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Original article

The influence of demographics on influenza vaccine awareness and hesitancy among adults visiting educational hospital in Saudi Arabia

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ABSTRACT

Objective: To understand the influence of demographics and education levels on awareness levels, and on the prevalence of hesitancy to receive the influenza vaccine among adult patients at King Saud University Medical City (KSUMC).
Method: A crosssectional study in the outpatient pharmacy area at KSUMC was conducted. Data was collected from January 1 to January 31, 2020. A total of 318 random adult patients were encountered and a predesigned survey was administered. After capturing demographic information, respondents were categorized into 3 groups: group A consisted of respondents who had never heard of the influenza vaccine; group B was comprised of respondents who answered that they had never received the influenza vaccine; and group C included respondents who answered that they had received at least one influenza vaccine.
Results: Out of the 317 survey respondents, 36 (11%) had never heard of the influenza vaccine (Group A). Of the remaining 281 (89%), 122 (39%) had not received the vaccine (Group B), whereas 159 (50%) had received it (Group C). Chi-square test results indicated a significant association between age group and awareness of the vaccine ($p = .023$). Moreover, there was a significant association between education level and awareness of the vaccine ($p = .002$). The prevalence of vaccination hesitancy was 42%. Chi-square test results indicated a significant association between gender and vaccination hesitancy ($p < .001$), and between education level and vaccination hesitancy ($p = .011$).
Conclusion: Influenza vaccination hesitancy is prevalent among the study's population. Further efforts by health care providers and public health services may be necessary to educate the community regarding the influenza vaccine's safety and efficacy.

1. Introduction

Seasonal influenza is an acute viral infection caused by influenza viruses; infected individuals are highly contagious and can transmit influenza for 24 h before becoming symptomatic (Nuorti, 2010). There are several studies discussing prevalence of influenza in the middle east but there is no overall estimation of the viral infections in the region. In one systematic review and *meta*-analysis designed to "(2)", the study found that the prevalence in middle east was 10.5% with evident heterogeneity and relative frequency ranged from 0.5 in Qatar to 70% in Syria (Moghoofei et al., 2018).

In addition to the prevalence element of the infection, influenza's high infection rate makes it a major source of morbidity and mortality, especially among high-risk groups such as children,

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elderly people, pregnant women, and patients with certain chronic heart conditions (Thompson et al., 2010).

On other hand, Influenza vaccination can reduce the risk of associated hospitalizations for children, working age adults, and older adults. During 2016 and 2017, vaccination prevented an estimated 85,000 influenza-related hospitalizations (CDC. Summary of the, 2019). A 2014 study in the US. showed that vaccination reduced children's risk of influenza-related pediatric intensive care unit (PICU) admission by 74% during the 2010–2012 influenza seasons (Ferdinands et al., 2014). In recent years, according to a systematic review, vaccination has reduced the risk of influenza-associated hospitalizations among adults on average by about 40% (Rondy et al., 2017). A 2018 study in New Zealand showed that from 2012 to 2015, vaccination among adults reduced the risk of being admitted to an intensive care unit (ICU) with influenza by 82% (Thompson et al., 2018). However, despite the effectiveness of the influenza vaccine, vaccination rates remain low in Saudi Arabia. According to a cross-sectional study conducted in Makkah, only 18.5% of people received the vaccine, and the main reported barrier was concerns about vaccine safety (Korani, 2015). Another study conducted in Riyadh at King Abdulaziz Medical City found that 63.3% of respondents said they never get vaccinated, and reported barriers included concerns about vaccination side effects and the perception of influenza as a simple disease that does not require prevention (Sagor and AlAteeq, 2018).

