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# Assessment of knowledge and attitude toward influenza vaccinations within the adult population of Riyadh, Saudi Arabia

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## Abstract:

**BACKGROUND:** The most cost-effective measure for preventing the infectious disease, influenza, is vaccination. The purpose of this research was to evaluate knowledge levels, familiarity, and attitude toward influenza and influenza vaccination of the Riyadh adult population.

**MATERIALS AND METHODS:** A cross-sectional study was carried out in Riyadh and data was collected between December 2017 and March 2018. Five hundred participants were interviewed in person using a closed-ended questionnaire. Participants comprised the general population, students, and healthcare workers (HCWs), and were recruited from shopping malls, parks, Princess Nourah Bint Abdulrahman University, and King Abdullah Bin Abdulaziz University Hospital. A pilot study was conducted among 15 participants from the general population, students, and HCWs who gave verbal consent. Participants were asked if they comprehended the questionnaire and whether they felt comfortable participating. Descriptive statistics were used to describe the sample. Statistical significance was determined using t-test for quantitative variables and Chi-square test for qualitative variables.

**RESULTS:** Most participants in all groups had poor knowledge. The least informed was the general population (8.8%), followed by the students (11.8%), and the most aware were the HCWs (18.5%). The social media (35%) was the main source of participants' knowledge, followed by doctors and health educators in hospitals (33%). Only 15.6% of participants had been vaccinated this year. Even fewer (8.8%) stated that they took the vaccination every year. The most important reasons for getting vaccinated were the recommendations by the Ministry of Health or by their doctors (77.8% for each). The key barrier to vaccination was a lack of perceived benefit (the participants did not usually get influenza so they felt vaccination was unnecessary [66.2%]). About 34% of participants reported that they had the children in their families vaccinated. The main reason given was to protect their children from influenza complications (80.6%).

**CONCLUSION:** Within the Riyadh adult population, there was both low compliance to take the influenza vaccinations owing to a lack of perceived benefit and insufficient knowledge of the risks of influenza.

## Keywords:

General population, healthcare workers, influenza, vaccine

## Introduction

There are 3–5 million cases of seasonal influenza globally, every year, giving rise to severe illness and 250,000–500,000

deaths.<sup>[1]</sup> More than half of Saudi hospital admissions from the 2 million pilgrims attending Hajj each year are due to acute respiratory infections, the majority of which is caused by influenza.<sup>[2]</sup> Influenza viruses spread easily by droplets and aerosols, directly from person to person, or by the

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transfer of the virus from contaminated surfaces to the eyes, nose, or mouth.<sup>[1,3]</sup>

Influenza viruses belong to the family Orthomyxoviridae. They have a layer that protects the segmented negative-sense RNA genome when traveling between hosts. Types A, B, and C based on their core proteins are the three types of influenza viruses.<sup>[4,5]</sup> Types A and B, the most common, cause seasonal influenza epidemics. Type C is less severe and causes mild infection.<sup>[6]</sup>

Seasonal influenza causes symptoms of cough, sore throat, fever, headache, muscle and joint pain, severe malaise, and a runny nose.<sup>[6]</sup> Influenza usually causes epidemics with significant disease and mortality within high-risk populations. These groups include pregnant women, young children of <5 years, older adults (aged 65 or more), and individuals with chronic medical conditions, as well as healthcare workers (HCWs).<sup>[7]</sup>

Influenza vaccination reduces the population's risk to infection, prevents nosocomial infections, and reduces morbidity and mortality of patients.<sup>[8]</sup> For example, the likelihood of dying from pneumococcal diseases decreases by 50% in the vaccinated elderly. This risk is reduced even further (80%) for influenza-related complication deaths.<sup>[1]</sup> The intramuscularly administered vaccine comprising an inactivated vaccine is the most common type.<sup>[7]</sup> Complications of the influenza vaccines include influenza-like symptoms, the most common of which are fever and soreness at the site of the injection. Headache, nausea, muscle aches, and chills can also occur.<sup>[9]</sup> Vaccination is not recommended for those with documented anaphylaxis from a previous influenza vaccine.<sup>[10]</sup>

