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# Review of seasonal influenza vaccination in the Eastern Mediterranean Region: Policies, use and barriers

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ABSTRACT

Vaccination is the main control measure for influenza and its severe complications. To better understand the influenza vaccination situation in the Eastern Mediterranean Region, we conducted an extensive review of literature published between 2006 and 2016 in the region on influenza vaccine policies, use, recommendations and coverage. Forty-eight articles met the inclusion criteria. These originated from 11 of the 22 countries of the region, with most being from Saudi Arabia and Iran. The review revealed knowledge gaps and misconceptions about influenza and its vaccines even among healthcare workers. Most of the papers reviewed reported low coverage in the target populations. Limited literature on the number of countries with concrete national influenza vaccination policies was available, which may not accurately represent the situation in the Region. In conclusion, lack of awareness and knowledge are the main barriers to influenza vaccination, which remains very low in the Eastern Mediterranean Region. Countries of the region need to promote and invest in research on influenza vaccination, which is critical to inform evidence-based programmes and policies to improve vaccination rates and control influenza.



## Introduction

Influenza is a respiratory tract illness that causes substantial morbidity and mortality worldwide every year. Influenza infection is often clinically mild and recognized by a number of symptoms such as fever, cough and sore throat. However, severe influenza infection can occur and is commonly associated with pulmonary complications including primary viral and secondary bacterial pneumonia [1]. In particular, higher morbidity and mortality rates are observed in high-risk groups including infants, elderly people, pregnant women and individuals with underlying medical conditions [1,2].

Influenza vaccination is the mainstay for mitigating influenza outbreaks and disease severity, especially in high-risk groups [3]. A World Health Assembly resolution in 2003 (WHA 56.19) urged World Health Organization (WHO) Member States to consider immunizing high-risk groups against influenza, and a 2005 resolution (WHA 58.5) requested WHO to strengthen linkages and work with other international and national partners to reduce the global shortage of influenza vaccines [4,5]. The WHO Global Action Plan for Influenza Vaccines (GAP), launched in 2006, aimed to increase capacity for production of influenza vaccines as a strategy to reduce the gap between vaccine demand and supply. Since the launch of GAP, global production capacity for seasonal and pandemic influenza vaccine has increased substantially; however, the increase is still far from the amount needed to achieve the goal of equitably immunizing 70% of the world's population, and further interventions are needed [6]. WHO recommends that countries consider introducing or expanding influenza vaccine programmes and prioritizes pregnant women at any stage of their pregnancy, whereas other risk groups are not ranked by priority [7].

Given its geographic location and large population, the WHO Eastern Mediterranean Region (EMR) is an important region for influenza circulation [8]. The EMR includes 22 countries:

