Seasonal Influenza Vaccine Uptake and Determinants of the Vaccine Receipt among Healthcare Workers in King Abdullah Medical City in Makkah during Hajj Season 1436 H (2015 G)

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Abstract

Seasonal influenza vaccination of health care workers (HCWs) is essential for patient safety, their own safety and for the safety of hospital operation. However, despite its strong recommendation for all HCWs, studies indicate a low rate of vaccine uptake. Recently, a mandatory vaccination policy was adopted for HCWs running the Hajj health care facilities. This paper aims to assess rates of and factors affecting influenza vaccine uptake among HCWs. A cross sectional survey was carried out during October 1-16, 2015 at King Abdullah medical city in Makkah, Saudi Arabia. A questionnaire was used to assess the uptake of seasonal influenza vaccine among HCWs and to examine potential predictors of compliance with the vaccine uptake. Out of 500 HCWs approached for participation, 447 returned valid self-reported questionnaires with a response rate 89.4%. Overall, 88.3% of the participants reported receiving influenza vaccine during 2014-2015 season, significantly higher than 2013/2014 season (61.2%) and 54.5% for 2012/2013 season. Uptake was significantly higher among nurses (93.3%) compared to physicians (86.9%) and other health professionals (83.1%) (p=0.012). To capture factors independently associated with the compliance of influenza vaccine uptake; the multivariate logistic regression model revealed that reading influenza vaccine circulars/guidelines (OR: 1.94; 95%CI 1.29-2.93; p<0.01), intention to receive the vaccine next season (OR: 4.45; 95%CI 2.00-9.91; p<0.001), nurse' assignment (OR: 3.54; 95%CI 1.76-7.71; p<0.01) and other HCWs (OR: 2.65; 95%CI 1.30-5.40; p<0.01) compared to physicians, longer length of practice (5-9 years) compared to those with <5 years practice (OR: 1.85; 95%CI 1.14-3.00; p<0.05); and age >40 years (OR: 2.69; 95%CI 1.30-5.58; p<0.01) were factors independently found to be associated with the compliance of vaccine uptake. Our results show a proper uptake of seasonal influenza vaccine during 2014/2015 season,

after adoption of the new policy of mandatory vaccination. Still orientation programs are needed to correct HCWs' misconceptions about the vaccine. Based on large effect size, we strongly recommend to extend the mandatory vaccination policy to all health facilities in the Kingdom.

BACKGROUND

Seasonal influenza is an acute viral infection caused by influenza virus. Infected individuals are highly contagious and can transmit influenza for 24 hours before they are symptomatic. It is associated with high rates of morbidity and mortality; among vaccine-preventable diseases, influenza causes by far the most deaths, outpacing all other vaccine preventable diseases combined. Hospitalized patients are frequently more vulnerable to influenza than general population [1-2].

Health care workers (HCWs) can be a key source for influenza transmission in hospitals as they are exposed to both infected patients and patients in high risk groups [1]. Influenza outbreaks in hospitals can directly increase morbidity among patients as well as HCWs and have indirect consequences of disturbances in the normal function of the health care system; lack of HCWs, work overload, fewer elective admissions, fewer operations and income loss due to work absenteeism [3].

Seasonal influenza vaccination of HCWs is a core component of patient safety programs, it is recommended for all HCWs [4-5], and can reduce patient morbidity and mortality, increase patient safety and reduce work absenteeism in the health care [6-8]. Vaccination of HCWs should be considered part of a broader infection control policy for health-care facilities [4].

Vaccination coverage among HCWs varies substantially between different studies and countries, with lower rates of uptake mostly reported. In a cross sectional survey in 27 European countries the vaccination coverage in HCWs ranged between 13 and 89% and uptake rates are commonly less than 35% and often less than 25% [8]. In the United States, the Centers for Disease Control and Prevention (CDC) influenza season report from 2014-15 showed that 77.3% of all health care workers reported having had an influenza vaccination, with an increase of 13.8 percentage points compared with the 2010–11 season estimate. This percentage increment in the vaccine coverage was attributed mainly to the more hospitals adopted the mandatory vaccination policy [9].

