the health system that is participation in the generation, application and dissemination of knowledge. Participants made reference to this participation in the interviews; for example: “people must participate in policy-making”, “people must participate in health system implementation”, “people must participate in monitoring the health system”, “people must participate in health research” and “everyone should follow the issues of health partnership from his/her own perspective.” The hierarchy between those who generate knowledge and those who are the consumers of knowledge and technology (the people) could result in increasing gaps in power and control. When people actively participate in the generation of knowledge relevant to their own needs and demands, they are more willing and able to apply this knowledge to their own lives. In addition, when people disseminate knowledge, the knowledge would be shared more widely and effectively among different groups of people and communities who are first-hand users of this knowledge. Therefore, the health system in its move towards socializing of health should enhance people’s participation in the generation, application and dissemination of knowledge.

Participatory approaches mean that all stakeholders and main players should participate actively in policy-making, implementation, monitoring and evaluation of all health-related affairs that influence them or are influenced by them.

The principle of empowerment is at the heart of participation. Capacity-building and empowerment play a crucial role in enabling participation. Indeed, participation and empowerment are two sides of the

same coin. When people are empowered, to the level of their capacity, they can take responsibility and participate in their own and their society's health affairs; and when people have the opportunity to participate in health-related affairs, they become empowered and capable of greater and more effective participation.

Empowerment should not just be limited to the people and communities; empowerment within the health sector is also necessary to be able to deal with the different levels of complexity of participatory planning, implementation, monitoring and service provision. Empowerment should also include different governmental and non-governmental organizations and civil society. Empowerment is a vital element of health equity.

Socializing the health system requires political will because it necessitates capacity-building in individuals, institutions, organizations, communities and societies that may conflict with the interests of the established authority in these groups. Therefore, authorities need to be convinced that socializing of health is not only useful but necessary to tackle the existing challenges of the health system in the Islamic Republic of Iran.

### Approaches

More than 4 decades ago, when the primary health care system of the Islamic Republic of Iran was formed, the main objective was to reduce the substantial burden of communicable diseases and the high maternal and infant mortality rates. As such, the system was designed to treat or reduce diseases. Since then, a better understanding of health and emerging concepts of individual rights has resulted in an increasing demand for disease prevention and health promotion activities among communities. Therefore, a shift toward socializing the health system requires that the current health system approach changes to being health-oriented. In a health-oriented health system, health promotion, disease prevention, and consideration of the deeper causes of ill health (e.g. social determinants of health) are the main priorities compared with the existing goal of the health system in the Islamic Republic of Iran which is to provide therapeutic and curative services.

Involvement in a participatory system requires more complex skills, especially in countries where participation is not widely implemented. Therefore, in order to socialize the health system, there is a need to build capacity for participation and create an enabling environment through a common learning platform, and share health-related up-to-date information, evidence and experiences. The participants expressed this need as, for example: "the social potential must be identified and the people, society and organizations must be empowered," "people should be empowered in primary care" and "individuals, families and communities must be empowered to provide, maintain and promote their health".

This common learning opportunity is also necessary for capacity-building. When resources are limited, the

existing capacities of individuals, communities, societies, nongovernmental organizations, and private and non-health sectors should be identified and directed towards health improvement, as health is an investment for development.

In developing countries such as the Islamic Republic of Iran, participation and community involvement and engagement are new approaches. Therefore, systematic actions and process-orientated approaches are required to gradually build capacity and enable participation. Participants pointed to systematic action such as: "...so far we haven't had a health system but we have had a health sector, to get a health system, we have to go further and use powers and resources outside the health sector." In addition, they spoke about process orientation: "we must consider that establishing a social health system is a process and happens gradually in a long time span," "we must wait for change" and "socializing the health system is not an easy task. It can take 15 to 20 years. It is important to start and move along." To re-define the norms and values, cultural context and structure to enable participation that justifies a process-oriented approach are needed too.

Health is influenced by social determinants; therefore, a move towards socializing the health system should take account of the social determinants of health. Primary health care together with the social determinants of health should be the focus of a health system that is working towards socialization. Although improving the social determinants of health should not be considered the sole responsibility of the health sector, they cannot be ignored by the health sector.