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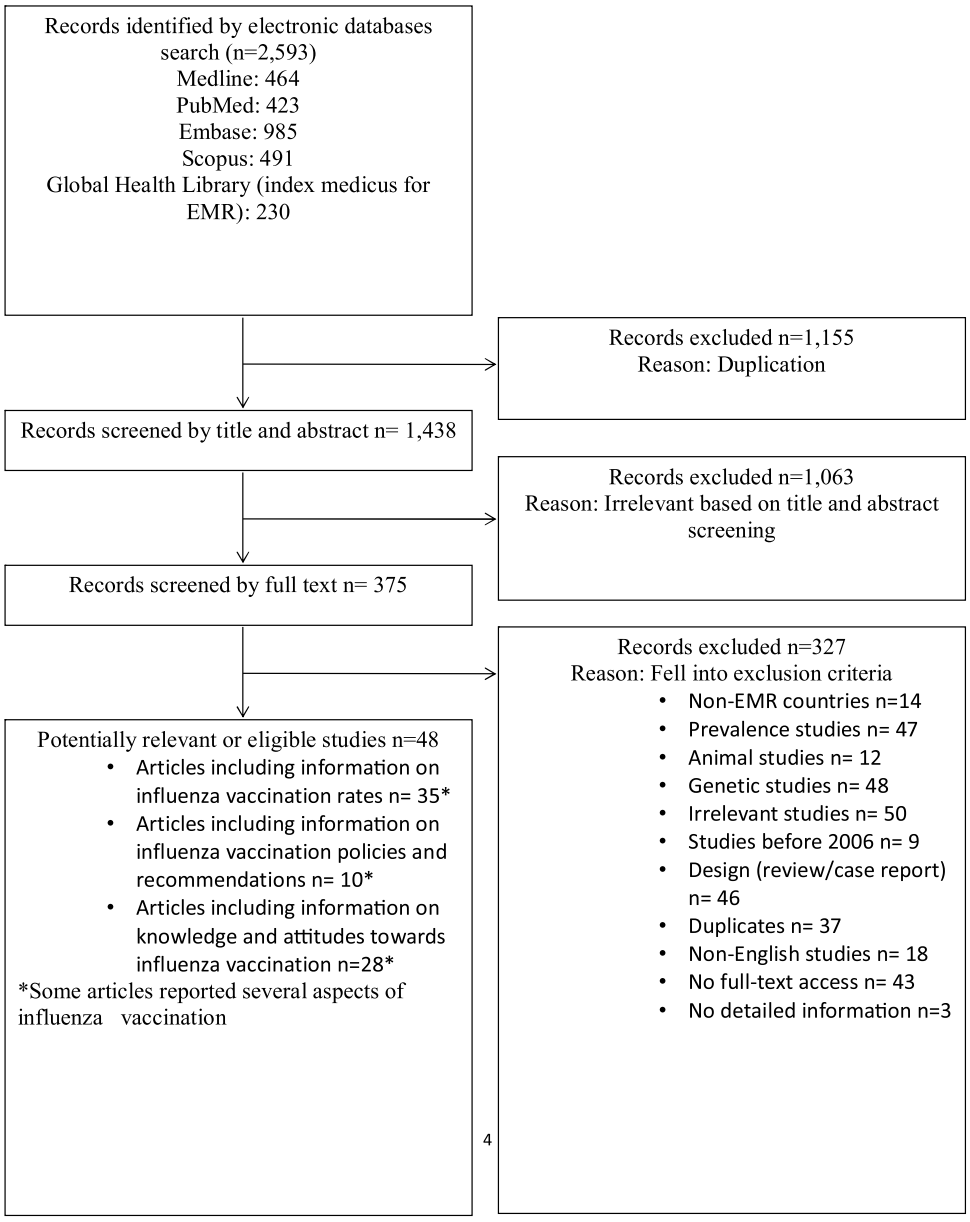


**Fig. 1.** Flow diagram of the search process.

Afghanistan, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates and Yemen [9]. In the EMR, influenza generally peaks during the winter season. However, some countries (e.g. Qatar and Oman) have a two-peak pattern a year, similar to the tropics [8]. Nonetheless, data on seasonal influenza vaccine use, recommendations and coverage are limited in the region. To better understand the influenza vaccination situation in the EMR, this review evaluates the current policies on the seasonal influenza vaccine, its use and attitudes to it in EMR countries.

## Methods

An extensive literature search was conducted of literature published between January 2006 and October 2016 in the 22 EMR countries. The following electronic databases were searched: MEDLINE, PubMed, Embase, Scopus, and the Global Health Library – Global Index Medicus. A range of search terms (see supplementary material) was used in combination with “influenza”, “flu”, “vaccine”, “immunization” and country name.

All relevant articles were compiled into a library using EndNote software and duplicates were removed. The inclusion criteria for review were: studies that reported on seasonal influenza vaccine policies, recommendations, risk groups, coverage, access to vaccines, knowledge and attitudes. We excluded seroprevalence studies, animal studies, studies not in English, reviews and case reports. The initial screening of titles and abstracts, full texts, and data abstraction was undertaken by two independent reviewers. The independent reviewers were research assistants at the American University of Beirut. Differences were resolved by a third reviewer. Reviewers abstracted data from the studies included using a standardized data abstraction form. The following information was extracted when available: country, risk group, sample size, percentage of vaccination, coverage, policy/recommendation, knowledge and attitudes.