In neighboring countries, the uptake of seasonal influenza vaccine among health care workers is low; reported 24.7% in Emirate, 46.4% in Oman and 67.2% in Kuwait [10] and 19.4% in Qatar [11]. The trend of the vaccine uptake in Saudi Arabia is also low. In 2014, 38% coverage rate was reported among HCWs in 6 major hospitals [12], not far away from a coverage rate (34.4%) reported in another study in 2010 [13].

Mandatory polices of seasonal influenza vaccination of HCWs are being increasingly adopted by health care institutions and public health authorities in particular in United States, where influenza coverage rates increased from 71% in 2007 to 98% in 2008 [4].

In Saudi Arabia, during Hajj seasons, health care settings are providing medical care for high-risk groups of patients; most of them are elderly, with comorbid conditions. In response to this vulnerability, Ministry of Health (MOH) mandated seasonal influenza vaccination for all health care workers in health care settings providing health care for pilgrims.

No previous studies were carried out to assess seasonal influenza vaccine uptake among HCWs in King Abdulla Medical City, likewise, there is a need to assess the effect size of the mandatory vaccination policy. The aims of this work were to assess the uptake rates of seasonal influenza vaccine among HCWs and to identify determinants of compliance with the vaccine uptake and reasons that inhibit or motivate vaccination.

METHODS

Study design and Setting

The study was a cross-sectional survey, carried during October 1-16, 2015, among health care workers (HCWs) in King Abdulla Medical City (KAMC), a tertiary care, 550-bed hospital, located in holy Makkah, Saudi Arabia. The hospital run by more than 3150 personnel; of them 574 physicians, more than 900 nurses and 720 other HCWs directly involved in patient care. The hospital admitted 11329 inpatients and received 155204 outpatient visits during 2014.

Subjects

The eligible participants were health care workers who are engaged in direct patient care, including physicians, nurses and other health care workers (pharmacists, laboratory personnel, therapists, technicians and other staff directly involved in patient care.

Sample

The investigators received a complete list of the eligible health care workers. A representative stratified random sample was undertaken from the eligible population. Sample size was determined before study initiation and calculated conservatively to allow for maximum sample size, assuming a 50% influenza vaccination uptake among the respondents with a margin of error of 5% and 95% confidence level. Consequently, a sample of 327 HCWs was sought. Anticipating 60-70% response rate, 500 questionnaires were distributed taking into consideration a balanced proportion of HCWs according to assignment, departmental affiliations and work shifts.

Survey instrument and administration

An anonymous structured questionnaire was constructed based on in the literature review and previous research findings. The questionnaire included the demographic, professional and work practice characteristics of the respondents; receipt of seasonal influenza vaccine during 2014/2015, 2013/2014 and 2012/2013 seasons; vaccine availability, provision of instructions and guidelines; beliefs, attitudes and concerns about influenza vaccine. Included in the last section questions sought to assess respondents' knowledge about influenza disease and vaccine facts and uptake recommendations. The instrument was reliable for internal consistency with calculated Cronbach's alpha coefficient at 0.78. The consenting subjects, self-completed the questionnaire after distribution to the eligible HCWs with a briefing for the study objectives by trained coordinators who did not have medical or administrative responsibilities in the hospital during the study (6 last year medical students).

Pilot study

The questionnaire was pre-tested and piloted with a convenience sample of 20 HCWs with similar professional and demographic characteristics to the study population to ensure clarity and ease of administration. Based on respondents' recommendations, some changes were incorporated to simplify and improve the final questionnaire.

Ethics

The Ethical Committee of King Abdulla Medical City approved the study protocol and the final questionnaire, with approval number 15-216.

