



A Snapshot of Influenza Surveillance, Vaccine Recommendations, and Vaccine Access, Drivers, and Barriers in Selected Middle Eastern and North African Countries

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ABSTRACT

Objectives: Influenza is a vaccine-preventable acute respiratory viral infection that causes epidemics annually around the globe. A regional influenza stakeholder network (MENA-ISN) comprised of experts assessed the status of influenza prevention and control using a structured survey. **Methods:** A survey questionnaire was used to obtain information from each participating country on surveillance system, the burden of disease, influenza vaccination programs, recommendations, funding and access for vaccine and vaccination, target rate, coverage rate monitoring, and drivers and barriers to influenza vaccination. **Results:** Out of the 10 countries that participated, nine had an influenza surveillance system and vaccination policy, and seven had World Health Organization (WHO) accredited reference laboratory. Three countries had burden of disease data available and eight had a reimbursement vaccine policy. Influenza vaccine was available in five countries through the Ministry of Health whereas in others, pharmacies also dispensed for the private sector. In all countries, prescribers were physicians, and vaccinators, which could be physicians, nurses, and pharmacists. Eight countries had a set vaccination target rate and only three monitored the influenza coverage rates. Drivers and barriers of vaccination were similar in all countries. **Conclusions:** Despite existing policies, influenza vaccination coverage remains far below the WHO recommendations. Increased awareness and effective implementation of policies with collaboration of stakeholders can help increase the rates to reach WHO targets.

Influenza is a vaccine-preventable acute respiratory viral infection, which causes epidemics annually around the globe. During annual influenza epidemics 3–5 million people develop severe disease and 250 000–500 000 people die due to influenza-related complications.¹ All age groups are affected by influenza with the greatest risk of complications in children aged below two years, adults above 65 years, pregnant women, and people of any age with underlying medical conditions including immunosuppression.^{1,2}

In an effort to develop evidence-based strategies to fight against influenza, the World Health Organization (WHO) established a Global Influenza Surveillance and Response System (GISRS) in 1952

to monitor influenza viruses.³ GISRS also serves as a global alert mechanism for the emergence of influenza viruses with pandemic potential. Virological data collected from member states through GISRS enable the WHO to make recommendations for vaccine composition annually. Although the WHO has been monitoring influenza since 1952, several countries in various regions of the world have not established influenza surveillance systems and continue to lack vaccination programs.^{4–6}

Influenza vaccines are the most effective way to prevent infection and reduce the severity of the disease.⁷ Safe and effective vaccines have been used for over 60 years around the world.^{7,8} In 2012, the WHO recommended pregnant women be given the

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highest priority for influenza vaccination, and also recommended vaccination for healthcare workers (HCWs), children aged 6–59 months, the elderly, and persons with chronic medical conditions, in no order of priority.⁷ Despite the WHO vaccination recommendations and compiling scientific evidence on influenza burden and awareness, vaccination coverage rates remain low in Middle East and North African (MENA) countries.^{9–13} In addition, prior to very recent publications on the burden of influenza from Egypt, Iran, and Tunisia in collaboration with WHO/Eastern Mediterranean Region (EMRO), only a handful of countries such as Oman and Turkey had previously published studies on the burden of influenza in the MENA region.^{14–18}

In line with the WHO's Global Action Plan for Influenza Vaccines objectives to increase influenza awareness, a regional influenza stakeholder network (MENA-ISN) was established in 2014.¹⁹ MENA-ISN is comprised of experts from basic and clinical sciences and officials from Ministry of Health (MOH) from Algeria, Egypt, Iran, Lebanon, Libya, Jordan, Kingdom of Saudi Arabia (KSA), Morocco, Oman, Tunisia, Turkey, and United Arab Emirates (UAE). In order to enable better planning for actions to be taken that will help increase influenza awareness and vaccination coverage rates, MENA-ISN conducted a survey to collect data on the current status of influenza prevention and control in Algeria, Iran, KSA, Lebanon, Libya, Morocco, Oman, Tunisia, Turkey, and the UAE. The survey was conducted in countries where at least one MOH official was available to confirm the data. The collected data explored the existence of surveillance systems, vaccine recommendations, and influenza programs in each country. Herein, we provide a snapshot of the regional status of influenza prevention and control based on this survey results and published data when available from these countries.

METHODS

Data collection was done using a survey questionnaire to obtain information in four categories from each participating country:

1. Existence of surveillance system and availability of burden of disease data.
2. Influenza vaccination programs, recommendations, and funding for vaccine/vaccination.