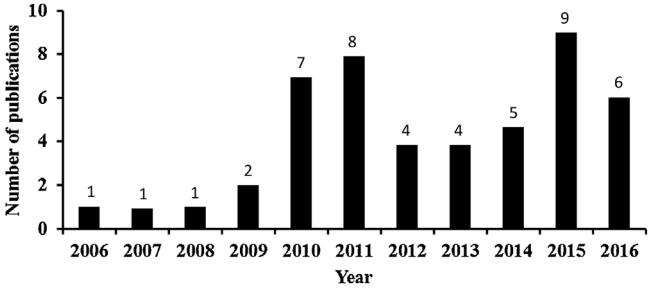


**Fig. 2.** Number of publications each year.

## Results

### *Characteristics of the included studies*

Our search identified 2593 articles related to influenza vaccination in the EMR. The eligibility of 1438 studies was assessed after removal of duplicates. Review of the titles and abstracts excluded a further 1063 articles. The full texts of the remaining 375 articles were retrieved and assessed for eligibility, and 48 met our inclusion criteria (Fig. 1). These studies were conducted in 11 of the 22 EMR countries. Of the 48 studies, 19 were conducted in Saudi Arabia; other studies were from: Iran (n = 8), Pakistan (n = 4), Egypt (n = 4), Morocco (n = 4), Qatar (n = 4), Lebanon (n = 3), Jordan (n = 2), Kuwait (n = 1), Oman (n = 1), and United Arab Emirates (n = 1). The sum is more than 48 because some studies were conducted in more than one country. The number of studies conducted over the search period ranged between one (in 2006, 2007 and 2008) and 9 (2015). An increase in the number of articles focusing on influenza vaccination was notable in the post-2009 pandemic years compared with the pre-2009 pandemic years, peaking at 9 articles in 2015 (Fig. 2). Twenty-one articles focused on healthcare workers, while the rest focused on other risk groups such as pilgrims, pregnant women, college students and other adults. Of the 48 articles included, 35 examined the rate of influenza vaccination, 10 examined policies and recommendations concerning influenza vaccination and 28 attitudes to and knowledge of influenza vaccination.

### *Influenza vaccination rates in high-risk groups*

Table 1 gives a summary of the 35 studies that reported on influenza vaccination rates in EMR countries. The target populations reported in the included studies were healthcare workers, pilgrims, pregnant women and adult patients with varying health conditions. The sample size varied between 56 in a study conducted in Pakistan and 14,055 in a study from Qatar [10,11].

Almost half of the studies on vaccination rates (17/35) were conducted on healthcare workers. The vaccination rates among healthcare workers varied widely within and between the countries depending on the year of study and the recommended requirements for influenza vaccination of their healthcare personnel. Influenza vaccination rates among healthcare workers were lowest in Pakistan (less than 1%) and highest in Qatar, reaching up to 71.1% [30,32]. The median influenza vaccination coverage among healthcare workers was 28.2%.

Four studies assessed influenza vaccination rates among pilgrims [12,14,38,43]. The lowest and highest vaccination rates were reported from Egypt, showing a decreasing trend in coverage from 98.1% in the 2011 Hajj season to 19.4% in 2015 [12]. The median influenza vaccination coverage among pilgrims was 22% as reported from Saudi Arabia in 2013 [43].

Four studies from three EMR countries (Iran, Pakistan and Saudi Arabia) reported data on vaccination rates among pregnant women [19,20,29,44]. The reported coverage rates among pregnant women ranged from 0% in a study from Pakistan to about 18% in Saudi Arabia [29,44]. However, the studies from Iran and Saudi Arabia were conducted in large representative cities, while that from Pakistan was a study of primarily low-income, urban pregnant women [19,20,29,44].

With regard to annual vaccination rates among other risk groups, most countries reported rates below 50%. In Morocco, a vaccination rate of 3.9% was reported among patients with influenza-like illness and severe acute respiratory illness during the 2008–2009 season [27]. Another study on a sample of patients with rheumatoid arthritis in Egypt and Morocco estimated the vaccination rates to be 28.7% and 42.3%, respectively [13]. A cross-sectional survey in a number of community pharmacies in Lebanon found that the overall 2014–2015 seasonal influenza vaccination rate among ambulatory adults was 27.6%. The sample population included participants in high-risk groups where the immunization rates ranged from 18.2% to 35% [26]. In Iran, low immunization rates were reported among elderly people and/or people with chronic diseases or of immunosuppressed status (5.5–29.1%) [20]. Two studies from Saudi Arabia showed the vaccination rates among military personnel and workers in food and chemical industries, and blood donors to be 17.8% and 58.1% respectively [34,39]. Finally, a study from Morocco showed the vaccination rate among blood donors to be 7% [28].