The issue of not taking the vaccine despite its availability is commonly known as vaccination hesitancy. Vaccination hesitancy is defined as "the delay in acceptance or refusal of vaccination despite availability of vaccination services."(MacDonald, 2015). Several factors contributed to vaccine hesitancy in the literature (Larson et al., 2014). The level of income/socioeconomic status was a significant factor in vaccination acceptance, where high-income was presumed as a barrier to vaccine acceptance (Wei et al., 2009) and in other low-income was presumed as a barrier to vaccine acceptance (Wu et al., 2008). Further, higher education was perceived as a promoter for vaccine acceptance (Danis et al., 2010; Uwemedimo et al., 2012) and low education was perceived as a barrier in others (Babalola, 2011). Moreover, mass communication and media campaign were also a significant promoter when the community perceived it as positive communication (Babalola and Lawan, 2009), while receiving negative messages regarding vaccination perceived as a barrier (Chen et al., 2011). Finally, cost, in terms of financial, distance, and general accessibility-perceived or real- were all perceived as significant barriers (Mapatano et al., 2008;50(2):61-.).

Influenza is given high priority in Saudi Arabia, where various influenza outbreaks have occurred in recent years (Alabbad et al., 2018). According to a Saudi study at a tertiary care hospital in Riyadh in 2015–2016 on the prevalence of influenza vaccine hesitancy (defined as a "delay in acceptance or refusal of vaccines despite availability of vaccine services") (Alabbad et al., 2018), out of 300 participants, 51 completely refused vaccinations. The most common reasons for refusal were the disbelief in the positive effect of the vaccine (n = 11[21.5%]), lack of usefulness (n = 9 [17.6%]), and the belief of causing harm (n = 7[13.7%]) (Alabbad et al., 2018).

A study performed among college students at US universities showed very low influenza vaccination uptake, and it was noted that healthy students lacked the motivation to receive the vaccine. However, after a targeted awareness campaign about the benefits and risks of vaccination in healthy individuals and the need for college students to understand, access, and utilize health care services, the number of students who accepted the vaccine increased significantly, showing that awareness can improve vaccine uptake (Bednarczyk et al., 2015).

a. Objective

Influenza vaccination hesitancy is still persistent despite awareness programs and overall effort from relevant entities. Several literatures worldwide were identified which measured the prevalence of the hesitancy and related promoters and barriers; however, there is little known about the issue in Saudi Arabia and relevant factors leading to it. Thus, in this study, we aim to understand the influence of demographics on awareness levels and the prevalence of hesitancy to receive the influenza vaccine among adult patients at King Saud University Medical City (KSUMC). Moreover, we report patients' reasons for accepting or refusing the vaccine. The results of this study will inform a larger initiative that utilizes digital health-based interventions that raise awareness about influenza vaccination at the point of care in the outpatient clinic settings at tertiary hospitals.

2. Methods

a. Study design and sampling

A cross-sectional study with convenience sampling was conducted among the outpatient pharmacy area at KSUMC from January 1 to January 31, 2020. Ethics committee clearance was obtained from the KSUMC institutional review board (IRB number 20/0324). The sample size needed for this study is 360 participants (180 in each study arm). . The sample size calculator arrived at 370 participants, using a margin of error of ± 5%, a confidence level of 95%, a 50% response distribution, and 20,000 people. Two trained senior pharmacy students administered a predesigned electronic survey and total of 318 adult visitors were interviewed. The survey was adopted from Arabic study and was reviewed by specialized subject matter expert and further piloted among small group of students to ensure capturing local context (Barry et al., 2020).

b. Outcome definition

For the purpose of the study, vaccine awareness was defined as participants who heard about the vaccination despite that they have received it or never received it. While vaccination hesitancy was defined as participants who heard about the vaccination but did not report receiving any vaccination in their lives.

c. The questionnaire

To this end, and after capturing demographics information, we divided the respondents into three groups based on their responses. Group A consisted of respondents who had never heard of the influenza vaccine. Group B comprised respondents who answered that they had never received the influenza vaccine. Group C included respondents who answered that they had received at least one influenza vaccine. We designed the electronic survey to be adaptable to respondents' answers. For instance, if the respondent answered that they had never heard of the vaccine (Group A), the survey directed them to page submission, and no further questions were. If the respondent answered that they knew about the vaccine but had never received it (Group B), a list of questions about what prevented them from receiving the vaccine was added to the survey. However, if they answered that they received a vaccine previously (Group C), the survey introduced questions regarding how often they get vaccinated and what makes them more willing to receive a vaccine (Fig. 1). For this study's purposes,

vaccination hesitancy is defined as the percentage of people who had delay in acceptance or refusal of vaccination despite availability of vaccination services (MacDonald, 2015)