3. Access to the vaccine, vaccination target rate, and coverage rate monitoring.

4. Drivers and barriers to influenza vaccination.

Information was collected by face-to-face interviews or through telephone interviews with contact persons in national surveillance laboratories, public health institutions, and the national influenza coordinator in Algeria, Iran, KSA, Lebanon, Libya, Morocco, Oman, Tunisia, Turkey, and the UAE between September 2014 and April 2017. Ethical approval was not required for this study as it was based on secondary data and did not include human subjects. The data and information provided were further verified by the authors.

RESULTS

Nine out of 10 (90.0%) countries reported established surveillance systems. Surveillance was general/family practice-based in Algeria and hospital-based in Lebanon and Oman. In Iran, Libya, KSA, Morocco, Tunisia, and Turkey surveillance was based both on general practice and hospitals. The UAE was the only country without a surveillance system [Table 1].

Seven out of 10 (70.0%) countries had a WHO-accredited laboratory designated as a national influenza center (NIC). Libya and KSA reported having only regional laboratories that had not yet been accredited by the WHO. At the time of data collection, burden of disease data was only available from Algeria, Iran, Oman, and partially from Turkey [Table 1].

Nine out of 10 countries (90.0%) had a vaccination program [Table 2]. Vaccine recommendations at varying degrees existed in all countries except in Lebanon where there was only a press release from the MOH to the public encouraging certain high-risk groups to get vaccinated. Groups recommended to receive vaccination were somewhat in line with WHO recommendations.³ Persons with chronic medical conditions and HCWs were the most commonly (80.0%) recommended groups, followed by pregnant women (70.0%), and the elderly and pilgrims (60.0%) [Table 2]. In Tunisia, only 2–5-year-old children with underlying conditions were recommended for vaccination and not adults with underlying health conditions. Only KSA recommended vaccination to healthy children aged 6–59 months.

In eight out of 10 (80.0%) countries, a reimbursement policy existed for vaccine-

Table 1: Existence of surveillance system and availability disease burden data.

Country	Existence of surveillance and laboratory					Availability of disease burden data
	Does surveillance exist?	Surveillance GP/FP-based	Surveillance hospital-based	Does laboratory exist		
				NIC	Other	
Algeria	Yes	YES	NO	YES	NO	Yes, in the annual report of the National Institute of Public Health
Iran	Yes	Yes	Yes	Yes	Yes	Yes
KSA	Yes	Yes	Yes	No	Regional	No
Lebanon	Yes	No	Yes	Yes	No	No
Libya	Yes	Yes	Yes	No	Central at MOH	No
Morocco	Yes	Yes	Yes	Yes	Regional	No
Oman	Yes	NA	Yes	Yes	Central at MOH	Yes
Tunisia	Yes	Yes	Initiated in six hospitals in 2015–2016 season	Yes	No	No
Turkey	Yes*	Yes	Yes	Yes	Yes	Partial, but not by MOH
UAE	No	NA	NA	No	No	No

GP/FP: general practice/family practice; NIC: national influenza center; KSA: Kingdom of Saudi Arabia;

UAE: United Arab Emirates; MOH: Ministry of Health; NA: not applicable.

*Surveillance is sentinel in Turkey.

recommended groups. Among these countries, Iran provided vaccine free of charge to vaccine-recommended groups. Lebanon and the UAE did not have a reimbursement policy. In Lebanon, patients either paid out of pocket or private insurance covered the vaccination in limited numbers whereas in the UAE private insurance did not cover the vaccination, patients paid out of their pocket. In five countries, private insurances also covered vaccination [Table 2]. Persons who did not belong to the risk groups either paid out of pocket or, if available, private insurance paid for the vaccination [Table 2].

In six out of 10 (60.0%) countries, pharmacies were the retailers. In these countries, MOH dispensed the vaccine for recommended groups either at vaccination centers or hospitals, or through vaccine institutes [Table 3]. In Libya, the UAE, Tunisia, and Morocco, pharmacies did not play a role as vaccine retailers; vaccines were available only through MOH or related institutions.

In all countries, prescribers were physicians. In general, physicians, nurses, and pharmacists were the vaccinators at varying distribution in all countries [Table 3].

All countries with defined risk groups except Iran and Turkey had set a target rate for vaccination at varying levels depending on the risk group [Table 3]. Algeria had a fixed target rate of 35.0% for all vaccine-recommended groups. For KSA, Libya, Morocco, Oman, and Tunisia depending on the risk group, the target rate ranged from 10.0% to 75.0%, 20.0% to 90.0%, 100%, 90.0% to 100%, 5.0% to 90.0%, respectively. Among all of these countries with a set target rate, KSA, Libya, and Oman declared monitoring the coverage rate. However, the achieved rate was not disclosed.