### *Policy and recommendations for seasonal influenza vaccination*

Ten studies discussing seasonal influenza policy and recommendation were reported from six of the 22 EMR countries. In Saudi Arabia, the recently published guidelines of the Saudi Thoracic Society adopted well defined vaccination guidelines, recommending annual influenza vaccination for all persons aged 6 months and above, including pregnant and breastfeeding women. For children aged 6 months to 8 years, the appropriate dosage depends on previous vaccination history; one dose is required for those previously vaccinated and two doses for those being vaccinated for the first time. For children younger than 6 months, vaccination is not recommended; however, it is recommended for household contacts or caregivers of these children. When the vaccine supply is limited or delayed, an age- and risk-targeted vaccination strategy is adopted, which prioritizes people with chronic illnesses, healthcare professionals, and household contacts and caregivers of children aged <5 years, adults aged ≥65 years, and people with underlying medical conditions [45].

As the host of the Hajj, Saudi Arabia has also recommended influenza vaccination for all pilgrims departing for the Hajj [46–49]. In accordance with the Saudi Ministry of Health recommendations, Egypt required pre-departure vaccination for all its pilgrims and restricted the pilgrimage age to 12–65 years [12,14]. Based on studies in Kuwait, Oman and the United Arab Emirates, the uptake of influenza vaccine was strongly recommended for healthcare workers [24]. Measures to promote vaccination and reduce vaccination rejection among healthcare workers were also recommended and included conducting educational and promotional campaigns, establishing internal policies and procedures for healthcare facilities, increasing vaccine availability after regular daytime hours, and implementing appropriate follow-up and reminder systems for vaccination. A study from Iran adopted modified recommendations of the Advisory Committee on Immunization Practices for influenza vaccination, which include the following target groups: pregnant women, adults aged ≥65 years, healthcare personnel, immunocompromised patients and patients with chronic illnesses [20].