Statistical analysis

Statistical analysis was carried out using EpiInfo 7 program. We generated descriptive statistics for all survey items. A binary outcome variable was created to reflect compliance of the subject with seasonal influenza vaccine uptake. A compliant subject was defined as "the subject who received seasonal influenza vaccine regularly without interruption for the last three seasons; 2014/2015, 2013/2014, and 2012/2013". A bivariate analysis with Chi-square test and t test as appropriate was done to explore factors associated with HCWs receipt of the vaccine with demographic, professional and practice characteristics, as well as knowledge and attitude towards influenza vaccine. A multivariate logistic regression model with backward selection and cut-off point of <0.2 was developed to capture predictors independently associated with the compliant behavior of seasonal influenza vaccine receipt. Odds ratios (ORs) and their 95% confidence intervals (CIs) were reported as measures of association between predictors and outcome of interest. All statistical tests were two-tailed and the p-values of 0.05 or less were considered statistically significant.

RESULTS

Respondent data and Influenza vaccine uptake

In total, 500 questionnaires were distributed and 447 were returned complete, representing a response rate of 89·4%. The characteristics of the respondents are summarized in Table 1.

Overall 394/447 respondents (88·3%) reported receiving a vaccination in 2014/2015 season, significantly higher than 2013/2014 season 273/47 (61.2%) (p=0.014) and 243/447 (54.5%) for 2012/2013 season (p<0.01) (Figure 1).

Uptake was significantly higher in the last season among nurses (93.3%) compared to physicians (86.9%) and other health professionals (83.1%) (p=0.012). There was no difference in the demographic characteristics of the vaccinated or unvaccinated respondents in 2014/2015 season. The mean age of respondents for the two groups were 32.35±7.78 and 32.50±7.89 and the length of practice were 7·46±6·17 years and 7·61±6·24 years (p =0·185), for the two groups respectively.

Variables associated with respondents' vaccination uptake

The potential predictors for compliance of seasonal influenza vaccine uptake were examined on bases of the compliance definition postulated in the present study as "the subject who received seasonal influenza vaccine regularly without interruption for the last three seasons; 2014/2015, 2013/2014, and 2012/2013 seasons).

Table 2, presents the results of logistic regression analysis. In the univariate logistic regression analysis with the potential predictors, we found that: nurses were significantly more compliant to receive vaccination regularly than physicians (OR: 2.29; 95%CI 1.37-3.84; p<0.01); respondents with longer length of practice (5-9 years) compared to those with <5 years practice (OR: 1.80; 95%CI 1.15-2.83; p<0.05); intention to receive the vaccine next season (OR: 5.02; 95%CI 2.32-10.87; p<0.001); reading MOH vaccine circulars/guidelines (OR: 2.47; 95%CI 1.67-3.63; p<0.001); self-efficacy of belief having sufficient knowledge about the vaccine (OR: 1.63; 95%CI 1.11-2.41; p<0.05); recommending the vaccine to family members (OR: 1.95; 95%CI 1.14-3.33; p<0.05) and participants agreement for mandating the vaccine to all HCWs (OR: 5.02; 95%CI 2.32-10.87; p<0.001).

In the multivariate logistic regression analysis intended to capture predictors that are independently associated with the compliance of vaccine uptake; the model revealed that: reading MOH influenza vaccine circulars/guidelines (OR: 1.94; 95%CI 1.29-2.93; p<0.01), intention to receive the vaccine next season (OR: 4.45; 95%CI 2.00-9.91; p<0.001), nurses compared to physicians (OR: 3.54; 95%CI 1.76-7.71; p<0.01), other HCWs compared to physicians (OR: 2.65; 95%CI 1.30-5.40; p<0.01), longer length of practice (5-9 years) compared to those with <5 years practice (OR: 1.85; 95%CI 1.14-3.00; p<0.05), and age >40 years (OR: 2.69; 95%CI 1.30-5.58; p<0.01) were the

factors that were independently found to be associated with the compliance of vaccine uptake.

