Original Article

Influenza immunization rates, knowledge, attitudes and practices of health care workers in Iran

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Abstract

Introduction: This study aimed to determine influenza vaccine coverage and evaluate the knowledge, attitudes and practice about influenza and vaccine of health care workers in Tehran, Iran.

Methodology**:** This cross-sectional survey involved 144 health care workers (HCWs) at the Tehran University of Medical Science between October 2008 and February 2009. Participants received a self-administered questionnaire directed at 35 items of knowledge and every correct response was scored one point.

Results: Influenza vaccination coverage for the 2008–2009 season was 66.9 % (range, 45% to 62%). Most HCWs (80.6%) had received an influenza vaccination in the past, and 65.4% intended to receive vaccination in the coming year. The main reason given for being immunized was the effectiveness of the influenza vaccine (51.4%). The main reason given for not being immunized was concern about adverse effects (23.1%). The knowledge score for the 35 items ranged from 0 to 34 (mean 17.37). Mean knowledge scores differed between educational levels. There was no significant difference in mean knowledge scores between females and males ($P > 0.05$).

Independent variables (age, sex, marital status, having children aged ≤ 16 years, educational level) were not significant predictors of taking influenza immunization.

Conclusion: Despite the high coverage rate of influenza vaccination in our study, we would expect a higher rate because of free vaccine availability. The results indicate the need for on-going education of influenza disease among HCWs to increase vaccination rates.

Key words: health care worker; influenza; influenza vaccination

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Introduction

Influenza is an important cause of excessive morbidity and mortality each winter [1-3]. Its short incubation period and efficient transmission from person to person makes influenza hazardous to the patients and staff in health care facilities [4].

Rates of serious illness and death are highest among persons over 65 years of age [5,6], children aged younger than two years [7], and persons of any age who have medical conditions that place them at increased risk for complications from influenza [5-7]. Annual influenza epidemics are estimated to affect 5-15% of the global population. Although most cases are mild, influenza still causes severe illness in three to five million people and around 250,000–500,000 deaths worldwide. In industrialized countries, severe illness and deaths occur mainly in the high-risk populations of infants, the elderly and chronically ill patients [8].

In addition to these annual epidemics, Influenza A virus strains caused three major global epidemics during the 20th century: the Spanish flu in 1918, the Asian flu in 1957, and the Hong Kong flu in 1968–69.The influenza virus has also caused several pandemic threats over the past century, including the pseudo-pandemic of 1947, the 1976 swine flu outbreak, and the 1977 Russian flu, all caused by the H1N1 subtype [9]. The last pandemic occurred early in April 2009, after several patients infected with novel H1N1 swine-origin influenza virus A (S-OIV A) were identified in the United States and Mexico. Through rapid and frequent international travel, the virus has spread around the world. Over 17,700 deaths have been reported up to April 4, 2010, in the world and the World Health Organization (WHO) Regional Office for the Eastern Mediterranean (EMRO) has reported over one thousand deaths [10]. Up to 10 February 2010, over 3,672 cases of A(H1N1) flu and 147 deaths have been reported in

Iran [11]. This situation underlines the importance of high immunization coverage rates.

Strategies for the control of influenza have included immunization of individuals at high risk for complications from the illness, their close contacts, and the health care workers (HCWs) who care for them [12,13]. Implicated in the transmission of influenza to other HCWs and to patients during outbreaks in acute care or long-term care facilities, HCWs are an important reservoir of infection [14]. Influenza among HCWs is also associated with increased absenteeism, which compounds the already severe nursing shortage during outbreaks, and the quality of patient care suffers [15]. Both HCW absenteeism and nosocomial transmission of influenza from HCW to patient increase hospital costs [16]. Studies have demonstrated a reduction in absenteeism in the winter due to influenza-like illness in HCWs who have received the influenza vaccine [16-18].

Since 1986, the Advisory Committee on Immunization Practices has recommended influenza vaccination for all HCWs who have contact with high-risk patients [19] and in 1995 extended this recommendation to every HCW [20]. All Iranian HCWs with clinical responsibilities are advised by the Ministry of Health [21] to participate in seasonal influenza vaccination programs.