**Table 1**
Summary of studies reporting on influenza vaccination rates among high risk groups in the EMR.

| Country | Year | Risk group | Age group (years) | Sample size | Vaccination rate % (number vaccinated) | Vaccine cost | Study |
|---|---|---|---|---|---|---|---|
| Egypt | 2011 | Pilgrims | 12–65 | 551 | 2009: 98.1 (542) | – | [12] |
| | 2015 | People with rheumatoid arthritis | ≥18 | 308 | 28.7 (88) | – | [13] |
| | 2016 | Pilgrims | 0–105 | 2012: 824 | 2012: 19.7 (162) | – | [14] |
| | | | | 2013: 740 | 2013: 9.3 (69) | | |
| | | | | 2014: 827 | 2014: 29.5 (244) | | |
| | | | | 2015: 973 | 2015: 19.4 (189) | | |
| Iran | 2009 | Healthcare students (nurses, dentists, medical students) | 18–59 | 851 | 5.2 | – | [15] |
| | 2010 | Healthcare workers | 23–57 | 139 | 66.9 (93) | – | [16] |
| | 2010 | Medical students | – | 172 | 4.7 | – | [17] |
| | 2011 | Healthcare workers (nurses) | 22–59 | 167 | 21 (35) | – | [18] |
| | 2012 | Pregnant women | 16–42 | 416 | 6 (25) | – | [19] |
| | 2015 | Healthcare professionals | 15–84 | 174 | 18.4 | – | [20] |
| | | People with pulmonary disease | 15–84 | 79 | 29.1 | | |
| | | People with cardiovascular disorders | 15–84 | 215 | 11.2 | | |
| | | People with diabetes | 15–84 | 173 | 11.6 | | |
| | | People with chronic kidney disease | 15–84 | 123 | 14.6 | | |
| | | People on haemodialysis | 15–84 | 70 | 18.6 | | |
| | | Elderly | >65 | 160 | 160 | | |
| | | Adults | 50–65 | 190 | 5.5 | | |
| | | Immunocompromised patients | 15–84 | 168 | 7.1 | | |
| | | Pregnant women | 15–84 | 70 | 10 | | |
| | 2015 | Adults | ≥65 | 1274 | 10.4 (132) | – | [21] |
| | 2016 | Healthcare workers | – | 412 | 27.7 (114) | – | [22] |
| Jordan | 2016 | Adults | ≥18 | 941 | 20.4 (192) | – | [23] |
| Kuwait | 2010 | Healthcare workers (professionals and paramedics) | – | 232 | 67.2 (156) | – | [24] |
| Lebanon | 2011 | College students and healthcare workers | | 99,106 | 7.1 (7), 25.5 (27) | – | [25] |
| | 2015 | Ambulatory patients aged ≥18 years | ≥18 | 640 | Irregular uptake: 72.4; rate for that season: 27.6 | – | [26] |
| Morocco | 2011 | Patients with influenza-like illness and severe acute respiratory illness | – | 2007–2008: 1400<br>2008–2009: 1702 | 2007–2008: 2.8 (39)<br>2008–2009: 3.9 (66) | – | [27] |
| | 2013 | Blood donors | 18–45 | 150 | 7 | – | [28] |
| | 2015 | People with rheumatoid arthritis | ≥18 | 227 | 42.3 (91) | – | [13] |
| Oman | 2010 | Healthcare workers (professionals and paramedics) | – | 360 | 46.4 (167) | – | [24] |
| Pakistan | 2008 | Primary care providers | – | 56 | 54 (30) | – | [10] |
| | 2015 | Pregnant women | 18–49 | 283 | 0 (0) | – | [29] |
| | 2016 | Healthcare professionals | 24–40 | 165 | 0.6 (1) | – | [30] |
| | 2010 | Healthcare workers | | Medical staff: 9064<br>Non-medical staff: 4991 | 19.4 (1563)<br>23.4 (1166) | – | [11] |
| Qatar | 2011 | Healthcare workers (physicians and nurses) | – | 523 | 13.4 (70) | – | [31] |
| | 2014 | Healthcare workers | – | 2011–2012: 209<br>2012–2013: 325 | 2011–2012: 61.7 (129)<br>2012–2013: 71.1 (231) | Free of charge | [32] |
| | 2015 | Healthcare providers at a paediatrics department | – | 230 | 67.7 (151) | – | [33] |
| Saudi Arabia | 2006 | Workers in the food processing and chemical industry | – | 2400 | 58.1 (1396) | 20 Saudi riyals per shot (US$ 5) | [34] |
| | 2007 | Healthcare workers | 20–60 | 392 | 5.9 (23) | – | [35] |
| | 2009 | Healthcare workers | ≥20 | 244 | Previous year: 41; Previous 5 years: 69 | – | [36] |
| | 2010 | Healthcare workers | 22–64 | 512 | 34.4 (176) | – | [37] |
| | 2010 | Malaysian pilgrims | – | 394 | 72 | – | [38] |
| | 2011 | Military personnel | – | 2230 | 17.8 (396) | – | [39] |
| | 2012 | Healthcare workers | – | 161 | 36.6 (59) | – | [40] |
| | 2013 | Healthcare workers (primary health care centre) | 22–59 | 347 | 28.2 | – | [41] |
| | 2013 | Healthcare workers | – | 242 | 38 (95) | – | [42] |
| | 2014 | Pilgrims | 18–93 | 5235 | 22 | – | [43] |
| | 2016 | Pregnant women | – | 998 | 18.1 (178) | – | [44] |
| United Arab Emirates | 2010 | Healthcare workers (professionals and paramedics) | – | 401 | 24.7 (99) | – | [24] |

–: not reported.

*Cost of influenza vaccination*

A limited number of studies reported on the cost of influenza vaccination in the EMR. In a study performed in the Cuban Hospital in Qatar, it was reported that healthcare workers were offered influenza vaccination free of charge as part of a national immunization campaign [32]. In Iran, seasonal influenza vaccine is available for medical students through private market purchase only [17]. A cost-benefit analysis in two important industries in Saudi Arabia reported that the cost of a single influenza vaccine injection was US$ 5 and estimated a net saving of about US$ 28 for each vaccinated worker [34].