Reasons for acceptance or declining to receive seasonal influenza vaccine

Table 3, presents the most frequent reasons cited by the respondents for having and not having seasonal influenza vaccine. The most cited reasons for being vaccinated were: self-protection (81.5%), to protect patients (74.4%), as an institutional requirement (55.6%), to prevent cross infection (45.7%), and having household children contact (32.2%). The most cited reasons for not getting the vaccine were: the misconception that the vaccine causes influenza (38.5%), concerns about vaccine efficacy (32.7%), trust in/wish to challenge natural immunity (21.2%), the vaccine was not available (11.5%), not all strains of the virus are covered (9.6%) and prior experience of severe localized reaction in previous vaccination (9.6%).

DISCUSSION

The study was a cross-sectional survey among health care workers in King Abdulla Medical City (KAMC); a tertiary care, 550-bed hospital, located in holy Makkah, Saudi Arabia, serving pilgrims among other patients during Hajj and Umrah seasons.

Most of the Hajj population presented at health services are vulnerable elderly with comorbidities [14] exposed to a stressful physical conditions that puts them among other conditions at a higher risk of getting the highly contagious influenza infection with its serious complications [15-16].

Prevention and control of nosocomial influenza entail multiple measures; vaccination of HCWs is advocated by World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) to prevent influenza transmission in healthcare settings [4-5].

It was prudent to adopt the mandatory vaccination policy to reach an acceptable level of vaccination coverage among HCWs to ensure patient safety and prevent any drop in hospital operation may occur due to an influenza outbreak [2].

This study provides an evidence of success of this strategy to increase influenza vaccine uptake by all HCWs. A proper coverage rate (88.3%) was achieved for the last season 2014/2015, with an increase of 33.8 percentage points compared to the 2012/2013 season before adoption of this strategy; a coverage rate touches the US standards (90%) [17] and exceeds the European's Union goal (75%) [18]. This strategy proved effective in other reports [9,19-21] and have a strong a rational and ethical background [22].

The study results showed that mandatory vaccination in 2014/2015 season masked almost all predictors of the voluntary vaccination found in the previous seasons, which

entail that mandatory vaccination policy defeated the barriers of suboptimal vaccination among HCWs.

In spite of the good coverage rate last season, an important misconceptions and inadequate knowledge about seasonal influenza vaccine were present. The participants attained a suboptimal knowledge score about influenza and vaccine (16.03±5.86 out of 33 point); 42.2% of them reported having insufficient knowledge about the vaccine and a considerable percentage of HCWs having misconceptions about vaccine side effects (38.5%) and vaccine efficacy (32.7%) which imply that orientation programs are crucially needed to correct the misconception and knowledge gap of the HCWs.

Good knowledge about influenza vaccine is not only important for sustaining good uptake of the vaccine among HCWs, but also important for the commitment of the HCWs to prescribe the vaccine to the vulnerable target groups of patients and risky healthy people. Vaccination of physicians together with their opinions on the effectiveness of the vaccine was a predictor of vaccination coverage in their patients [23-24].

Taking into consideration the important predictors of influenza vaccine uptake highlighted by the present study; planning for the next seasonal influenza vaccine campaigns and organization of the orientation programs will be more successful when giving more emphasis on and more attention to physicians, younger HCWs, and supplementing all HCWs with the guidelines and official circulars concerned with influenza and influenza vaccine.

CONCLUSION

The results of the current study showed a proper seasonal influenza vaccine uptake among HCWs during 1414/1415 season coinciding with the adoption of the new policy of mandatory vaccination. This maximizes both patient and HCWs safety along with putting the hospital operation in a better situation against any drop due to influenza virus outbreaks.

Still orientation programs are needed for clarifying HCWs' misconceptions about influenza vaccine and help to maintain satisfactory level of vaccine uptake. These programs should address evidence-based arguments about vaccine safety and efficacy

The large effect size of mandatory vaccination policy seen in the present study, strongly suggest extending this policy to all health facilities in the Kingdom of Saudi Arabia.