Reported drivers and barriers of influenza vaccination for each country are listed in Table 4. Reported drivers and barriers were the professional views of the interviewed persons and the field experience of MENA-ISON members. However, for countries like Turkey and Oman, published data were available on drivers and barriers.^{12,14} Among the reported barriers, perceived low vaccine effectiveness, fear of side effects, lack of recommendation by doctors, and negative media were the major barriers for vaccination. The major drivers were the awareness of disease severity, recommendation

Table 2: Influenza vaccination programs, recommendations, and funding for vaccination.

Country	Vaccination program exists	Recommendations by MOH				Reimbursement by MOH				Vaccination of patients other than risk groups are paid by		
		Pregnant	Elderly	Healthy children	HCW	Persons with chronic illness	Other	Risk groups	Other patients	Private insurance	Self	
Algeria	Yes	Yes	No	Yes	Yes	Yes	Pilgrims	Yes	No	80.0%	No	
Iran	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes***	No	Limited	Yes	
KSA	Yes	Yes	Yes 6-59 months	Yes	Yes	Yes	Pilgrims	Yes	No	No	Yes	
Lebanon	No	No	No	No	No	No	No	No	No	Limited	Yes	
Libya	Yes	Yes	No	Yes	Yes	Yes	Pilgrims	Yes	Yes	No	No	
Morocco	Yes	No	No	No	No	No	MOH workers and Pilgrims*	HCWs	NA	NA	NA	
Oman	Yes	Yes	No	Yes	Yes	Yes	Pilgrims	Yes	NA	NA	Yes	
Tunisia	Yes	No	No	Yes**	Only Children 2-5 years	Yes	Pilgrims	Yes	Pilgrims	Yes	Yes	
Turkey	Yes	Yes	No	Yes	Yes	Yes	Salicylic Acid users (6 months-18 years)	Yes	No	Limited	Yes	
UAE	Yes	Yes	No	Yes	Yes	Yes	Pilgrims	No	No	No	Yes	

KSA: Kingdom of Saudi Arabia; UAE: United Arab Emirates; HCW: healthcare workers; MOH: Ministry of Health.

*Influenza vaccine program is limited to HCW, working for MOH and medical and nursing students. Each season the MOH purchases 60 000 doses to cover all HCWs. For pilgrims it is mandatory but not supported by the MOH.

But only 10-20% of HCW use vaccine in Tunisia. *Provided free of charge.

Table 3: Access to vaccine, vaccination target rate, and coverage rate monitoring.

Country	Access to vaccine			Vaccination coverage	
	Prescriber	Dispenser*/retail**	Vaccinator	Target rate for risk groups, %	Monitoring
Algeria	Physicians	MOH and pharmacies	Physicians, nurses, and pharmacists	35.0	No
Iran	MOH physicians/HCPs	MOH and pharmacies	HCW	No	No
KSA	Physicians	MOH, non-MOH hospitals, private clinics, pharmacies	Physicians, nurses, and pharmacies	10.0–75.0	YES, for the whole population
Lebanon	Physicians and pharmacies	Physicians and pharmacies	Physicians and pharmacies	No	No
Libya	Physicians	Vaccination centers at MOH	Physicians and nurses	20.0–90.0	Yes, for some risk groups
Morocco	MOH physicians for HCWs	NA	NA	100	NA
Oman	Physicians	MOH and pharmacies	EPI Staff and nurse	90.0–100	Yes
Tunisia	Physicians	MOH	Physicians	5.0–90.0	No
Turkey	Physicians	MOH for HCW only and pharmacies	Physicians and nurses	No	No
UAE	Physicians	MOH and private	Physicians and nurses	No	No

*KSA: Kingdom of Saudi Arabia; UAE: United Arab Emirates; HCW: healthcare worker; MOH: Ministry of Health; HCPs: healthcare practitioners, EPI: extended programme of immunization. *MOH purchases the vaccine through tender for public market and dispenses it to the related institutions/doctors. **Pharmacies are the retailers that sell the vaccines.*

Table 4: Motivators and barriers for influenza vaccination.