Vaccinations for individuals 6 months and older (including high-risk groups) are recommended by the World Health Organization and the United States' Centers for Disease Control and Prevention.<sup>[6]</sup> The United States Advisory Committee on Immunization Practices recommends vaccination for HCWs to reduce healthcare influenza-related morbidity.<sup>[11]</sup>

Despite the higher rates of vaccination in developed countries, there is the reluctance to take the influenza vaccine. Vaccination coverage in the United States during the 2016–2017 influenza season was 43.3% in adults and 59% in children (6 months to 17-years-old).<sup>[12]</sup> While high-risk groups and HCWs are generally more inclined to be vaccinated, in Saudi Arabia, a survey of six major hospitals showed that influenza vaccination rates in HCWs was 38%.<sup>[5]</sup> To understand this reluctance, it is necessary to identify the motivational factors, attitudes, and cultural differences.<sup>[13]</sup>

Poor uptake of influenza vaccination is often due to low knowledge levels and a negative attitude to influenza vaccines, including the fear of an adverse reaction.<sup>[14]</sup> Pregnant women are often hesitant because of the fear of harming the fetus or increasing their chances of miscarriage.<sup>[15]</sup>

The goal of this research was to assess comprehension, beliefs, and mindsets regarding influenza vaccination in the adult population in Riyadh city and identify the reasons for accepting or declining immunization.

## Materials and Methods

This cross-sectional questionnaire-based study was conducted at Princess Norah Bint Abdulrahman University, King Abdullah Bin Abdulaziz University Hospital, shopping malls and parks in Riyadh from December 15, 2017 to January 30, 2018. Participants included students, HCWs and the general population. All were residents of Riyadh city aged 18-year-old and above. Residents outside Riyadh city and those younger than 18-year-old were excluded from the study. Previous literature has shown that 46.5% of the general population has an acceptable level of influenza vaccine knowledge. Using a power of 80% (beta = 20%) and a level of confidence of 95% (alpha = 0.05) and a margin of error of 6%, the minimal sample size needed was 426. This was increased to 500 participants to adjust for missing or incomplete data. Participants in this study were selected by the convenient sampling technique. Ethical approval was obtained from the Institutional Review Board of Princess Nourah Bint Abdulrahman University vide Letter No. IRB-17-0217 dated 13/12/2017 and informed written consent was taken from all participants.

The information was collected from adult participants using a 4-part closed-ended, interviewer-based questionnaire, adapted from previous studies.<sup>[3,11,16,17]</sup> The questionnaire consisted of 32 questions, the 1<sup>st</sup> part of which had nine questions on the sociodemographic characteristics. The 2<sup>nd</sup> part with 12 questions assessed influenza knowledge; part three consisting of 3 questions assessed vaccine knowledge and the 4<sup>th</sup> comprised 8 questions on the attitude toward influenza vaccination. The content validity of the questionnaire was evaluated by a focus group composed of a microbiologist, an internal medicine physician, an epidemiologist, and an infection control specialist.

A pilot study was conducted on 15 participants from the general population, students, and HCWs who gave verbal consent. The questionnaire was distributed in person and collected after completion. Participants were asked if they comprehended the questionnaire and whether they felt comfortable participating.

Descriptive statistics were used to describe the sample. Statistical analyses were performed using *t*-tests and Chi-squared tests. A statistically significant result was noted when the *P* value was under 0.05. According to microbiologists and biostatisticians, 60% was considered a good knowledge score for the general population (including students). For HCWs, 70% was defined as a good knowledge score.

## Results

The 500 participants in the study consisted of 124 HCWs (24.8%), 195 students (39%), and 181 participants from the general population (36.2%). Ages ranged from 18 to 76 with a mean of  $28 \pm 9.67$  [Table 1]. Most responders were in the 18–29 age group (63.2%), most (436) were female (87.2%), were Saudi (85.2%), 40% were married, and 47.4% were university educated.