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Table 1: Characteristics of the participants (n=447)

	Overall N (%)	**Vaccination status 2014/2015 season**		
		Vaccinated n (%)	**Unvaccinated n (%)**	***p***
Assignment				0.0121
- Physician	99 (22.1)	86 (86.9)	13 (13.1)	
- Nurse	193 (43.2)	180 (93.3)	13 (6.7)	
- Other HCWs	155 (34.7)	128 (83.1)	26 (16.9)	
Gender				0.160
- Male	221 (49.4)	200 (90.5)	21 (9.5)	
- Female	226 (50.6)	194 (86.2)	31 (13.8)	
Age in years				0.125
- <=25	53 (11.9)	46 (86.8)	7 (13.2)	
- 26-30	197 (44.1)	174 (88.8)	22 (11.2)	
- 31-35	80 (17.9)	65 (81.3)	15 (18.8)	
- 36-40	62 (13.9)	59 (95.2)	3 (4.8)	
- >40	55 (12.3)	50 (90.9)	5 (9.1)	
Median (Mean±SD)	30 (32.35±7.78)	30 (32.50±7.89)	29 (31.29±6.96)	0.294
Education (highest degree)				0.290
- Less than Bachelor	27 (6.0)	22 (81.5)	5 (18.5)	
- Bachelor	262 (58.6)	235 (90.0)	26 (10.0)	
- Postgraduate (Dip/Master)	80 (17.9)	67 (83.8)	13 (16.3)	
- Postgraduate (Board/PhD/MD)	78 (17.4)	70 (89.7)	8 (10.3)	
Length of practice in years				0.384
- <5	168 (37.6)	143 (85.6)	24 914.4)	
- 5-9	152 (34.0)	137 (90.1)	15 (9.9)	
- =>10	127 (28.4)	114 (89.8)	13 (10.2)	
Median (Mean±SD)	6 (7.46±6.17)	6 (7.61±6.24)	5 (6.40±5.54)	0.185
Marital Status				0.099
- Single	169 (37.8)	147 (87.5)	21 (12.5)	
- Married	269 (60.2)	241 (89.6)	28 (10.4)	
- Others (Divorced, widowed)	9 (2.0)	6 (66.7)	3 (33.3)	
Have Children under 16 year				
- Yes	179 (40.0)	162 (90.5)	17 (9.5)	0.244
- No	268 (60.0)	232 (86.9)	35 (13.1)	
Have any chronic disease				0.181
- No	385 (85.9)	337 (87.5)	48 (12.5)	
- Yes	63 (14.1)	57 (93.4)	4 (6.6)	
Average patients seen per working day				0.800
- <5	134 (30.3)	116 (86.6)	18 (13.4)	
- 5-9	97 (21.9)	87 (89.7)	10 (10.3)	
- 10-14	75 (17.0)	67 (90.5)	7 (9.5)	
- 15+	136 (30.8)	119 (87.5)	17 (12.5)	
Knowledge Score about influenza and vaccine. Median (Mean±SD)	16 (16.03±5.86)	16 (15.80±5.98)	16 (15.80±5.98)	0.315
Vaccinated 2013/2014 season				0.003
- Yes	273 (61.2)	251 (63.7)	22 (42.3)	
- No	173 (38.8)	143 (36.3)	30 (57.7)	
Vaccinated 2012/2013 season				0.014
- Yes	243(54.5)	223 (56.6)	20 (38.5)	
- No	203 (45.5)	171 (43.4)	32 (61.5)	
Intend to receive the vaccine next season				
- Yes	383 (86.8)	353 (90.5)	37 (9.5)	<0.001
- No	58 (13.2)	30 (58.8)	21 (41.2)	