Country	Vaccination motivators	Vaccination barriers
Algeria	<ul style="list-style-type: none"> ▪ Disease severity leading to death ▪ Prevention of death by vaccination ▪ WHO NIC available for advice 	<ul style="list-style-type: none"> ▪ HCW ▪ Lack of information (lack of vaccine communication outside flu season) ▪ Fear of side effects ▪ Lack of scientific communication on the effectiveness
Iran	<ul style="list-style-type: none"> ▪ Doctors recommendation, MOH recommendation ▪ Free of charge coverage for high-risk population such as HIV patients 	<ul style="list-style-type: none"> ▪ Low public awareness, low acceptance, and belief in some HCP, side effects (like Guillain-Barre syndrome), no coverage by main insurance facilities
KSA	<ul style="list-style-type: none"> ▪ HCW: MOH interest, local global recommendations, easy vaccination process, data, education ▪ Lay public: Doctor's recommendation, free vaccination, awareness 	<ul style="list-style-type: none"> ▪ HCW: Not convinced, logistical barriers such as equipment, time consumption, infrastructure ▪ Lay public: Lack of awareness
Lebanon	<ul style="list-style-type: none"> ▪ Awareness in some segments of the population ▪ Previous encounters with influenza 	<ul style="list-style-type: none"> ▪ Fear of side effects ▪ Impression it is ineffective ▪ Providers not always recommending strongly
Libya	<ul style="list-style-type: none"> ▪ High awareness 	<ul style="list-style-type: none"> ▪ No barriers
Morocco	<ul style="list-style-type: none"> ▪ HCP are concerned for the risk groups ▪ Awareness campaign at the start of the season ▪ Vaccine reimbursement for some populations (insurance) 	<ul style="list-style-type: none"> ▪ Fear of side effects ▪ Doubts on vaccine effectiveness ▪ Health care workers not convinced ▪ No public awareness campaign at the national level ▪ Disease severity is under-recognized ▪ Negative effect of media during 2009 pandemic
Oman	<ul style="list-style-type: none"> ▪ National Disease Morbidity and Mortality 	<ul style="list-style-type: none"> ▪ No barriers
Tunisia	<ul style="list-style-type: none"> ▪ Awareness of the need for protection of high-risk groups 	<ul style="list-style-type: none"> ▪ No barriers
Turkey	<ul style="list-style-type: none"> ▪ Fear of complications and death ▪ Doctor's recommendation 	<ul style="list-style-type: none"> ▪ Negative media coverage about the vaccine ▪ Fear of side effects ▪ Distrust in vaccine effectiveness
UAE	<ul style="list-style-type: none"> ▪ Knowledge of disease and its severity 	<ul style="list-style-type: none"> ▪ Lack of effectiveness ▪ The negative effect of media

WHO: world health organization; NIC: national influenza center Laboratory; KSA: Kingdom of Saudi Arabia; UAE: United Arab Emirates; MOH: Ministry of Health; HCP: Healthcare practitioner; HCW: Healthcare worker; NA: not applicable.

by doctors, previous encounters with influenza, belief in protection by vaccines, and local/global recommendations. In KSA, interest from MOH, and in Oman availability of disease burden data played as major drivers for HCWs to vaccinate [Table 4].

DISCUSSION

Surveillance is an important tool to monitor influenza virus circulation patterns and document disease burden, which is necessary for setting public health priorities and developing effective control programs including vaccination. In addition, increasing the number of countries participating in GISRS will increase the diversity and volume of viruses shared with WHO collaborating centers. Evaluation and inclusion of viruses from diverse areas may allow better prediction of the vaccine reference viruses increasing the likelihood of match between circulating viruses and the vaccine.²⁰ According to our survey, the majority (90%) of countries had a national surveillance system. The UAE was the only country without established surveillance. Respiratory virus surveillance was established in KSA in 2017. One of the most important religious mass gatherings, Hajj, takes place in Mecca. Therefore, establishing a sustained respiratory virus surveillance will provide information on influenza and other emerging respiratory viruses, which will guide the development of effective control measures in KSA. Although surveillance existed in the majority of countries, many countries did not use the data collected to determine the burden of disease. According to the survey, disease burden data at varying levels was available only from Algeria, Iran, Oman, and Turkey. Algeria and Iran indicated that disease burden data were available only in the MOH annual report whereas for Oman and Turkey data was published in peer-reviewed journals.¹²⁻¹⁵ However, as this manuscript was being written, influenza disease burden data concerning only the incidence of influenza confirmed severe acute respiratory illness cases for Iran, Egypt, and Tunisia was published in the July 2016 issue of *Eastern Mediterranean Health Journal (EMHJ)*.¹⁶⁻¹⁸ In the same issue of the *EMHJ*, influenza outbreak characterization from other regional countries such as Jordan, Lebanon, Morocco, and Yemen were also published.²¹⁻²⁴ This is a step forward in the Eastern Mediterranean region; however, to establish effective

prevention policies, more data including the health and economic burden of influenza over several seasons in the regional countries is needed.