Health in all policies is a necessary approach for socializing the health system, because the health of people is largely influenced by the decisions made by non-health sectors such as education, employment, agriculture, transport, trade, social services and environment. Health in all policies means that all policies should be made with full consideration of their impact on health.

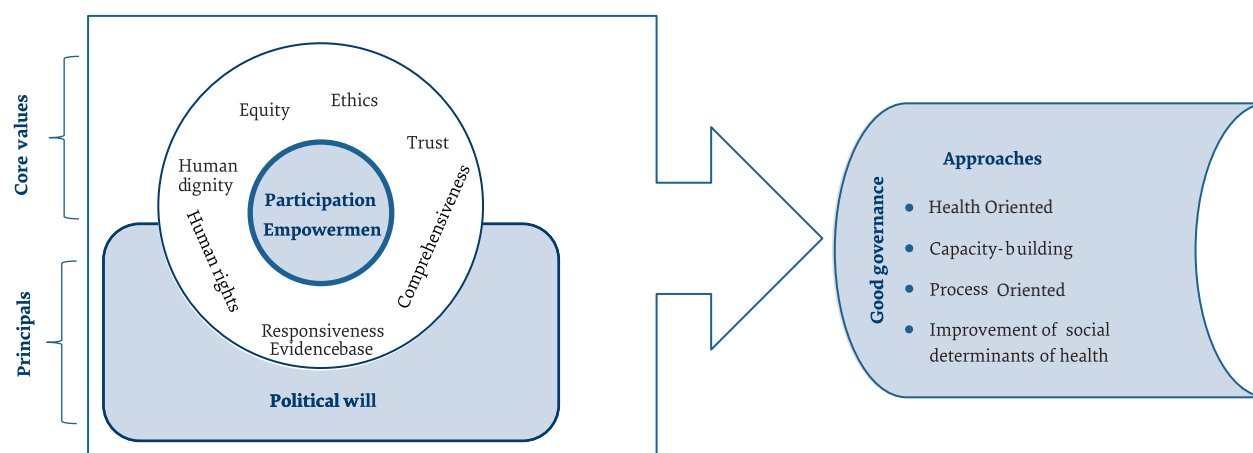
Figure 2 shows the main values, principles and approaches that should govern socializing of the health system in the Islamic Republic of Iran.

### Discussion

To the best of our knowledge, this is the first study that attempted to provide a conceptual framework for socializing the health system in the Islamic Republic of Iran. Our study provided a consensus on the definition of socializing of the health system and identified its main groups involved. It also defined the core values, principles and approaches of socializing the health system.

Health policies should be guided by values (20), and our study identified participation, human dignity, equity and social justice, ethics, and trust as the main core value of socializing the health system.

Human dignity validates the value of equity and equity is a fundamental ethical basis for all health policies

**Figure 2** Values, principles and approaches for socializing the health system in the Islamic Republic of Iran

(21,22). WHO identified health equity as the core value for action on social determinants of health, which is based on the principle of human rights (1). Trust was another core value identified for socializing the health system because it enables participation. The health system can enhance the trust of people by increasing the transparency, efficacy, and value for people of their services (23).

Ethics was identified as another core value. It has been said that knowledge and practice of ethics and notions of social justice are prerequisites for those engaged in the health field in the 21st century (24). WHO notes that “equity, solidarity, social justice, reciprocity and trust” are important factors in an ethical approach to public health (20). However, it is also maintained that when there is a conflict between institutional goals and health system goals, or there are competing interests or conflicting values, taking an ethical approach in all policies and activities might be challenging (20). Socializing health could help resolve conflict, making health a common interest and a core universal value.

Our study, not only identified participation as a core value, but also identified the main principles of socializing the health system. The idea of participation has evolved through developmental efforts since 1980 (25). Eight levels of participation have been described and “people control” is the highest level of participation (26). In this paper, there is an emphasis on participation as a process which is characterized by being dynamic, moulded by the participants, responding to local needs and changing circumstance and influenced by bottom-up approaches. Such participation has at its heart confidence and competence, greater individual fulfillment, personal development and self-awareness (27), in other words, the elements of empowerment.

