

Original Research

Evaluating the knowledge, attitudes, and uptake of the influenza vaccine in healthcare professionals: A cross-sectional study from the United Arab Emirates

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Abstract

Background: Influenza, a yearly epidemic, can present with a wide array of symptoms ranging from mild rhinorrhoea and cough to life-threatening superadded bacterial infections. It affects the lives of around 12.5% of the world's population every year and accounts for almost half a billion deaths. With growing populations, these numbers will follow a similar growth resulting in increased morbidity and mortality. Currently, the recommended method to prevent influenza is through the administration of a yearly vaccine that entails the suspected strains of the virus for the year and region. **Objective:** This study aims to explore the knowledge, attitudes, and practices of the health care professionals in the United Arab Emirates (UAE) regarding Influenza vaccination. **Methods:** A cross-sectional study, utilizing a self-administered questionnaire, was distributed amongst health care professionals in the four largest emirates in the UAE, via convenience sampling. 417 responses were completed and analysed using SPSS-24. **Results:** 54.1% (n=225) of participants continue going to work while being sick despite 67.6% (n=282) reporting they are aware of the recommendations published by the Centers for Disease Control and Prevention (CDC). Multiple linear regression showed that age and profession were the only significant predictor of influenza vaccine knowledge. 54.2% (n=226) of the participants reported receiving the vaccine; of those, only 38.9% (n=88) receive it annually. One of the most commonly reported barriers to taking the vaccine was the uncertainty of its effectiveness. Those using a reminder system were 2.044 times more likely to take the vaccine regularly. **Conclusion:** This study demonstrates that the attitudes and practices towards taking the influenza vaccine as recommended are suboptimal. Campaigns targeting health care professionals regarding the influenza vaccine and the CDC recommendations would perhaps positively skew the results in the future.

Keywords

Influenza; Immunization; Vaccination

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INTRODUCTION

Influenza is an annual epidemic, due to mainly influenza viruses A and B. The World Health Organisation (WHO) estimates that influenza infects 1 billion people and results in 300,000–500,000 deaths, annually.¹ Infection with these viruses can cause a spectrum of respiratory illnesses, ranging from a mild upper respiratory disease associated with pyrexia, rhinorrhoea, cough, headache, myalgia, and fatigue, to severe lower respiratory disease, which can be primary viral pneumonia or a superimposed bacterial infection.² The best current method of prevention is via vaccination and thereof herd immunity; however, continuous sporadic antigenic shifts and drift of viral surface glycoproteins necessitates a regular update to the vaccine, and hence annual vaccination.³ According to the Centres for Disease Control and Prevention (CDC), an influenza vaccine that is matched well with the circulating virus strains reduces the risk of illness, in the general population, between 40% and 60%.⁴

Several factors have been linked to a more severe progression of infection and negative sequelae, including extremes of age (<1 year and >65 years), pregnancy, and pre-existing medical conditions, especially cardiopulmonary diseases, diabetes, and immunosuppression.⁵ The CDC reports a lack of sufficient



data regarding the efficacy of the influenza vaccine in these groups compared to others.^{4,6} As healthcare professionals (HCPs) interact with the vulnerable groups described above, HCPs can lead to negative patient outcomes in case of virus transmission to these groups.

HCPs are exposed to the influenza virus in the community and healthcare facility; hence, they have also been implicated as a key factor in its transmission to patients and their colleagues.⁷ Influenza leads to a disruption in the healthcare system due to illness and absenteeism. While some HCPs stop working, a considerable proportion of HCPs continue to work despite the illness and being encouraged to stay home.⁸ In addition, a study conducted in an Italian hospital estimated that the annual economic burden is €1,763,683 secondary to absenteeism of HCPs due to influenza.⁹ The current guidelines from the CDC and WHO advise the vaccination of HCPs, to alleviate the burden on the healthcare system secondary to absenteeism and to reduce negative patient outcomes.¹⁰ These guidelines are implemented by the three main local health authorities in the United Arab Emirates (UAE); the Department of Health (DOH) of Abu Dhabi, Dubai Health Authority (DHA) in Dubai, and the Ministry of Health (MOH) in the Northern Emirates. Despite this, a study conducted in the Middle East a decade ago showed that almost half of the HCPs in the region are unaware of these recommendations, with only 24.7% being vaccinated in the UAE.¹¹ However, a more recent study conducted in Saudi Arabia revealed a good vaccine uptake rate following the adoption of a mandatory vaccination policy.¹²