Participants' knowledge scores ranged from 5 to 35 with a mean of  $18 \pm 5.85$ . The highest mean knowledge score was observed in people aged 40 and older. The lowest mean knowledge score was in people aged between 18 and 29 and was statistically significant ( $P = 0.03$ ) [Table 2].

**Table 1: Sociodemographic characteristics of study participants (n=500)**

Variables	N (%)
Age (years)	
18-29	316 (63.2)
30-39	108 (21.6)
≥ 40	76 (15.2)
Nationality	
Saudi	426 (85.2)
Non-Saudi	74 (14.8)
Gender	
Female	436 (87.2)
Male	64 (12.8)
Educational level	
Elementary school	10 (2.0)
Middle school	20 (4.0)
High school	190 (38.0)
University school	237 (47.4)
Postgraduate	37 (7.4)
No educational qualification	6 (1.2)
Marital status	
Single	300 (60.0)
Married	200 (40.0)
Occupation	
Healthcare workers	124 (24.8)
Physician	34 (6.8)
Nurses	36 (7.2)
Other healthcare workers	54 (10.8)
Students	195 (39.0)
Health sciences	107 (21.4)
Non-health sciences	88 (17.6)
General population	181 (36.2)

For gender, almost the same mean knowledge score was observed with statistical insignificance ( $P = 0.165$ ). NonSaudis had a higher mean knowledge score ( $21.4 \pm 6.94$ ) than Saudis ( $17.4 \pm 5.44$ ), and was statically significant ( $P < 0.001$ ). The mean knowledge score for married ( $18.26 \pm 6.34$ ) was higher than for nonmarried but was not statistically significant ( $P = 0.460$ ). Postgraduate participants had the highest mean knowledge score ( $23.05 \pm 6.63$ ). Participants with middle school certificate had the lowest score ( $13.35 \pm 6.14$ ), which was statistically significant ( $P < 0.001$ ). The mean knowledge score of HCWs was  $21.07 \pm 6.44$ , which was higher than that of the students ( $17.56 \pm 5.16$ ) and the general population ( $16.43 \pm 5.35$ ) with statistical significance ( $P < 0.001$ ). Physicians had the highest mean knowledge score of all subgroups. Although the mean knowledge score for health science students was higher than that of non-health sciences students; it was statistically insignificant ( $P = 0.161$ ).

Sixty participants (12%) were considered high-risk for influenza: 31 (51.7%) participants had chest disease; 19 (31.7%) had diabetes mellitus; 6 (10%) had heart disease; 5 (8.3%) had neurological disease, and 2 (3.3%) had liver disease. The mean knowledge score for this group was  $17.38 \pm 5.40$ .

A knowledge score of 60% was considered good for the general population and students, whereas 70% was considered good knowledge for HCWs. Most participants in all groups had poor knowledge; only 62 (12.4%) had good knowledge. The lowest percentage of good knowledge was the general population (16 participants, 8.8%), followed by students (23, 11.8%) and HWCs (23, 18.5%). Of the HCWs, 47% of physicians (16 participants), 16.7% of nurses, (6) and 1.9% of other HCWs (1) had good knowledge. Of the students, 13% in health science (14) and 10.2% in non-health science (9) had good knowledge. The main sources of knowledge were the social media (35%) and doctors and health educators in hospitals (33%). Only 3% of participants had no information.

Table 2 shows the vaccination rates of the different groups. Surprisingly, the vaccination rate of HCWs was the lowest (12.9%), followed by students (15.9%), and the general population (17.1%), and statistically insignificant ( $P = 0.602$ ). All students had similar vaccination rates and were statistically insignificant ( $P = 0.88$ ). Of the 60 high-risk participants, 31.7% (19 participants) had been vaccinated this year.