Participation can be promoted by community-based participatory interventions and action-based research or any other innovative approaches that engage people in health preservation and promotion activities (28,29). Health interventions should address the real needs of local communities and should be tailor-made for the

particular requirements of a community. The conceptual framework for public health emphasizes this requirement (30), which can be achieved through participation.

Empowerment was identified in our study as another principle of the conceptual framework for socializing the health system. The framework for action on the social determinants of health (1) also identified empowerment as fundamental to people's participation and control of their health. People need to be able to distinguish their real health needs and not to be driven by outside forces that deliver economic benefit or power to a particular group of beneficiaries (31). In addition, empowering minorities and marginalized people through positive discrimination could enable them to participate in improving their health and, in turn, the community could benefit from their abilities and values (32).

Our study identified political will as the main principle of socializing the health system. WHO emphasizes that a high level of politics is necessary for any change in the health system (33).

An orientation on health was one of the approaches selected to promote socializing the health system. This means that the focus of the health system should be on health promotion and well-being, not just control and treatment of diseases.

Our study identified capacity-building as a way to socialize the health system. Capacity-building provides a platform for collaborative learning. This platform also offers an opportunity to conceptualize and consult on health affairs, undertake measures and experience outcomes and then reflect on the data and evidence in a cycle of learning (34–36). The importance of enhancing organizational capacity and improving institutions has also been discussed as necessary to strengthening health systems in low-income countries (37).

The social determinants of health and health in all policies were other approaches identified in our study that should be used to promote socializing the health system. Health in all policies is necessary for health promotion

across the world (38). One of the responsibilities of the health sector is to create an enabling environment for collaboration with non-health sectors to improve the health of people through enhancing the social determinants of health (4). The slogan “health for all, all for health” emphasizes that the health sector should work to ensure that decision-makers in other sectors take account of health and that they are able to identify the health effects of their decisions and guarantee that not only do they not harm the health of people but they improve health (39).

Our study has some strengths and limitations. Using a mixed-method design to develop the conceptual framework of socializing the health system, which combined in-depth interviews, focus group discussions, panel discussions, review of the literature, and the opinions of a large number of experts within and outside the health sector, increasing the reliability of the information. However, as socializing the health system is a new approach in health system governance, developing a conceptual framework for it needs to be refined and redefined through implementation and evaluation.

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**Competing interests:** None declared.

## Cadre conceptuel pour la socialisation du système de santé iranien

### Résumé

**Contexte :** La socialisation du système de santé est une nouvelle approche de gouvernance participative qui vise à promouvoir la santé communautaire et à améliorer durablement l'équité en santé dans la communauté. Cette approche fait partie de la réforme du système de santé en République islamique d'Iran.

**Objectifs :** La présente étude visait à élaborer un cadre conceptuel pour la socialisation du système de santé en République islamique d'Iran en tant que base théorique de cette réforme.

**Méthodes :** Les données ont été recueillies au moyen d'un examen de la littérature, d'entrevues approfondies, de groupes de discussion thématique et de tables rondes. Les participants étaient des experts du domaine des systèmes de santé au sein du ministère de la Santé et des universités médicales. L'analyse du contenu a été utilisée pour analyser les données et identifier les valeurs, principes et approches clés pour la socialisation du système de santé.

**Résultats :** Les valeurs fondamentales définies comprenaient la dignité humaine, l'équité, l'éthique et la confiance. Les principes étaient la participation, l'autonomisation, les droits de l'homme, la réactivité et l'exhaustivité. Les approches identifiées étaient la bonne gouvernance, une orientation favorable à la santé, le renforcement des capacités, une méthode centrée sur les processus et l'amélioration des déterminants sociaux de la santé. Une volonté politique forte est considérée comme essentielle pour la socialisation du système de santé.

**Conclusions :** Le cadre conceptuel décrit les conditions à remplir pour la socialisation du système de santé iranien. Toutefois, comme il s'agit d'une nouvelle approche de la gouvernance du système de santé, elle doit être affinée et redéfinie par la mise en œuvre et l'évaluation.