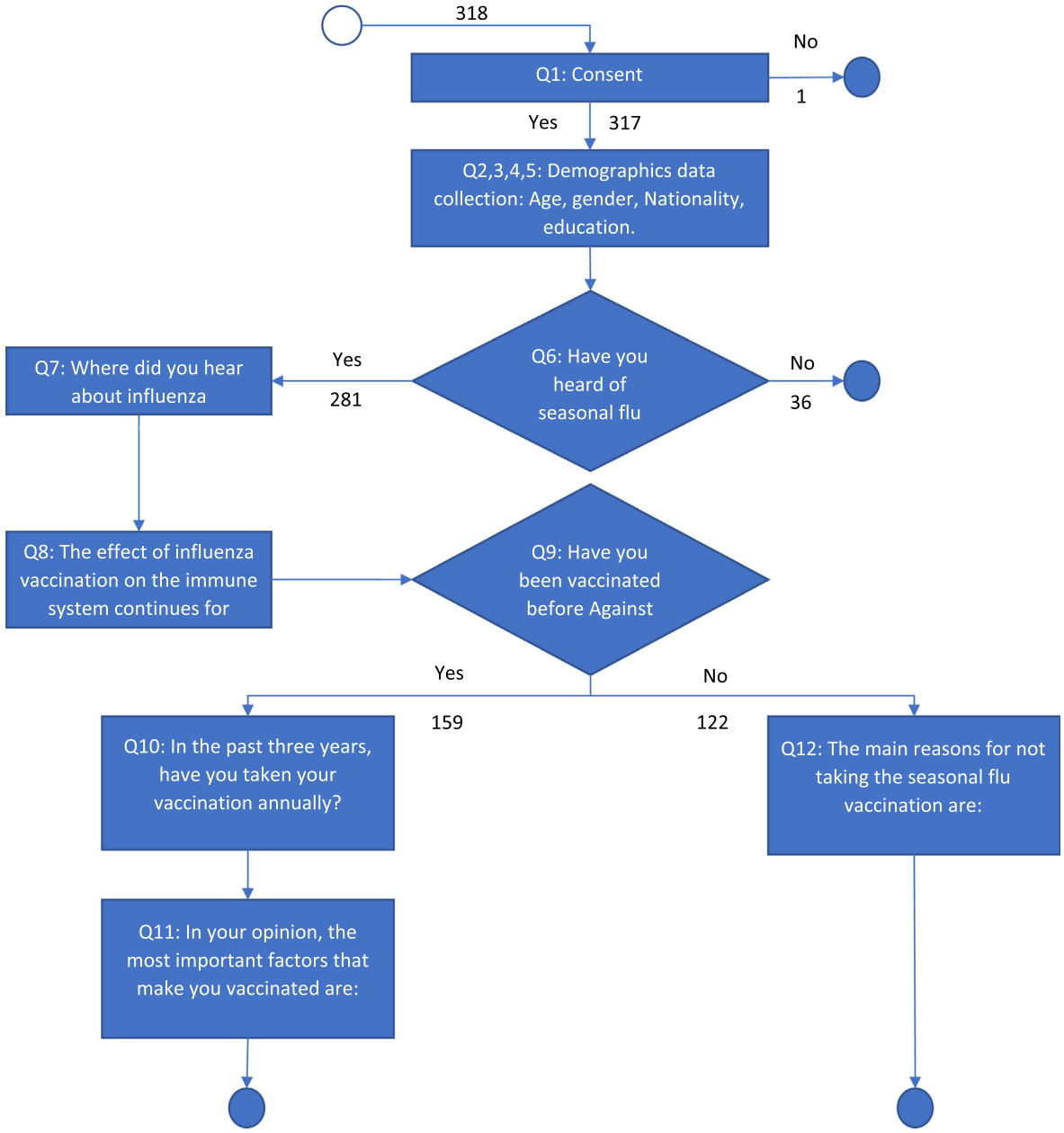

Fig. 1. Flow chart of the questionnaire used for this study.

the prevalence of vaccination hesitancy is defined as the percentage of people who heard about influenza vaccination but did not report receiving such a vaccine.

d. Data processing and transformation

Data pre-processing and transformation was the preliminary step used to prepare the data for analysis. We used MS Excel, MS Access, and RStudio to code responses, split multi-entry variables into different rows, and generate calculated fields. We also introduced new variables, such as class labels for each response, to assist with the analysis.