*Knowledge and attitudes*

A total of 28 studies from the EMR assessed knowledge of and attitudes to influenza vaccination. Most of the healthcare workers studied had a poor understanding of influenza disease and its prevention and hence had a negative attitude to receiving the vaccine. The most common factors that made healthcare workers unwilling to be vaccinated were lack of time, lack of knowledge about the vaccine and influenza virus, unawareness of availability of the vaccine and concerns about its side-effects. On the other hand, being vaccinated was significantly associated with a higher knowledge score about the vaccine, participation in educational campaigns, improved access to vaccination and mandatory immunization policies [11,15,16,18,22,30,36,37,40–42,50].

Our review revealed variations in the knowledge and attitudes of parents about vaccinating their children. A survey of 469 participants in Saudi Arabia reported that 422 (about 90%) worried about the safety of the vaccine [51]. However, another study in Saudi Arabia revealed better knowledge of and positive attitudes to some aspects of childhood vaccination including the general role of vaccination in preventing some infectious diseases and timing of the first dose [52]. In this study, 45.7% of the respondents were aware of the importance of vaccination of children against seasonal influenza [52]. In Jordan, a study noted a positive attitude to influenza vaccination among mothers, although only 34.8% of the respondents knew about the national influenza vaccination programme [53].

A number of research teams reported on pregnant women's knowledge of and attitudes to influenza vaccination. A study of 283 unvaccinated pregnant women in Pakistan found that most of them (87%) expressed willingness to have the influenza vaccine, if offered [29]. Unlike Pakistan, pregnant women in Iran and Saudi Arabia reported that they would be unwilling to be vaccinated and they lacked sufficient knowledge about influenza vaccination [19,44]. It was evident from our review that study participants were strongly influenced by their health providers, families and relatives when making decisions about being vaccinated [19,29,54]. In Pakistan, the decision to take the vaccine was based on advice of husbands and parents-in-law [29].

With regard to the adult population, most of the studies emphasized the urgent need to increase awareness about influenza and, more importantly, about the vaccine. This was because of the clear misconceptions people had about the efficacy and benefits of influenza vaccination, which acted as barriers to vaccination. In particular, thinking that the vaccine was not effective was a major barrier to vaccination. Other barriers, such as fear of side-effects and vaccine cost, were almost equally important [17,23,26,55–57]. A study in Saudi Arabia also suggested that misconceptions about the influenza vaccine were barriers to the provision of influenza vaccine in healthcare institutions [50].

## Discussion

This study presents the first extensive review of seasonal influenza vaccine policies, coverage, use, barriers in the EMR for the years 2006–2016. In general, there was a relatively small number of studies that tackled influenza vaccination in the EMR. For instance, only 30 articles were identified on knowledge of and attitudes to influenza vaccination. During the same period, 199 studies on vaccine hesitancy originated from the Americas and 179 from Europe [58]. Important questions about influenza vaccination in the EMR were not considered such as vaccination in children and country- and region-specific data on vaccine efficacy and cost-effectiveness. An increase in research on influenza vaccination in the EMR was observed in the years following the 2009 H1N1 pandemic influenza. This suggests an increase in awareness about influenza and the importance of vaccination in reducing its burden.

The findings of this review provide important information on several factors related to influenza vaccination that are critical for the development and update of influenza prevention policies and practices in the region. The studies conducted in the EMR highlight the effect of misconceptions/beliefs about influenza and the safety and effectiveness of the vaccine in various populations including healthcare workers [23,26,44,50,52].

Hesitancy of healthcare workers to receive the influenza vaccine will likely reduce their willingness to recommend it to their patients as well. Indeed, advice from a healthcare provider was reported to be a driving factor for accepting the vaccine by pregnant women in Pakistan [30]. In addition, easy access to vaccination or being offered the vaccine was an enabling factor or a motive to get vaccinated [30]. Healthcare workers play a role in nosocomial transmission of influenza and increasing vaccination coverage among them provides added protection to their patients [59,60]. The vaccination rates among healthcare workers varied widely in the EMR. The lowest reported coverage among healthcare workers was 0.6% in Pakistan. On the positive side, studies from Qatar, Saudi Arabia, Kuwait and Iran reported that vaccination rates among healthcare workers exceeded 60% in some institutions [16,24,32,33,36]. A more recent study from Qatar reported increased coverage among healthcare workers to 77% [61]. The high vaccination rates in Qatar were the result of a campaign that included education on the importance of influenza vaccination and provision of the vaccine free of charge [32]. However, it should be noted that despite providing free influenza vaccination at the worksite in Qatar, universal coverage of all healthcare workers was not attained, suggesting the presence of some barriers to vaccination [41].