Participants aged between 18 and 29 had the highest vaccination rate (16.1%), with statistical insignificance ( $P = 0.170$ ). Saudis had a higher vaccination rate (16.7%) than non-Saudis (9.5%),

**Table 2: Influenza vaccination knowledge score and vaccination rate for the adults in Riyadh**

Variables	Vaccination rate %	Knowledge score Mean±SD	P-value
Age (years)			0.03
18-29	16.1	17.67±5.31	
30-9	15.7	17.93±6.27	
≥40	13.2	19.64±7.06	
Nationality			0.01
Saudi	16.7	17.4±5.44	
Non-Saudi	9.5	21.4±6.42	
Gender			0.165
Female	14.8	19.07±6.42	
Male	22.2	19.07±6.42	
Educational level			0.01
Elementary school	20.0	17.9±6.77	
Middle school	25.0	13.35±6	
High school	16.8	17.21±5.1	
Bachelor's degree	14.3	18.29±5.7	
Postgraduate	13.5	23.05±6.63	
No educational qualification	0.0	18.00±4.7	
Marital status			0.460
Single	16.3	17.87±5.5	
Married	14.3	18.26±6.34	
Occupational			0.01
Healthcare workers	12.9	21.07±6.4	
Physician	14.7	24.55±7.57	
Nurses	8.3	22.8±5.09	
Other healthcare workers	14.8	17.72±4.7	
Students	15.9	17.5±5.16	
Health sciences	15.9	18.88±4.83	
Non-health sciences	15.9	15.96±5.13	
General population	17.1	16.43±5.35	

SD=Standard deviation

but was statistically insignificant ( $P = 0.115$ ). Two hundred and five participants (41%) intend to have an influenza vaccination in the future; however, 59% had no intention of doing so. A statistically insignificant ( $P = 0.165$ ) higher proportion of males were vaccinated (22.2%) than females (14.8%); 14.5% of married participants were vaccinated this year, with no statistical significance ( $P = 0.85$ ). Participants with a middle school certificate had the highest vaccination rate (25%), but postgraduate degree holders had the lowest vaccination rate (13.5%). These results were statistically insignificant ( $P = 0.668$ ).

Most studied participants (88.6%) knew that a virus causes influenza 44%; 33% thought it was bacteria, and 25% did not know the cause. Most of the population knew that the incubation period was 1–4 days, and 70.8% considered influenza a potentially severe disease [Table 3]. Most participants (84.6%) considered inhalation of infected droplets in the air as a mode of transmission; 44% considered touching their eyes, nose, or mouth with contaminated hands as the mode of transmission. Also, 23.4% believed that

influenza and the common cold were the same, and 50.8% thought antibiotics were suitable treatment for influenza. Most participants thought of fever, sore throat, fatigue, headache, and cough as symptoms of influenza (76.4%, 60.8%, 59.8%, 56%, 50.2% respectively) and 70% of participants thought of sinus and ear infections as complications. 61.6% were aware that high-risk influenza-related complications affected young children (under 5) but only 36.4% knew that elderly people (65 and older) were also vulnerable. Most participants had had a cough with a fever this year: 33% had had it once; 26.6% twice; 21.6% more than twice, but 18.8% had no cough. 77.2% believed that influenza could be prevented by social distancing, while 71.4% and 66.2% respectively considered vaccination and hand washing as preventive methods. 73.4% believed children should be vaccinated, while 38.2% considered HCW vaccinations necessary.

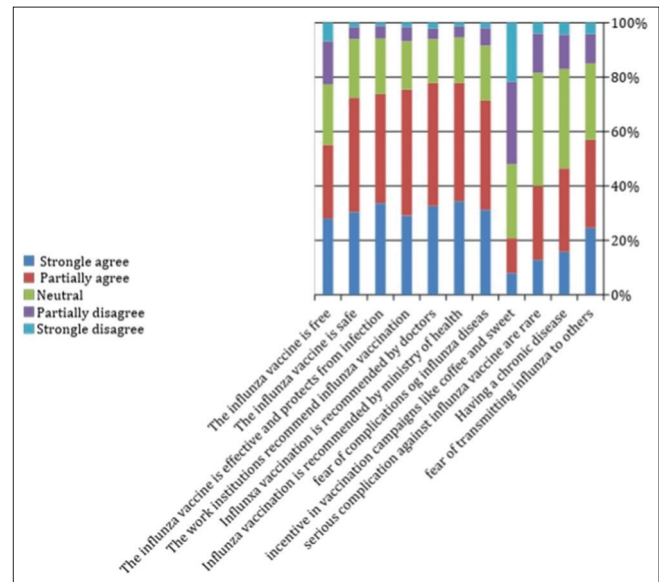
The study showed that most participants had not had the vaccine this year (60.8%). Moreover, 43.4% of the population had never been vaccinated [Table 4].