2.1. Data analysis

Descriptive statistics were used to report on study population demographics (Age, gender, education and nationality). Frequency tables answering how study population heard about the vaccine, and their knowledge regarding how long the influenza vaccine remains effective and the frequency of receiving vaccine among patients who heard about it and the main reason for receiving the vaccine among study population were all reported. Moreover, Chi-square will be used to measure the association between demographic variables and awareness of the vaccine report on patient awareness and vaccination hesitancy.

3. Results

a. Demographics

A total of 318 patients were approached for the study; of these, 1 refused to participate. Of the 317 enrolled in the study participants, 36 (11%) had never heard of the influenza vaccine (Group A). Of the remaining 281 (89%) participants who had heard of the

vaccine, 122 (39%) had not received the vaccine (Group B), whereas 159 (50%) had received it (Group C). The participants' average age was 36.9 years (SD = 13.8). About 45% were female, and about 56% held college degrees. Non-Saudis represented about 11% of the study population. Table 1 contains the demographics and variable statistics for each participant category.

b. Awareness of influenza vaccination

In this study, 36 (11%) of 317 participants had never heard of the influenza vaccine. We conducted a chi-square test (χ^2) to measure the association between demographic variables and awareness of the vaccine. The test results indicate a significant association between age group and awareness of the vaccine (2, N = 317) = 7.2, p = .023. Moreover, there was a significant association between education level and awareness of the vaccine (4, N = 317) = 21.3, p = .002. The analysis indicates that, among age groups, the older age group (>65) had the highest rate of participants who had not heard of the vaccine (about 30%). However, a sensitivity analysis showed no significant difference between the baseline age group (Uwemedimo et al., 2012; Babalola, 2011; Babalola and Lawan, 2009; Chen et al., 2011; Mapatano et al., 2008;50 (2):61-.; Alabbad et al., 2018; Bednarczyk et al., 2015; Barry et al., 2020; Aljamili, 2020; Alqahtani et al., 2017) and > 65 age group. There was also no significant association between the other demographic frequencies, gender and nationality, and awareness of the vaccine (Table 2).

Among the 281 participants who had heard about the vaccine, 75 (27%) stated they first heard about it from friends and family; 68 (24%) heard about it from medical staff, 58 (21%) heard about it from public health campaigns, 52 (19%) learned about it from social media, and 28 (10%) learned about it from television or newspaper media (Table 3). In the same groups (B and C), 219 (78%) participants believed the vaccination generally remains effective for one winter season, 38 (14%) believed it remains effective for about 2 years, 12 (4%) believed remains effective for about 5 years, and 12 (4%) believed it remains effective for life.

c. Vaccination hesitancy and reasons for receiving or refusing the vaccine

In this study, the prevalence of vaccination hesitancy (participants who had heard about the vaccine but had never received it) was 42% (122 of 281 patients). We conducted a chi-square test to measure the association between demographic variables and vaccination hesitancy. The test results indicated a significant association between gender and vaccination hesitancy (1, N = 281) = 9.0, p < .001, with hesitancy prevalence of 53% among women compared to 35% among men (Table 2). There was also a significant association between education level and vaccination hesitancy (4, N = 281) = 1 2.9, p = .011. A sensitivity analysis indicated a significant difference between the elementary education level and higher education levels (intermediate and above) (1, N = 281) = 6.8, p = .008. There was no significant association between the other demographics, gender and nationality, and receiving the influenza vaccine (Table 2).

Among those participants who had received the vaccine, 104 (35%) had received it at least once in the past 3 years. Their main reasons for receiving the vaccine were as follows: 89 participants (31%) cited a physician's recommendation, 71 (24%) mentioned further information about vaccination from authorized institutions, 69 (24%) cited ease of access to the vaccine, 54 (19%) stated that the service was offered free of charge, and 7 (2%) gave other reasons (Table 4).