Despite this recommendation, the overall HCW influenza vaccination rate remains low, with an immunization rate of 36% reported in the National Health Interview Survey [12]. Vaccination coverage rate in a study by Hees *et al*. was 42.8% [22]. Blank *et al*. cited rates of 25.0% in UK; 27.4% in Germany; 21.8% in Spain; 24.2% in France; and 24.4% in Italy in 2006/07 [23].One study conducted in Iran between November 2005 and February 2006 revealed that the overall immunization rate in 884 HCWs was 5.2 % [24].

The aim of this study was to determine influenza vaccination coverage in the 2008/09 vaccination season among HCW in Tehran, Iran. The study further aimed to evaluate the knowledge, attitudes and practices of HCWs to verify the compliance with national guidelines and the feasibility of adopting Centers for Disease Control and Prevention (CDC) recommendations.

Methodology

Study design

This study was a cross-sectional survey that was performed between October 2008 and February 2009 in HCWs reporting to the Health Deputy of the Tehran University of Medical Science, Tehran, Iran, who received free influenza vaccine over the past 3 years.

The participants included 139 HCW who received a self-administered questionnaire in their workplace. A research assistant waited to collect the questionnaires while the participants answered the questions. The questionnaire had been developed previously [24], but some changes were made for the current study. Questions included demographic information; knowledge and attitudes about influenza vaccines (reasons for receiving or not receiving the immunization); and vaccination behaviour (personal recommendations to patients). The questionnaire addressed 35 items of knowledge and every correct response was scored one point.

Statistical analysis

Analyses were performed using SPSS version 11.5 (SPSS Inc., Chicago, IL, USA). A test of the questionnaire for internal consistency identified a high Cronbach alpha correlation coefficient, $r = 0.87$. The response rates differed by item; hence the frequency distributions were calculated using the denominator for the individual item. The sum of all correct answers (each scored 1) to the 35 knowledge items resulted in a continuous variable with a value ranging from 0 to 35. Comparisons between the means of the knowledge score were performed using t-test and analysis of covariance (ANCOVA). In the ANCOVA model, sex, age, marital status, having children aged 16 years of age and younger living at home, and uptake of influenza immunization for the 2008–2009 season served as co-variates. Multiple logistic regression analyses were used to identify predictors of being vaccinated for the season. α was set at 0.05.

Results

The questionnaires were fully completed by 139 (96.5%) of the 144 HCWs, of whom 94 (67.6%) were female. Of 139 respondents, 18% were internal physicians, less than 1% were dentists, 18% were nurses and midwives, 3% were environmental and occupational health workers, 30% were paramedics, and 30% had graduated from high school and worked as secretaries, typists, and drivers of hospital vehicles. Seventy-five percent of the participants were married and 49% had children16 years of age or younger. Responses to the question regarding state of health were as follows: 58.3% of the participants

rated their health as good; 23% as excellent; 16.5% as intermediate; and 2.2% as weak. The mean age of the participants was 38.49 ± 7.25 years (range 23–57 years).

The influenza immunization rate for the 2008–2009 season was 66.9 % (93/139), (CI 95%: 59-75). Of the 139 respondents, 112 (80.6%) indicated on the questionnaire that they had taken an influenza vaccine in previous years. Ninety-three (66.9%) participants stated that the influenza vaccine is available at their place of employment at no cost. Of 139 participants, 135 (97.1%) indicated that their coworkers also had taken an influenza vaccine in previous years. Of 112 who had a vaccination history, 32 (28.5%) stated that they had developed adverse effects following vaccination: 15 (46.8%) complained of muscle pain; 8 (25%) reported influenza-like illness; 5 (15.6%) noted malaise; and 4 (12.5%) cited fever.

Sick leave was taken by 18.7% (26/139) of participants. The mean days of sick leave were 2.2 ± 1.2 (range 1-6 days). Sixty-three (45.3 %) of the participants had been exposed to patients with influenza.

More than half of the participants (91/139; 65.4%) said they would take the vaccine in the coming year, and 12.9 % (18/139) of the participants said they would take the vaccine in the coming year if it is free. Less than half (45.3%) of the participants would recommend the vaccine to their families and co-workers (most likely = 23.7%; very strongly = 21.6%), and 33.1% would not recommend it (not likely = 29.5%, never = 3.6%). Missing data = 21.6%.