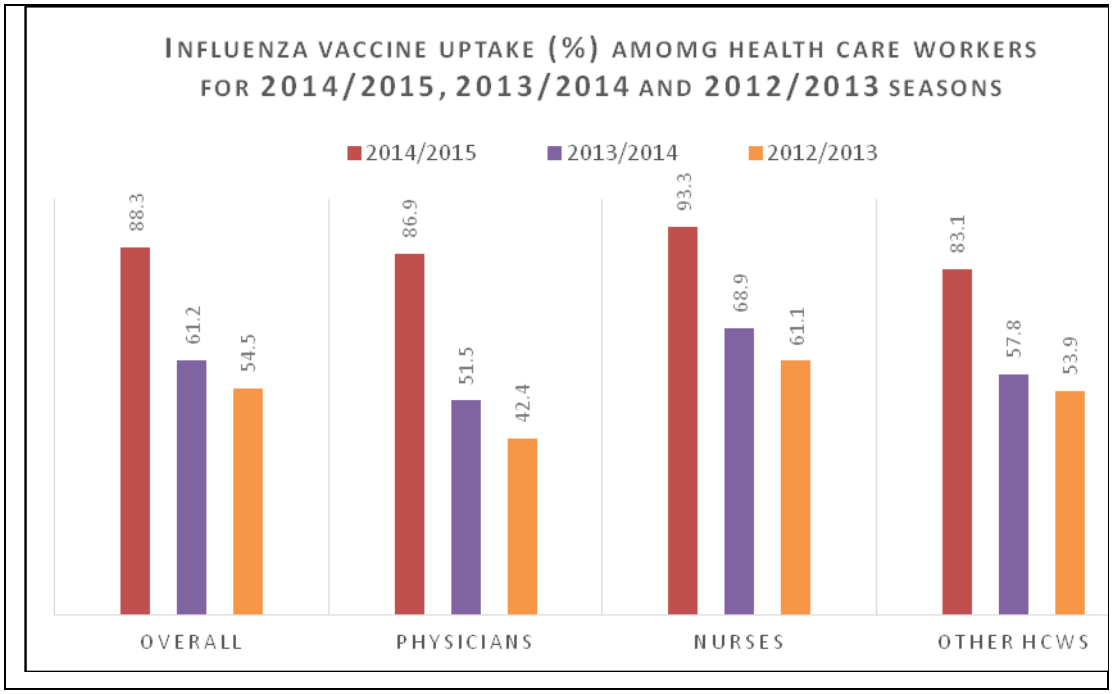

Table 3: Most frequent reasons cited by HCWs for acceptance or declining to receive seasonal influenza vaccine in King Abdulla Medical City, Holy Makkah, 2015.

Reason	**Frequency**	**Percent**
Reasons for Influenza Vaccine Uptake (n= 394)		
- Protect myself	321	81.5
- Protect patients	293	74.4
- Required by my institution	219	55.6
- Prevent cross- infection	180	45.7
- Having children contact at home	127	32.2
Reasons for Influenza Vaccine Avoidance (n=52)		
- The vaccine causes influenza	20	38.5
- Concern about vaccine efficacy	17	32.7
- Trust in/Wish to challenge my natural immunity	11	21.2
- The vaccine was not available	6	11.5
- Not all stains are covered	5	9.6
- Prior experience of severe localize reaction	5	9.6

Table 2. Logistic regression analysis of demographic, professional and institutional factors associated with Compliance with Seasonal Influenza Vaccine Uptake among 447 Health Care Workers, in King Abdulla Medical City, Makka, KSA, 2015.