Among those participants who had not received the vaccine, their main reasons for refusal were as follows: 57 participants (35%) selected "I do not think it is beneficial," 38 (23%) chose "I don't like needles," 30 (18%) chose "It is not recommended by medical staff," 23 (14%) selected "I think it is harmful," 10 (6%) chose "I am allergic to the influenza vaccine," and 6 (4%) selected "I think it is expensive" (Table 5).

4. Discussion

In this study, we measured the influence of patients' demographics and education levels on awareness of the influenza vaccine and the prevalence of vaccination hesitancy among adult patients at KSUMC. We also reported patients' main reasons for receiving or refusing the vaccine. In this study, the prevalence of vaccination hesitancy was 42%. This finding is lesser than what we found in other studies on vaccination hesitancy in Saudi Arabia, in which it is between 45% and 55.5% (Aljamili, 2020; Alqahtani et al., 2017; Alotaibi et al., 2019). This could be attributed to the high percentage of college degree holders in the study population (57%). The finding of this study and the other studies shows there is a persistence of relatively high percentage of vaccine hesitancy in Saudi Arabia despite the awareness regarding influenza vaccination. Perhaps, the current vaccination campaign effort might need a revision for optimization and effort regarding designing and deploying an effective vaccination campaign in future is advised. From the finding of our study, it seems like questioning the benefits of the vaccine is the main reason for vaccination hesitancy. Thus, designing awareness campaigns that target the specific reasons for vaccination hesitancy may yield better results.

In this study, about 11% of the participants had never heard of the vaccine, and the > 65 age group had the highest representation among the those who never heard about the vaccine. Although age group was significantly associated with vaccine awareness, age group was not significantly associated with vaccination hesitancy (whether participants were vaccinated after hearing about the vaccine). This indicates that raising awareness of the influenza vaccine among older adults might be key to minimizing the vaccination hesitancy rate. This view is strengthened by our study's findings, in which only the education variable was significantly associated with vaccination awareness (whether participants had heard of the vaccine) and vaccination hesitancy (whether participants were vaccinated after hearing about the vaccine). The sensitivity analysis indicated a significant difference between the elementary education level and higher education levels. Other studies also documented a significant association between education level and vaccination rates (Alotaibi et al., 2019; CDC. Estimates of Influenza Vaccination Coverage among Adults—United States, 2018). The emphasis on education among older adults is especially important because members of this group are at high risk of developing serious complication from influenza.

Moreover, women were more likely to be hesitant toward receiving the vaccine compared to men. Further research is necessary to understand this variation across gender. Misconceptions regarding the safety of the influenza vaccine for pregnant women may explain this variation (Alqahtani et al., 2017; Mayet et al., 2017). In a study conducted in 2017 to assess Saudi nationals' knowledge and attitudes regarding seasonal influenza vaccination and found that only 9.5% of the study population "understood pregnant women could be vaccinated with the influenza vaccine" (Alqahtani et al., 2017). Further efforts by health care providers and public health services may be necessary to educate the community about the vaccine's safety and efficacy. This study's findings are limited by the size of the study population, which was limited by shortening of the data collection step due to the spread of the novel coronavirus in Saudi Arabia. However, as indicated in

Table 1
Population demographics and variable statistics.

Demographics	Study groups			
Variables	Group A n(%)	Group B n(%)	Group C n(%)	Total n(%)
Age				
15–24	10 (3.2%)	22 (6.9%)	38 (12.0%)	70 (22.1%)
25–64	21 (6.6%)	94 (29.7%)	115 (36.3%)	230 (72.6%)
>65	5 (1.6%)	6 (1.9%)	6 (1.9%)	17 (5.4%)
Education				
Elementary	10 (3.2%)	12 (3.8%)	4 (1.3%)	26 (8.2%)
Intermediate	9 (2.8%)	22 (6.9%)	51 (16.1%)	82 (25.9%)
High school	3 (0.9%)	11 (3.5%)	16 (5.0%)	30 (9.5%)
Undergraduate	3 (0.9%)	12 (3.8%)	17 (5.4%)	32 (10.1%)
Postgraduate	11 (3.5%)	65 (20.5%)	71 (22.4%)	147 (46.4%)
Gender				
Female	15 (4.7%)	68 (21.5%)	60 (18.9%)	143 (45.1%)
Male	21 (6.6%)	54 (17.0%)	99 (31.2%)	174 (54.9%)
Nationality				
Non-Saudi	5 (1.6%)	11 (3.5%)	20 (6.3%)	36 (11.4%)
Saudi	31 (9.8%)	111 (35.0%)	139 (43.8%)	281 (88.6%)
Total	**36 (11%)**	**122 (39%)**	**159 (50%)**	**317 (100%)**