Even though vaccination plays a crucial role in the prevention of influenza, they are not completely foolproof and may not always be effective. A mismatch between the developed vaccine for a particular year and the circulating strains would reduce its efficacy; consequently, the complications of the virus would then remain an existing concern.² This doubt about the efficacy of the vaccine, along with concerns regarding potential side effects are two of the main factors affecting the rate of vaccination against influenza among HCPs, in addition to claims of low susceptibility to the virus.^{13,14} This study aims to assess the knowledge about the vaccine, the awareness of the recommendations regarding it, and the vaccination rates among HCPs in the UAE. The study also intends to identify the barriers against vaccination, which could improve the vaccine coverage among HCPs during the influenza season in the UAE.

METHODOLOGY

Study design and target population

An observational, cross-sectional study was conducted to assess the knowledge, attitudes, and practices (KAP) regarding the influenza vaccine among HCPs in the UAE. Convenience sampling was utilised to recruit all eligible

English-speaking healthcare workers practising in the UAE, both in the public and private sectors who were present at the time of the questionnaire distribution. This included physicians, nurses, dentists, pharmacists, paramedics, physiotherapists, dieticians, lab technicians, and administrators. The study was conducted in the cities of Abu Dhabi, Dubai, Sharjah, and Ajman. These cities are the cultural and commercial hubs of the country and comprise most of the UAE population. Using a similar proportion of vaccine uptake among healthcare professionals in a previous study of 50.6%, (15) the sample size was calculated using Cochran's sample size formula. Assuming an absolute sampling error of 0.05 and a confidence level of 95%, a minimum sample size of 377 participants was required. To account for non-response, attrition and incomplete responses, the sample size was increased by 10%, making the minimum sample size required for this study to be 415 participants.

Questionnaire development and pilot study

An anonymous, self-administered, structured questionnaire was distributed among HCPs who met the inclusion criteria. The inclusion criteria consisted of healthcare professionals working in private or governmental hospitals, who spoke English and worked in Abu Dhabi, Dubai, Sharjah, or Ajman. The questionnaire was adapted from a previous study conducted in 2010 with approval from the authors.¹¹ The questionnaire was divided into three sections: demographic data (eight questions), knowledge about and attitude/practices towards the vaccine (seven questions), reasons for and barriers against receiving the vaccine (seven questions). Standardisation sessions were conducted before data collection for harmonization to ensure researchers agreement on a consistent and uniform data collection methodology, to ensure comparability over time. Before the commencement of the survey, the questionnaire was piloted on 10 randomly selected HCPs (4 nurses, 3 physicians, 2 pharmacists and 1 lab technician) from the University Hospital, Sharjah. This allowed for cognitive testing of the questionnaire, to improve the quality of the questions, by helping identify questions, words or phrases that are vague or difficult to understand. Based on the feedback, the questionnaire was modified and edited by the authors to reduce ambiguity. Data obtained from the pilot was not included in the data analysis. Following that, HCPs were recruited to be part of the survey.

Data collection and analysis

The study was conducted between November 2019 and March 2020. During data collection, participants were given a brief introduction and explanation of the aims and objectives of the study and briefed about how to complete and return the questionnaires through a participant information sheet. Participants were also assured that all responses would remain anonymous and that they had the right to withdraw at any point during or after they had completed the questionnaire.



Questionnaires were numbered to monitor response rate and data collection stations were set up at different sites. Written informed consent was obtained prior to participation in the study. Additionally, the researchers were available, at the collection points at each of the sites, to clarify any doubts the participants might have. The study was approved by the ethics committee at the University of Sharjah, reference number REC-18-10-03-03-S.