Most countries in the developed world have a national immunization policy against influenza.⁶ In our survey, Lebanon was the only country without a national policy in the region. Countries with a national policy recommended the vaccine to risk groups aligned defined by WHO and many supported their recommendation financially by various forms of reimbursement, or free supply of the vaccine.⁷ Vaccination of pregnant women has been shown to be safe and effective in preventing disease, and even cost-effective.⁷ According to WHO recommendations, pregnant women should be given the highest priority in countries starting or expanding seasonal influenza vaccination programs. Recommendation for pregnant women already exists in 70% of MENA countries included in the survey. However, influenza vaccine recommendations for healthy children only exist in KSA. Vaccine recommendation to healthy children is not optimal in most European countries either.²⁵ Children are important in the transmission of influenza and herd immunity benefits of pediatric vaccination programs have been documented.²⁶ Therefore, the inclusion of children in vaccination policies might help reduce the burden of influenza.

Pilgrimage to Mecca is a major mass gathering event where people from all over the world come together for a few days, thus increasing the risk of contracting influenza and taking it back to the pilgrim's country of origin.²⁷ Although not included in the vaccine-recommended risk groups by WHO, vaccination of local pilgrims is mandatory in KSA [Table 1]. This is also an indication that influenza is considered as a health threat in the region.

Those countries with recommendations also had a reimbursement policy at varying levels. However, despite the recommendations and reimbursement schemes, vaccination coverage remains low (3%) in the surveyed countries.¹³ The WHO launched Global Action Plan for Influenza Vaccines (GAP) in 2006, a-10 year initiative to address the anticipated shortfall in vaccine supply in the event of a pandemic, with three main objectives: 1) increase in seasonal vaccine use, 2) increase in vaccine production capacity, and 3) research and development.¹⁹ Within this context, global vaccine production has increased since 2006. However, vaccine utilization has not

increased accordingly. According to survey results, the vaccine was recommended for the risk groups in all countries, and a vaccination target rate was set in 60.0% of these countries. However, vaccination coverage rate monitoring was conducted only in 30.0% of the countries. Setting a target rate, monitoring the vaccination coverage rates, and measuring vaccine effectiveness are key for evaluating a vaccination program. This is important especially in resource-limited settings which will allow the countries to modify their vaccination programs accordingly.

There is a need for determining the vaccine prescribers and vaccinators to estimate targets for awareness training as needed. Physicians, nurses, and pharmacists were the most frequently cited vaccinators in the region.

The drivers and barriers of the vaccination in this region were similar to those published in other countries around the world.¹² Major drivers were the awareness of disease severity and recommendation by the doctors. Major barriers were low vaccine effectiveness and fear of side effects [Table 4]. Interest from the MOH seemed to have a direct effect on HCWs to vaccinate in KSA.

Countries with surveillance systems indicated that virus sharing and reporting to WHO is not always optimal, a potential area of improvement. A recent publication also reported that a few countries in the WHO/EMRO region send adequate number of viruses regularly to WHO collaborating centers indicating the need for improved virus sharing in order to improve the effectiveness of vaccine virus selection.²⁰ Countries also indicated that dissemination and use of surveillance data needed improvement. A recently-launched platform, eastern mediterranean Flu for sharing epidemiological and virological data on influenza in the WHO Eastern Mediterranean Region may help in better dissemination of surveillance data in the region.²⁸

This survey provides information on areas that need to be improved to document disease burden, increase influenza awareness, and vaccination coverage rates. Survey results indicate that issuing policies in line with WHO recommendations and reimbursement alone is not sufficient to increase awareness and the vaccination coverage rates (VCRs). The policies need to be implemented with sustained determination to increase VCR. Monitoring VCR and documenting the burden reduced by vaccination is key to evaluating vaccine policies. Continuing

guidance and support from WHO on developing and implementing effective immunization policies based on scientific evidence might help reduce the burden of influenza in regional countries. In addition, MENA-ISN-like networks can facilitate influenza awareness and vaccine advocacy by communicating scientific data, WHO policies, and guidelines developed by scientific organizations with all stakeholders including policymakers, HCWs, and the general public.

The purpose of the survey was to take a snapshot that gives a general idea about the status of influenza prevention and control in selected countries in the MENA region. The questions in the survey were answered by officials in the surveillance laboratories and MOHs public health institutions. We could not include all countries in the MENA region in this study due to MOH refusal to provide data. Despite the limitations, the results provide an updated picture of influenza policies and status of influenza prevention and control in the countries surveyed.

CONCLUSION

Survey results indicate that developing influenza prevention plans alone is not sufficient to increase influenza vaccination coverage in vaccine-recommended groups. Increasing the vaccination rate against influenza requires development and successful implementation of vaccination programs by health authorities.

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