The studies in our review emphasize the importance of advocacy for vaccination among healthcare workers, which could result in better coverage among their patients as well. In addition to healthcare workers, awareness campaigns aimed at educating various groups in the community on the health risks of influenza and the safety and benefits of vaccination should also result in better influenza vaccination coverage. A study from Brazil showed a direct association between higher vaccine coverage and compliance among elderly people who received advice from their physicians or those who were targeted by the national influenza campaign [62].

Pregnant women are considered a priority group for influenza vaccination by WHO. Influenza during pregnancy can result in severe complications ranging from miscarriage, to preterm delivery and high maternal mortality [63]. Vaccination during pregnancy has been shown to protect both mothers and their new-born children until it is safe for the children to receive the vaccine [64]. Only four studies reported on influenza vaccination rates among pregnant women in the EMR [19,20,29,44]. The coverage among this risk group was reportedly low in Iran, Pakistan and Saudi Ara-

bia. The lack of knowledge about the safety of the vaccine during pregnancy and lactation was the main reason for not accepting vaccination [19,44]. This was also a barrier for vaccinating children [51–53]. The decision to accept the vaccine by pregnant women was influenced by the family and relatives [19,29,54]. Therefore, a campaign strategy targeting various sectors of the community would be successful in raising coverage among pregnant women and children.

The Hajj is the largest global mass gathering attracting more than 2 million people from across the world annually. This gathering is an optimal environment for the spread of respiratory infections including influenza [65,66]. Experts report that two in every five pilgrims suffer from respiratory symptoms during the Hajj [66]. Influenza is one of the most common infections among these Hajj patients [67,68]. The Ministry of Health of Saudi Arabia recommends that all pilgrims, particularly those at high risk of influenza complications, receive the most recent influenza vaccine before undertaking the Hajj [69]. Egypt has the same recommendation for Egyptians prior to departing for the Hajj [12,14]. Despite this, vaccination rates among pilgrims from the EMR is generally low [14,43]; only 22% of Hajj pilgrims from the 22 EMR countries received the influenza vaccine in 2013 [14]. Similarly, a study in the United Kingdom found that only a third of British Muslim pilgrims reported being immunized against influenza even though a large proportion were at high risk [70]. These data suggest low compliance with vaccine recommendations and the need for more education on health issues including influenza during the Hajj. Emphasizing these recommendations together with evidence-based data on the effectiveness of vaccination in reducing the influenza burden are likely to be more effective in increasing coverage among pilgrims. Mandating the influenza vaccine for pilgrims is suggested. However, such a recommendation should consider other factors such as the timing of the Hajj in relation to influenza activity and the availability of the vaccine during this period.

Overall, the reportedly low coverage among risk groups such as pilgrims and HCWs and the widespread barriers to vaccination among high risk populations such as pregnant women is alarming.

## Conclusion

The reportedly low vaccination coverage in the EMR among various populations including those at high risk is alarming. Therefore, emphasis should be put on developing vaccination policies and ensuring that these policies are accessible and well communicated to the research and clinical communities and the public. Moreover, this review draws attention to substantial research gaps and major disparities across countries about seasonal influenza vaccination. Encouraging and investing in research to generate evidence on influenza vaccination is an important component of strategies that aim to improve vaccination rates and control influenza in the EMR. Such research is important to drive policy implementation and updates and for designing country- and region-specific advocacy campaigns. Finally, it should be noted that our conclusions are limited by the quality and extent of available data.

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## Competing interests

None declared.

## Ethical approval

Not required.

## Author contributions

Hassan Zaraket and Nada Melhem designed the review strategy with the assistance of Abdinasir Abubakar, Mamunur Malik, and Wasiq Mehmood Khan. Hassan Zaraket and Nada Melhem supervised the data synthesis and wrote the initial draft of the manuscript. All the authors contributed to the literature review and critically revised the manuscript.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jiph.2018.10.009.

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