## إطار مفاهيمي لتفعيل النظام الصحي الإيراني اجتماعيًا

على اصغر فرشاد، روكسانا ميركاظمي، نرجس روستاميجوران، سيد محمد هادي ايازي، مسعود مطلبلي

### الخلاصة

**الخلفية:** يُعتبر تفعيل النظام الصحي اجتماعيًا نهجًا جديدًا للحكومة التشاركية، ويهدف إلى تعزيز الصحة المجتمعية وتعزيز الإنصاف الصحي المستدام في المجتمع. ويأتي هذا النهج في إطار إصلاح النظام الصحي في جمهورية إيران الإسلامية.

**الأهداف:** هدفت هذه الدراسة إلى وضع إطار مفاهيمي لتفعيل النظام الصحي اجتماعيًا في جمهورية إيران الإسلامية، ليكون أساسًا نظريًا لهذا الإصلاح.

**طرق البحث:** جُمعت البيانات من خلال استعراض المطبوعات، وعُقدت مقابلات متعمقة، ومناقشات المجموعات البؤرية، وحلقات نقاشية. وكان المشاركون من الخبراء في مجال النظم الصحية في وزارة الصحة والجامعات الطبية. واستُخدم تحليل المحتوى لتحليل البيانات وتحديد القيم الأساسية والمبادئ والنهج اللازمة لتفعيل النظام الصحي اجتماعيًا.

**النتائج:** شملت القيم الأساسية المحددة الكرامة البشرية، والإنصاف، والأخلاقيات، والثقة. وتمثلت المبادئ في المشاركة، والتمكين، وحقوق الإنسان، والقدرة على الاستجابة والشمول. أما النهج المحددة، فتمثلت في الحوكمة الرشيدة، والتركيز الموجه نحو الصحة، وبناء القدرات، والأساليب الموجهة نحو العمليات، وتحسين المحددات الاجتماعية للصحة. واعتُبرت الإرادة السياسية القوية أمراً ضرورياً لتفعيل النظام الصحي اجتماعياً.

**الاستنتاجات:** يُحدد الإطار المفاهيمي المتطلبات اللازمة لتفعيل النظام الصحي اجتماعياً في إيران. وعلى الرغم من أن هذا النهج لا يزال جديداً في حوكمة النظام الصحي، فإنه يلزم تنقيحه وإعادة تعريفه من خلال التنفيذ والتقييم.

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# Elimination of trans-fatty acids in the Eastern Mediterranean Region<sup>1</sup>

Citation: Elimination of trans fatty acids in the Eastern Mediterranean Region. East Mediterr Health J. 2021;27(6):639–640. <https://doi.org/10.26719/2021.27.6.639>

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## Introduction

Noncommunicable diseases (NCDs) are the leading causes of mortality globally, responsible for almost 68% of deaths in the WHO Eastern Mediterranean Region, while unhealthy diet is a major contributing factor (1). Countries are therefore working towards reducing diet-related NCD risk factors, including the consumption of trans-fatty acids (TFA). The Eastern Mediterranean Region has one of the highest levels of TFA in its food supply (2).

Replacing industrially produced TFA (iTFA) with healthier fats/oils is feasible and cost-effective, and elimination of iTFA by 2023 is a global and regional priority for WHO (2). In May 2018, WHO launched the REPLACE action package to eliminate iTFA from the global food supply (3). As part of providing technical support and regulatory capacity-building to the countries of the Eastern Mediterranean Region, a virtual training workshop was held in the WHO Regional Office for the Eastern Mediterranean, Cairo, Egypt, 10–11 August 2020 (4). The workshop aimed to provide countries with technical guidance from WHO and ‘Resolve to Save Lives’ [an initiative of the global public health organization Vital Strategies (5)]. Specifically, the workshop aimed at:

- identifying progress, enablers and barriers to eliminating TFA in EMR countries;
- building capacity and relationships with partners working on TFA regulations in the Region;
- facilitating cross-regional learning among nutrition focal points, experts and stakeholders; and
- identifying specific support needs and creating follow-up plans to provide technical support.