The collected data were entered and analysed using Statistical Package for Social Sciences (SPSS) software, version 24, IBM Corporate Headquarters, Armonk, New York, USA.¹⁶ Descriptive statistics, including means, medians, frequencies, and percentages were used to summarize data and to illustrate participants' demographics and characteristics. The data was normally distributed; assessed and visualized using the Kolmogorov-Smirnov test ($p < 0.0005$). Pearson Chi-square, t-test and ANOVA models were used to examine associations between demographic characteristics and knowledge and attitudes towards vaccines and reasons for and against receiving the vaccine. A multiple linear regression (MLR) was adopted to analyse the variables that were statistically significant using ANOVA and Student's t-test. MLR was utilised to calculate regression coefficients to compare the effect of each causal variable on the outcome variable, knowledge of influenza vaccine. MLR model with entry method was applied to determine which of the demographic variables had the most effect on the knowledge score. Categorical variables were transformed into dummy variables. A p-value of < 0.05 was considered to be statistically significant. The methodological quality of this study was assessed using Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) scale.

RESULTS

The questionnaire was distributed amongst 450 HCPs in four Emirates (Abu Dhabi, Dubai, Sharjah, and Ajman) in the United Arab Emirates, out of which 417 agreed to participate (92.6% response rate). Data on the study population's demographics are presented in Table 1. Females made up 61.2% ($n=255$) of the study's population. Approximately 43.9% ($n=183$) of the participants were Arab Expatriates.

Variable	Frequency (n)	Percentage (%)
Gender		
Female	255	61.2
Male	162	38.8
Age		
<25 years	84	20.1
25-35 years	151	36.2
36-45 years	87	20.9
>45 years	95	22.8
Nationality		
UAE national	64	15.3
Arab Expat	183	43.9
Non-Arab	170	40.8
Profession		
Physicians and nurses	244	58.7
Other HCPs	172	41.3
Health Authority		
DOH	181	43.5
DHA	96	23.1
MOH	139	33.4
Smoking Status		
Never	267	64.2
Current	84	20.2
Past smoker	65	15.6

Almost a third of participants (30.7%, $n=128$) claimed they had never been infected with influenza; on the other hand, around 20.6% ($n=86$) stated they regularly had influenza-like symptoms. Even though 67.6% ($n=282$) of participants reported being aware of the CDC recommendations, over half (54.1%, $n=225$) of the respondents admitted continuing to go to work despite being ill with the flu. Unsurprisingly, physicians (73.8%, $n=96$) and nurses (72.1%, $n=75$) were more aware of the CDC recommendations compared to the other HCPs. The main motivator for participants to consider taking the vaccine was to 'protect self and reduce illness' (60.4%, $n=252$), 'reduce absenteeism' (20.9%, $n=87$) and 'protect

	Unstandardized Coefficient	Standardized Coefficient	t	p-value	R	R ²
	B	Standard Error	β			
Influenza vaccine knowledge					0.267	0.071
Age	-0.174	0.055	-0.153	-3.189	0.002	
Nationality	0.093	0.083	0.055	1.111	0.267	
Profession	-0.439	0.119	-0.180	-3.681	0.000	
Awareness of CDC recommendation	-0.196	0.125	-0.076	-1.573	0.116	



patients' (18.7% n=78). On the other hand, the main barriers against taking the vaccine were being 'unsure about effectiveness' (42.0%, n=175), 'potential side effects' (39.3%, n=164), and 'cost' (18.7%, n=78).

Nearly half (46.0%, n=192) of the participants identified 'prevent flu' as the outcome of taking the vaccine. Others hoped that it would 'reduce symptoms of flu' (35.3%, n=147); only 18.7% (n=78) expected 'herd immunity' as an outcome. When asked about who should be taking the vaccine, most respondents chose healthy people (62.4%, n=260), followed by elderly (58.3%, n=243), paediatrics (57.1%, n=238), and chronically ill patients (51.6%, n=215). MLR showed that age and profession were the only significant predictor of influenza vaccine knowledge as shown in table 2.

Around half (54.2%, n=226) of the participants reported that they have received the vaccine; of those, 38.9%

(n=88) receive the vaccine regularly, 37.2% (n=84) take it sporadically, 23.9% (n=54) have only ever received the vaccine once. Most respondents who opt for the vaccine, take it between the months of October through January (77.9%, n=131) with merely 5.4% (n=9) taking it in May through July and the rest opt to take it over the other months of the year. Around a third of the participants (39.4%, n=89) stated that they utilized a reminder system to ensure that the vaccine is taken regularly. Those with a reminder system were twice as likely to take the vaccine regularly (p=0.010) compared to those who do not utilize a reminder system (OR=2.044; 95%CI 1.180:3.541).