**Table 3: Knowledge about Influenza disease and influenza vaccination for the adults in Riyadh**

	Yes N (%)	No N (%)
The influenza disease can be transmitted		
By inhalation of infected droplets in the air	423 (84.0)	77 (15.4)
By touching eyes, nose, or mouth with contaminated hands	224 (44.8)	276 (15.2)
None of them	32 (6.4)	468 (93.6)
Symptoms of influenza disease		
Fever of $\geq 38^{\circ}\text{C}$	382 (76.4)	118 (23.6)
Cough	251 (50.2)	249 (40.8)
Rigors	140 (28.0)	360 (72.0)
Myalgia	189 (37.8)	311 (62.2)
Fatigue	299 (59.8)	201 (40.2)
Headache	283 (56.6)	217 (43.4)
Sore throat	304 (60.8)	196 (39.2)
Coryza	280 (56.0)	220 (44.0)
Difficulty in breathing	161 (32.2)	339 (67.8)
Confusion	36 (7.2)	464 (92.8)
I don't know	15 (3.0)	485 (97.0)
Do you consider influenza a potentially severe disease?	354 (70.8)	99 (19.8)
Complications of influenza disease		
Pneumonia	304 (60.8)	196 (39.2)
Sinus and ear infection	353 (70.6)	174 (29.4)
Inflammation of heart	47 (9.4)	453 (90.6)
Inflammation of brain	37 (7.4)	463 (90.6)
Inflammation of muscle	50 (10.0)	450 (90.0)
Sepsis	28 (5.6)	472 (94.4)
I don't know	74 (14.8)	426 (85.2)
The groups more vulnerable to influenza related complications		
Children younger than 5	308 (61.6)	192 (38.4)
Adults 65 years of age and older	182 (36.4)	318 (63.6)
Pregnant women	113 (22.6)	387 (77.4)
Residents of nursing homes and other long-term care facilities	67 (13.4)	433 (86.6)
People who have chronic disease	176 (35.2)	324 (64.8)
I don't know	81 (16.2)	419 (83.8)
Treatment of influenza disease		
Antiviral drugs	203 (40.6)	297 (59.4)
Antibiotics	254 (50.8)	388 (77.6)
Herbal medicine	112 (22.4)	246 (49.2)
It resolves by itself	130 (26.0)	370 (77.6)
The influenza disease can be prevented by		
Hands washing	331 (66.2)	169 (33.8)
Vaccination	357 (71.4)	143 (28.6)
Keeping away from patients with influenza	386 (77.2)	114 (22.8)
Drinking and eating foods that increase immunity	293 (58.6)	207 (41.4)
None of the above	22 (4.4)	478 (95.6)
The influenza vaccine should be given to whom		
Children	367 (73.4)	133 (26.6)
Pregnant	161 (32.2)	339 (67.8)
Healthy adults	224 (44.8)	276 (55.2)
Elderly people	258 (51.6)	242 (48.4)
People suffering from chronic disease	247 (49.4)	253 (50.6)

**Table 3: Contd...**

	Yes N (%)	No N (%)
Healthcare workers	291 (58.2)	209 (41.8)
None of the above	46 (9.2)	454 (90.8)
The influenza vaccine could be dangerous to the following groups		
Children	126 (25.2)	374 (74.8)
Pregnant	295 (59.0)	205 (41.0)
Adult	26 (5.2)	474 (94.8)
Elderly	94 (18.8)	406 (81.2)
People who suffer from chronic disease	160 (32.0)	340 (68.0)
Health professionals	36 (7.2)	464 (92.8)
None of the above	64 (12.8)	436 (87.2)