Table 2
Patients' awareness and vaccination hesitancy.

	Heard n (row%)			Vaccinated n (row%)		
Variables	No	Yes	P-value	No	Yes	P-value
Age			0.026$^{\alpha}$			0.465
15–24	10 (14.3)	60 (85.7)		22	38	
25–64	21 (9.1)	209 (90.9)		94	115	
>65	5 (29.4)	12 (70.6)		6	6	
Education			0.002$^{\alpha\beta}$			0.011$^{\alpha}$
Elementary	10 (38.5)	16 (61.5)		12 (75)	4 (25)	
Intermediate	9 (11)	73 (89)		22 (30.1)	51 (69.9)	
High school	3 (10)	27 (90)		11 (40.7)	16 (59.3)	
Undergraduate	3 (9.4)	29 (90.6)		12 (41.4)	17 (58.6)	
Postgraduate	11 (7.5)	136 (92.5)		65 (47.8)	71 (52.2)	
Gender			0.659			0.002$^{\alpha}$
Women	15 (10.5)	128 (89.5)		68 (53.1)	60 (46.9)	
Men	21 (12)	153 (88)		54 (35.3)	99 (64.7)	
Nationality			0.611			0.344
Non-Saudi	5 (13.9)	31 (86.1)		11 (35.5)	20 (64.5)	
Saudi	31 (11)	250 (89)		111 (44.4)	139 (55.6)	
Total	**36**	**281**	**NA**	**122**	**159**	**NA**

$\alpha = \chi^2$ was significant on alpha = 0.05
β = Fisher's Monte Carlo estimate for exact test, m = 20000

Table 3
Where did you hear about the influenza vaccine?

Variable	N (%)
Friends and family	75(27)
Medical staff	68(24)
Public health campaigns	58(21)
Social media	52(19)
TV or newspaper	28(10)

Table 4
Patients' most important reasons for receiving the vaccine.

Variable	N (%)
Physician recommendation	89(31)
Further information about vaccination from authorized institutions	71(24)
Ease of access	69(24)
Free of charge service	54(19)
Other	7(2)

Table 5
Patients' main reasons for refusing the seasonal influenza vaccination.

Variable	N (%)
I do not think it is beneficial	57(35)
I don't like needles	38(23)
It is not recommended by medical staff	30(18)
I think it is harmful	23(14)
I am allergic to the influenza vaccine	10(6)
I think it is expensive	6(4)

Table 2, this was accounted for in the analysis step, in which we conducted a Monte Carol simulation when a chi-square test was not feasible due to the small study sample. Moreover, we conducted this study in a university hospital with a relatively high percentage of postgraduate patients. Given that the education variable was significantly associated with the study's outcomes, the rate of vaccination hesitancy among the general population might be higher than what we found in this study. Hence, the finding of this study may not be generalizable across the nation. Additionally, the study used self-report method to capture the information which makes it prone to recall bias. Finally, the study has inherited some limitation of cross-sectional studies were associations identified in this research may be difficult to interpret.

5. Conclusion

In this study, we have measured the influence of patients' demographics and education levels on influenza vaccine awareness levels and the prevalence of influenza vaccine hesitancy of among adult patients at KSUMC. The study's results indicate that further efforts by health care providers and public health services may be necessary to educate the community regarding the influenza vaccine's safety and efficacy.

Ethical approval

The study was approved by the institution review board of King Saud Medical City, Riyadh, Saudi Arabia.

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