Among those who reported having taken the vaccine, the primary reason behind taking the vaccine was 'protection for patients' (58.0%, n=131), followed closely by 'following recommendations' (48.7%, n=110), and 'being flu free' (48.2%, n=109), as shown in Figure 1. Additionally, 60.2%

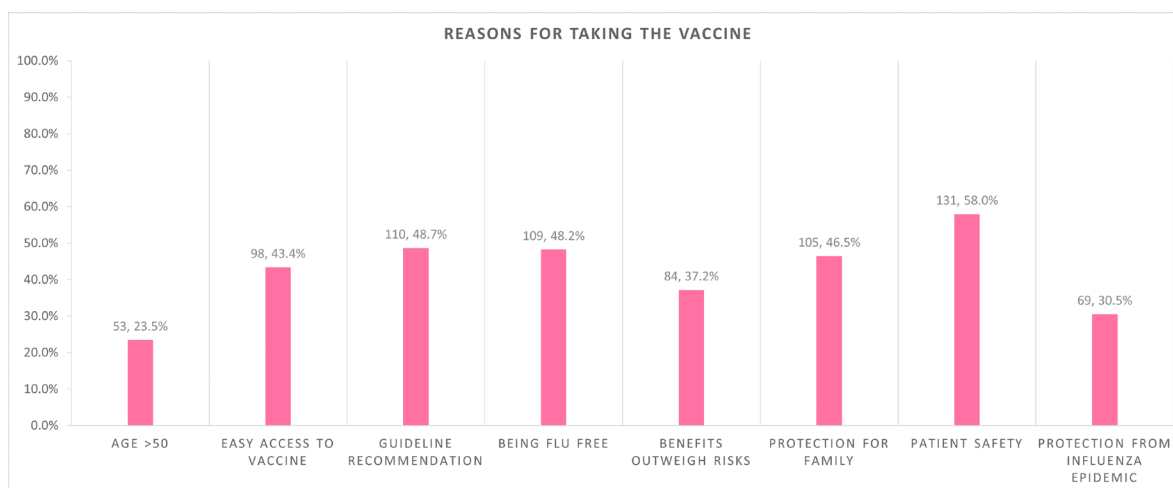


Figure 1. Reasons for taking the vaccine among HCPs

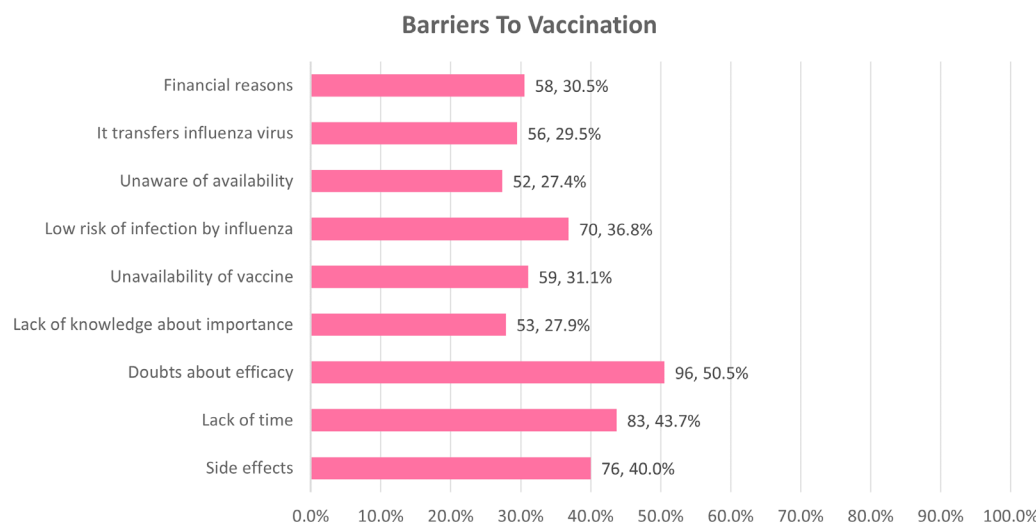


Figure 2. Barriers to taking the vaccine among HCPs



Table 3. Bivariate analysis of the association between the vaccination status of HCPs and the respondents' demographical distribution