**Figure 1: Responses of study participants to questions related to influenza vaccine**

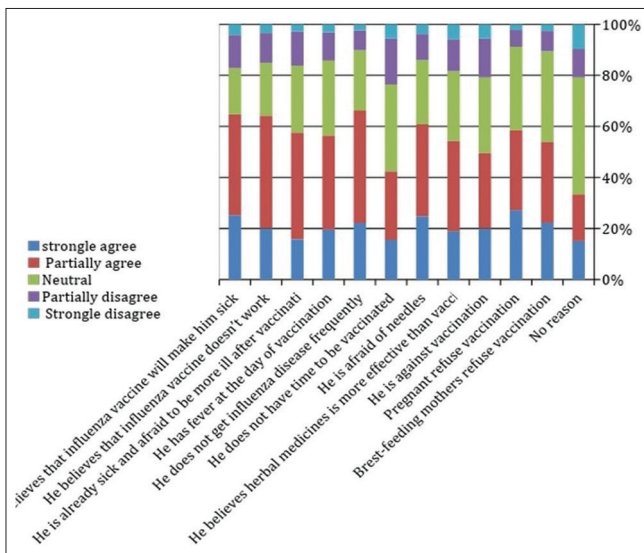
Figure 1 shows the reasons why people would take the influenza vaccination. The primary incentive was advice by their doctors and the recommendation by the Ministry of Health (MOH) (77.8% for each). The least common reason (20.8%) was vaccination campaign incentives such as coffee and sweets. Figure 2 shows the studied population's justifications for not getting vaccinated. The most common reason given was that influenza was uncommon (66.2%), followed by the belief that the vaccine would make them sick; 42.4% said they did not have the time to be vaccinated.

Child vaccination rates were better with 34.4% of participants indicating their children were vaccinated this year. A statistically significant ( $P = 0.024$ ) 38.4% of students, 35.4% of HCWs and 29.2% of the general population had vaccinated children in their families. The most important reason reported for child vaccinations was protection from influenza complications (80.6%), followed by doctors'

Contd...

**Table 4: Attitudes of study participants towards influenza vaccination**

Question	N(%)
Have you ever been vaccinated against influenza before?	
I am vaccinated this year	78 (15)
I am regularly vaccinated every year	44 (8.8)
I have been vaccinated before but not every year	161 (32.2)
I have never been vaccinated	217 (43.4)
Where did you receive influenza vaccine this year?	
Governmental/University hospital	98 (19.6)
Primary healthcare center	22 (4.4)
Private hospital	13 (2.6)
Private clinic	6 (1.2)
University/workplace	53 (10.6)
Malls	4 (0.8)
I did not receive the vaccine this year	304 (60.8)
In the future, will you be vaccinated against influenza again?	
Yes	205 (41.0)
No	121 (24.2)
I don't know	174 (34.8)
Have the children of your family been vaccinated against influenza?	
Yes	172 (34.4)
No	227 (45.4)
I don't know	101 (20.2)



**Figure 2: Barriers to influenza vaccination in the study participants**

recommendations. The least common reason was chronic conditions. Most families (59%) believed the vaccine would make their children sick, followed by 42.8% who gave the lack of time as the excuse for nonvaccination.

## Discussion

The present study was done to determine the level of knowledge and perception of both the general population

and HCWs as it pertains to influenza and associated vaccines. Most participants had poor knowledge of both. The HCWs had the highest knowledge score; they were followed by students, and then the general population. Physicians had the best knowledge score among HCWs. The mean knowledge score of HCWs was  $21.07 \pm 6.44$  (54% of the total score), which is comparable to the Haridi *et al's* study done at King Abdullah Medical City in Makkah, Saudi Arabia.<sup>[18]</sup> There, the mean knowledge score for the HCWs was  $16.03 \pm 5.86$  out of 33 points (48.6% of the total score). In the latter study, 42.2% of healthcare participants reported that they had insufficient knowledge of the vaccine.