## Summary of discussions

Global progress over the past 12 months was outlined, including best practice TFA policies coming into effect in two countries (Lithuania and Saudi Arabia) and being passed in two others (Brazil and Turkey). In addition, draft policies that meet the best practice criteria have been proposed and notified in India and Nigeria. In total, 14 coun-

tries had best practice TFA policies being implemented in 2020, and 40 countries had measures that would come into effect by 2022. Most countries do not, therefore, have policies in place yet and most policy action to date has been in higher-income countries in the WHO Americas and European regions. Consequently, there is still a long way to go to achieve global elimination by 2023.

Several enablers or solutions for accelerating progress were identified. Policy preparation could be facilitated by compiling evidence, publishing technical reports, mapping existing legislations, building on existing national nutrition policies/strategies, calculating costs/benefits of alternative policies, and establishing or strengthening multisectoral coordination mechanisms. During the policy development phase, progress can be accelerated by having strong regulatory bodies, writing comprehensive, legally sound and enforceable rules, and building political support. Policy implementation could be facilitated by educating stakeholders and providing guidance on compliance and enforcement of the rules. Finally, monitoring can be strengthened by including monitoring and evaluation mechanisms within regulatory measures and strengthening laboratory capacities.

## Recommendations

### To WHO

- compiling evidence and publishing technical reports;
- mapping existing laws/legislations and building on existing national nutrition policies/strategies;
- calculating costs/benefits of alternative policies; and
- establishing a multisectoral technical committee and building on existing coordination mechanisms.

### To Member States

- having strong regulatory bodies;
- writing comprehensive, legally sound and enforceable rules; and
- building political support (e.g. support of parliamentarians, other ministers beyond health).

<sup>1</sup> This summary is extracted from the report on the Elimination of trans fatty acids in the Eastern Mediterranean Region, Cairo, Egypt 10–12 August 2020 (<https://applications.emro.who.int/docs/WHOEMNUT287E-eng.pdf?ua=1>).

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**Response to:****Baseline survey for malaria prevalence in Khyber Pakhtunkhwa Province, Pakistan**

Humera Qureshi, Muhammad Imran Khan, Henock Ambachew, Hai-Feng Pan and Dong-Qing Ye. Baseline survey for malaria prevalence in Khyber Pakhtunkhwa Province, Pakistan. East Mediterr Health J. 2020;26(4):638. <https://doi.org/10.26719/emhj.19.015>

Sir,

I want to draw your attention to an article published in EMHJ titled “Baseline survey for malaria prevalence in Khyber Pakhtunkhwa Province, Pakistan”. This article reports primaquine to be the most prescribed drugs in the province of Khyber Pakhtunkhwa, Pakistan; I quote: “The most common drugs used to treat malaria were primaquine (62.5% of cases) and chloroquine (36.1%)”. However, I query these figures. The first line drug in Pakistan for vivax malaria is chloroquine and primaquine as a radical therapy and prescribed at 0.25 mg /kg/bw per day for 15 days or 15 mg per day for 15 days. In falciparum malaria it is used as gametocidal drug as single dose.

Until very recently primaquine was not even available in basic health units, i.e. primary care facilities, instead it was reserved for use by the district health officer. This was due to the fact that primaquine causes hemolysis in G6PD deficient individuals and facilities for G6PD testing were and are still not available in primary care settings. For the same reason, even if it is now available in health facilities, physicians are not inclined to prescribe it specially in primary health care settings where testing for G6PD is not available.

Could the authors please elaborate what exactly they asked the health care provider about primaquine prescription and who were the respondents (doctors, medical technicians, drug dispensers, lady health visitors etc.?).

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**Response by authors**

Sir,

We are very happy that our research has encouraged the author’s comments. We trust that if he had read this article more comprehensively, he would ascertain answers to most of the queries. However, we would like to clarify the points made.

The study was done between August and October 2015, which was the peak season for malaria transmission. The treatment data were collected through malaria facility services from the health care centres. The respondents for the survey were doctors and medical technicians. Primaquine is contraindicated in pregnant women, children < 5 years and known G6PD deficiency syndrome. If a patient is tested for G6PD status and there is no G6PD deficiency, primaquine can be safely administered in all patients above the ages of 6 months except in pregnant women. If the infant is above 6 months and there is no G6PD deficiency in lactating mothers, then the mothers may be treated for 14 days with primaquine. Hence, the G6PD test is essential for administering primaquine and chloroquine dosage.

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