Variable	Vaccinated		Not regularly vaccinated		p-value*
	n	%	n	%	
Age					
<25 years	10	26.3	28	73.7	0.017
25-35 years	28	31.1	62	68.9	
36-45 years	30	57.7	22	42.3	
>45 years	20	43.5	26	56.5	
Gender					
Male	34	38.2	55	61.8	0.526
Female	54	39.4	83	60.6	
Profession					
Physicians and Nurses	61	42.1	84	57.9	0.239
Other HCPs	27	33.3	54	66.7	
History of influenza infection					
Never	30	42.9	40	57.1	0.121
Rarely	36	47.8	74	52.2	
Regularly	22	32.7	24	67.3	
Work while sick					
Yes	47	40.9	68	59.1	0.283
No	41	36.5	72	63.5	
CDC recommendations					
Aware	67	38.5	107	61.5	0.729
Not aware	21	40.4	31	59.6	

*Pearson Chi-square test was used to explore the differences between the groups

(n=136) of the vaccinated group believe that the vaccine is effective for a full year.

As for the participants that do not take the vaccine, nearly half (50.5%, n=96) reported that 'doubts about efficacy' was their main barrier against vaccination. Lack of time (43.7%, n=83) and unavailability (31.1%, n=59) were also important deterrents, as shown in Figure 2. Of those that do not receive the vaccine, 49.5% (n=94) say they have future intentions to do so.

Interestingly, neither profession, history of influenza infection, nor being aware of the CDC recommendations increased the likelihood of taking the flu vaccine ($p > 0.05$). However, there was a significant difference in the vaccination rate between the different age groups ($p = 0.017$), with the highest rate (57.7%, n=30) being in the 36-45 age group, and the lowest (26.3%, n=10) in those <25 years old as shown in Table 3.

Furthermore, a significant association was found between age and the likelihood of going to work while sick with influenza; those aged 36 and above were 1.58 times more likely (95%CI 1.07:2.34) to continue

going to work while sick ($p = 0.022$). Arabs (both UAE nationals and expatriates) were twice more likely to continue working while sick with influenza, compared to non-Arabs (OR=2.019, 95%CI 1.36:3.00). There was a significant relationship between the frequency of having influenza-like symptoms and continuing to work while sick ($p < 0.0005$). On the other hand, neither profession nor Health Authority significantly affected whether the HCPs continued to work while sick.

As for the awareness levels of the participants regarding the CDC guidelines; nationality ($p = 0.016$), profession ($p = 0.001$), health authority ($p = 0.007$) and age ($p = 0.025$) all showed significant relationships as displayed in Table 4. Differences in awareness levels were found to be between two age groups only (>45 years and 25-35 years) ($p = 0.041$). The highest portion of HCPs who reported being aware of CDC recommendations worked at DOH (75.7%, n=137). Non-Arabs were 1.75 times more likely (95%CI 1.14:2.70) to be aware of the CDC recommendations. Physicians and nurses were twice as

Table 4. Awareness of the CDC recommendations across different demographical categories

Variable	Frequency (n)	Percentage (%)	p-value*
Occupation			
Administrator	21	60.0	0.001
Dentist	9	90.0	
Dietician	16	64.0	
Laboratory technician	11	50.0	
Nurse	75	72.1	
Pharmacist	8	42.1	
Physician	96	73.8	
Physiotherapist	20	57.1	
Radiology technician	15	71.4	
Others	11	68.8	
Nationality			
Arab expat	119	65.0	0.016
Non-Arab expatriate	127	74.7	
UAE national	36	56.3	
Health authority			
DOH	137	75.7	0.007
DHA	57	59.4	
MOH	88	62.9	
Age group			
<25	51	61.4	0.025
25-35	114	76.0	
36-45	59	67.8	
>45	57	60.0	

*Pearson Chi-square test was used to explore the differences between the groups



likely (OR=1.96, 95%CI 1.30:2.97) to be aware of the CDC recommendations compared to other HCPs ($p=0.001$). They were also almost 2.5 times more likely (OR=2.57, 95%CI 1.69:3.92) to take the vaccine ($p<0.0005$), yet there was no apparent significant relationship regarding the regularity of taking the vaccine ($p=0.807$).