A 2016 study conducted in Jordan<sup>[2]</sup> reported a higher mean knowledge score in the studied population ( $12.6 \pm 0.2$  out of 16; 78.8% of the total score). The mean knowledge score for HCWs ( $13.72 \pm 0.14$ ; 85.8% of total score) was significantly higher than non-HCWs ( $10.41 \pm 0.34$ ; 65% of total score) although both were higher than those reported in this study. In the current study, no correlation was found between the knowledge score and the rate of vaccination. Like these results, the Haridi *et al's* study reported that there was no statistical significance in the knowledge score and the vaccination status.<sup>[18]</sup> This contrasts with a study done in Lebanon which showed a correlation between higher knowledge of influenza and vaccination and higher vaccination rates.<sup>[1,13]</sup>

In this study, participants aged 40 years and older, non Saudis, and postgraduate participants had higher knowledge scores, which was statistically significant. However, the knowledge scores grouped by marital status and gender were statistically insignificant. This is consistent with the Haridi *et al's* study, which determined statistical significance in the knowledge scores according to age, marital status, education, income, and healthcare occupation.<sup>[18]</sup>

The participants' main source of knowledge in this study was the social media followed by doctors and health educators in hospitals. In accordance with these results, is the finding of a previous study conducted in 2017 in Saudi Arabia that explored the knowledge and attitudes of Saudi nationals on influenza vaccinations, which identified physicians and HCWs as the main source of information, and formal brochures and medical websites.<sup>[13]</sup> The lack of communication between the physicians and the community might be one of the main causes of poor knowledge in the majority of the population.

Participation of the studied population in vaccinations was poor. HCWs had the lowest rate of vaccination compared to students and the general population. The

fear of unproven vaccine side effects is thought to be a reason for the low vaccination rate in HCWs. Most were vaccinated at a governmental hospital followed by the university/workplace. There was no statistical significance in vaccination rates by age, gender, education, or occupation. This was comparable to a study of the adult population in Turkey, which reported low vaccination rates. The explanation this study posits for the low vaccination rates is that there are knowledge gaps and misconceptions about the vaccine.<sup>[19]</sup> In contrast, a previous survey of HCWs in primary healthcare centers in Abha reported a higher vaccination rate (28.2%).<sup>[20]</sup> A similar higher rate (27.6%) in the general population of Lebanon was also reported.<sup>[1]</sup> The high rate of vaccination in the latter study was due to a vaccination program carried out by physicians to improve knowledge about vaccinations.

The prime reason for consenting to influenza vaccination in the current study was MOH and doctors' recommendations. These same factors had positively affected vaccination rates in previous studies conducted on HCWs in King Abdullah Medical City in Makkah<sup>[18]</sup> and University Hospitals in the South-Eastern Region of Turkey in 2015.<sup>[16]</sup> In a study conducted in Abha, personal protection was the main reason for HCWs' desire to be vaccinated.<sup>[20]</sup> Of the physicians, 86.3% believed their contribution to getting their patients vaccinated was significant and that administering vaccines could be one of their functions (80.6%).<sup>[21]</sup>

The most important barrier to vaccination in our study was poor previous rates of vaccination, followed by the belief that vaccines would make them sick. The same factors were reported as barriers to vaccination in a previous study in Turkey.<sup>[16]</sup> The 2015 Turkish survey reported the misperception that regular influenza immunization was unnecessary.<sup>[19]</sup>

The current study showed a better rate of vaccination of children in the surveyed families. The primary motivation was to protect them from complications. The most important barrier was the belief that the vaccine would make their children sick. A lower rate of vaccination of children was reported in a Spanish National Health Survey study in 2006 in which only 6.8% of children had the influenza vaccination.<sup>[22]</sup> It is recommended that campaigns to increase awareness of influenza and the importance of vaccination should be held in health-care settings, shopping malls, and workplaces. An important limitation of our use of the convenient sampling technique is that the sample selected for this study is not representative of Riyadh city, thereby restricting representation and generalizability of our findings.

## Conclusion

The knowledge about influenza and vaccinations in the studied populations, including HCWs was poor. Influenza vaccination was low in the different groups of the studied population. Few and infrequent attacks of influenza and the side effects were the most common barriers to acceptance of the vaccine. It is recommended that health education, dispelling misinformation and dissemination of facts could play a significant role in increasing the rate of acceptance.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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