Variables	Vaccination Compliance#		Univariate OR (95% CI)	Adjusted OR (95% CI)
	NO [n (%)]	YES [n (%)]		
Assignment				
- Physicians	70 (70.7)	29 (29.3)	1	1
- Nurses	99 (51.3)	94 (48.7)	2.29 (1.37-3.84)**	3.54 (1.76-7.12)**
- Other HCWs	96 (61.9)	59 (38.1)	1.48 (0.86-2.55)	2.65 (1.30-5.40)**
Gender				
- Male	133 (60.2)	88 (39.8)	1	
- Female	132 (58.4)	94 (41.6)	1.08 (0.74-1.57)	
Age in years				
- < 40	229 (61.2)	145 (38.8)	1	1
- =>40	36 (49.3)	37 (50.7)	1.62 (0.98-2.69)	2.69 (1.30-5.58)**
Length of practice in years				
- < 5	112 (66.7)	56 (33.3)	1	1
- < 5-9	80 (52.6)	72 (47.4)	1.80 (1.15-2.83)*	1.85 (1.14-3.00)*
- => 10	73 (57.5)	54 (42.5)	1.48 (0.92-2.38)	1.56 (0.86-2.84)
Marital Status				
- Single	108 (63.9)	61 (36.1)	1	
- Married/Others	157 (56.5)	121 (43.5)	1.37 (0.92-2.02)	
Education (highest)				
- Less than Bachelor	20 (74.1)	7 (25.9)	1	
- Bachelor	142 (54.2)	120 (45.8)	2.42 (0.99-5.90)	
- Postgraduate degree	103 (65.2)	55 (34.8)	1.53 (0.61-3.83)	
Have a chronic medical condition				
- No	233 (60.5)	152 (39.5)	1	
- Yes	33 (52.4)	30 (47.6)	1.39 (0.82-2.38)	
Have children under 16 years				
- No	163 (60.8)	105 (39.2)	1	
- Yes	102 (57.0)	77 (43.0)	0.85 (0.58-1.25)	
Intend to receive the vaccine next season				
- No	50 (86.2)	8 (13.8)	1	1
- Yes	213 (55.5)	171 (44.5)	5.02 (2.32-10.87)***	4.45 (2.00-9.91)***
The vaccine is available at my workplace all the time				
- No	89 (63.1)	52 (36.9)	1	
- Yes	172 (57.3)	128 (42.7)	1.27 (0.84-1.93)	
Read/offered MOH circular/guidelines				
- No	170 (68.8)	77 (31.2)	1	1
- Yes	94 (47.2)	105 (52.8)	2.47 (1.67-3.63)***	1.94 (1.29-2.93)**
Feel have sufficient vaccine knowledge				
- No	124 (66.0)	64 (34.0)	1	
- Yes	140 (54.3)	118 (45.7)	1.63 (1.11-2.41)*	
Believe the vaccine is valuable in influenza prevention				
- No	75 (64.1)	42 (35.9)	1	
- Yes	189 (57.8)	138 (42.2)	1.30 (0.84-2.02)	
I recommend the vaccine to the target groups				
- No	56 (65.9)	29 (34.1)	1	
- Yes	209 (57.7)	153 (42.3)	1.41 (0.86-.2.32)	
I recommend the vaccine to my family members				
- No	56 (71.8)	22 (28.2)	1	
- Yes	209 (56.6)	160 (43.4)	1.95 (1.14-.3.33)*	
All HCWs should receive the vaccine (agreement)				
- Uncertain/Not agree/Strongly disagree	51 (69.9)	22 (30.1)	1	

- Strongly agree/Agree	214 (57.2)	160 (42.8)	1.73 (1.01-.2.98)*	
I have concern about the vaccine side effects or efficacy				
- No	119 (59.2)	82 (40.8)	1	
- Yes	146 (59.3)	100 (40.7)	0.99 (0.68-.1.45)	
Knowledge of influenza disease and vaccine Score [out of 32 points] Median (mean ±SD)	16 (15.80±5.98)	16 (16.37±5.66)	1.07 (0.98-1.05)	

Abbreviations: OR= Odds Ratio; CI= Confidence Interval; HCWs= Health Care Workers.

#Received vaccination in the last 3 seasons.

* p<0.05; ** p<0.01; *** p<0.001. (Final Model -2*Log-Likelihood: 534.09; Interactions=5; X2 =55.80, df=7, p<0.001).