DISCUSSION

Our study investigated the knowledge about, attitudes towards the influenza vaccine and the practices followed by HCPs across the UAE. Firstly, we assessed the frequency of contracting influenza among HCPs, which could affect the practices regarding the vaccine. A third of the participants reported being frequently infected with influenza, compared to almost half who had received the vaccine.

While more than two-thirds of the participants reported being aware of CDC recommendations, approximately half admitted to continuing to work despite being sick with influenza. This highlights a lack of implementation of said recommendations, which advise absenteeism in case of febrile illness with respiratory symptoms and the notification of infection control, as well as the adherence to proper respiratory hygiene while present at the healthcare facility.⁴ Although this is a promising increase compared to a previous Middle Eastern study where less than half of HCPs were aware of CDC recommendations, further emphasis needs to be placed on reinforcing the CDC recommendations regarding influenza infection.¹¹ The lack of application of CDC guidelines was also demonstrated by just over half of the participants reporting willingness to give the vaccine to the paediatrics age group, the elderly and the chronically ill.

Arabs were twice as likely to go to work while being sick with influenza compared to non-Arabs, possibly because Arabs in our study were less aware of the CDC recommendations compared to other nationalities. Another factor that might have contributed to this is cultural reasons regarding absenteeism. Anecdotal evidence and reports from the WHO suggest that diseases such as influenza are not considered serious and there is a cultural belief that being absent from work is seen as being irresponsible. Therefore, this could be a potential reason for absenteeism in the workplace.¹⁷

Approximately half of the participants reported taking the vaccine, compared to less than a quarter in a Middle Eastern study conducted a decade ago.¹¹ This can be credited to the National Seasonal Flu Awareness Campaign launched in 2016 by the local health authorities, targeting both healthcare workers as well as the general population.¹⁸ Despite an apparent doubling in vaccination rates, this still falls low of the desired range. Whether this is attributed to lack of knowledge or the lack of implementation of national guidelines, this calls for

reinforcing the current vaccination system for influenza. Additionally, our findings showed that using a reminder system could lead to more widespread vaccination. Applying such a system on a national scale could lead to better vaccination adherence amongst HCPs. Intriguingly, around a quarter of those receiving the vaccine had only taken it once; this could be due to perceived inefficacy deterring some from taking the vaccine again.

About five percent of participants reported “protecting patients” as a motivator for taking the vaccine, suggestive of the lack of knowledge about the link between taking the influenza vaccine and the protection of patients. This advantage of the vaccine has previously been addressed in literature; a study had shown a decrease in hospital-acquired influenza infections seen in immunocompromised oncology patients, which corresponded with an increase in the rates of influenza vaccination among HCPs.¹⁹

More than forty percent of the participants reported a perceived ineffectiveness of the vaccine and fear of its potential adverse effects as barriers against taking it. Interestingly, this does not differ from the findings in the 2010 study.¹¹ The main barriers for vaccination in a study conducted in Slovenia included, doubt in the effectiveness of the vaccine, fear of side effects and the belief that health professionals are not at high risk of influenza infection.²⁰ Similarly, a Turkish study explored the factors effecting influenza vaccination uptake among health care workers and the main identified barriers were found to be doubts regarding efficacy of vaccine as well as concern over potential side effects, allergic reactions and developing autoimmune diseases.²¹ Awareness campaigns would be an effective way to emphasize the importance of taking the vaccine among HCPs and tackle the common misconceptions regarding it, such as cost and possible side effects. Boosting the level of knowledge of HCPs regarding the vaccine would not only lead to better adherence among HCPs, but to a better vaccination rate of the public as well. Likewise, HCPs hesitating to take the vaccine themselves would mean a lesser chance of recommending it to patients, which include groups at high risk for serious influenza sequelae.²¹ Other aspects affecting the readiness of the participants to take the vaccine was lack of time and reported unavailability of the vaccine. These factors can be addressed through implementing campaigns aimed at both educating HCPs, as well as facilitating access to the vaccines and guiding them to available vaccination locations, either at the healthcare centres where they practice or on a national scale.

Age seems to play a remarkable role in vaccination rates among our participants; the highest rate was in the 36–45 year group, while the lowest was amongst the <35 year age group, which corresponds with findings of a previous study conducted in Saudi Arabia that shows higher compliance with influenza vaccination among older HCPs.²² Multiple factors could have led to this difference



including financial reasons, increased knowledge about guidelines among senior HCPs, or a perceived higher susceptibility of senior HCPs to the virus. Interestingly, the younger HCPs were more likely to stop working, while infected compared to the senior HCPs.

As physicians and nurses were more aware of CDC recommendations, they were more likely to take the vaccine more frequently compared to other HCPs. Another plausible reason is that they are more likely to be in direct contact with patients, thus they would get vaccinated to reduce their contraction of the disease and to reduce the possibility of transmitting it to their patients. MLR showed that profession is the most important predictor for knowledge on influenza vaccination. Increased knowledge regarding the vaccine leads to an increased likelihood of taking the vaccine. Health authority and nationality also significantly impacted awareness towards those recommendations, which was highest among non-Arab participants and those working under DOH. This is possibly due to the professional seminars and health-promoting campaigns that are held under the patronage of different health authorities, or a difference in the guidelines for each health authority.

Policymakers also have a major role to play by implementing guidelines and organizing campaigns to upraise awareness about the importance of the influenza vaccine among both HCPs and the public as increased awareness leads to higher vaccination rates. There has been a tremendous increase in demand for the influenza vaccine in Australia in 2020; the number of doses administered significantly increased compared to prior years. In 2020 alone, a record-breaking 18 million doses were administered compared to 11 million doses in 2018.²³ Similarly, a study conducted in the United Kingdom showed that influenza vaccination has increased dramatically over the past year; 56.7% of the individuals who were previously eligible to take the vaccine but had refused it in earlier years stated a clear intent to receive the vaccine in 2021. Almost 70% of those who became newly eligible to receive the vaccine described similar intent.²⁴ This increase in demand for the influenza vaccine across multiple geographical locations could be attributed to the COVID-19 pandemic which has led to an exponential increase in the awareness of the importance of vaccination and the significant role it plays to eliminate and reduce the impact of the disease. Both studies also highlight the importance of educating the public about the importance of vaccination as well as addressing any misconceptions hence allowing policymakers to put in effect better distribution strategies.

LIMITATIONS

Convenience sampling was used to acquire participants for this study in their workplace; this may lead to bias especially hence affecting the generalisability of the results. Additionally, we did not stratify for the health

authorities in the different Emirates; approximately half of the participants were under DOH in Abu Dhabi, which might further affect generalisability. Additionally, not all seven Emirates were represented equally, however, we collected data from the four largest cities which encompass most of the UAE's population and are the commercial and cultural hubs of the country. It would be interesting to explore the differences between all the Emirates in future studies, especially the rural areas of the Northern Emirates. We did not explore the socio-economic status, health insurance status or healthcare facility of participants, which may affect their perception of the importance of taking the influenza vaccine.

CONCLUSION

Despite a high percentage of self-reported awareness of the CDC recommendations regarding the influenza vaccine, the observed attitude towards the vaccine was suboptimal. Educational courses on the recommendations set by the CDC, the WHO, and national guidelines, with emphasis on community outcomes could help boost the vaccination rates among HCPs. Such awareness campaigns should especially target the highly perceived ineffectiveness of the vaccine and its potential side effects. Furthermore, the barriers preventing some HCPs from taking the vaccine should be acknowledged. A potential solution is the establishment of a reminder system integrated into all the health authorities' networks which would increase the overall vaccination rate. Finally, national policies should be established which entail the appropriate steps to adhere to after contracting the virus.

CONTRIBUTION

Study conception and design: E. A-G and H.J.B. Data collection: S. F. A, H. S., J. M. and A. N. Data analysis: B. S., S. F. A, H. S., J. M. and A. N. Analysis and prepared the figures and tables: S. F. A, H. S., J. M. and A. N. Administrative support: E. A-G and H.J.B. Manuscript drafting: S. F. A, H. S., J. M. and A. N. Revising of the manuscript: E. A-G and H.J.B. and B.S. All authors read and approved the final version of the manuscript.

CONSENT

I have read and agree with the privacy policy.

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COMPETING INTERESTS

The authors of this manuscript confirm that there are no



competing interests to declare as no commercial entities supported the work reported in the manuscript, are not associated with any such entities, have no financial

associations involving their children and spouse, or any other non-financial associations.

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