Table 1 shows all the reasons given for receiving the vaccination. The main reason given for being immunized was the effectiveness of the influenza vaccine (51.4%; 38/74). Other reasons included the following: influenza is a serious disease (43.2%; 32/74); being at risk because of the nature of the respondents' work (43.2%; 32/74); and being influenced by media reports (45; 32.4%).

Of the 139 participants, 27 (19.4%) had not taken the influenza vaccine in the previous year. The two most frequent reasons given for not being immunized were concerns about adverse effects (23.1% of non immunized participants) and the belief that the vaccine was not needed (20%). Other frequent reasons for not being immunized are shown in Table 2. Of these 27 people who did not receive the vaccine, two nurses said they had not been immunized because they believed that the vaccine was restricted to nurses in the hospitals at higher risk of exposure to influenza.

The knowledge score for the 35 items ranged from 0 to 34 (mean 17.37, standard deviation 7.92, quartile: 11, 15, 23). Mean knowledge scores for the different educational levels are shown in Table 3. Mean knowledge scores differed between educational levels, using ANCOVA (Table 4). There was no significant difference in mean knowledge scores between females and males.

Many of the respondents did not know that the health ministry recommends immunization for pregnant women and those who are breast feeding (42.4% and 32.4% respectively). The percentage of respondents who thought that immunization can itself cause influenza was 39.6%. Almost all (93.5%) of the participants knew that influenza immunization should be annual. The majority (74.8%) of the HCWs believed that persons 50 years of age and older, as well as physicians and nurses, should be immunized. Additionally, 64.7% thought it desirable to immunize long-term care residents and 58.3% of them believed that members of households with high-risk patients should be immunized (Table 5).

In a logistic regression model, we investigated the prediction impact of independent variables, including age, sex, marital status, having children aged 16 years of age or younger living at home, and educational level for taking influenza immunization for the latest season. None of the independent variables was a significant predictor for taking the influenza immunization.

Table 1. Reasons given for vaccination.

Main reason for vaccination	**No. of participants giving this reason (%)**
Influenza vaccine is effective	38(51.4)
Influenza is a serious disease	32(43.2)
Being at risk because of nature of their work	32(43.2)
Influenza vaccine is safe	16(21.6)
Preventing the spread of the virus to children	16(21.6)
Encouraged by other employees	16(21.6)
Preventing the spread of the virus to patients	8(10.8)
Cardiovascular disease	3(4.1)
Chronic pulmonary disease	0

Table 2. Reasons given for non-vaccination.

Main reason for non-vaccination	**Participants giving this reason n (%)**
Concerned about side-effects	15 (23.1)
Did not think it was needed	13 (20)
Unavailable vaccination	11 (16.9)
Forgetting and lack of time	11 (16.9)
Influenza vaccine is not effective	8 (12.3)
Not interested	5 (7.7)
Avoidance of medication	5 (7.7)
Not at risk to get influenza	4 (6.2)
Others	4 (6.2)
Concurrent pregnancy or breast-feeding	3 (4.6)
Prior side effects of the vaccination	3 (4.6)
Influence of employees	3 (4.6)
Fear that vaccination would cause influenza	3 (4.6)
Influenza wasn't severe disease	2 (3.1)
Do not like injections	2 (3.1)
Having another diseases	2 (3.1)
Concerns about pain and discomfort	2 (3.1)
Not in high-risk group	1 (1.5)
Vaccination had cost	1 (1.5)
Previous allergy to influenza vaccination	0
Lack of information on vaccine	0

Table 3. Mean knowledge scores of different educational level

Educational level	Mean	95% Confidence Interval Lower Bound	Upper Bound
Medical physician & dentistry	22.186	19.172	25.200
Midwifery & nurse	16.059	13.026	19.092
Environment & occupational health & Public health & Paramedics	27.561	20.132	34.989
Diploma	17.204	15.411	18.996

Table 4. Difference of mean knowledge scores in educational level.

Educational level **(I)**	Educational level **(J)**	**Mean difference(I-J)**	**95% Confidence Interval for Difference (a)** **Lower**	**Upper**
Medical physician & dentistry	midwifery & nurse	6.127(*)	1.662	10.591
	Environment & occupational health& public health & Paramedics	-5.375	-13.291	2.541
	Diploma	4.982(*)	1.439	8.526
Midwifery & nurse	Environment & occupational health & public health & Paramedics	-11.501(*)	-19.640	-3.363
	Diploma	-1.144	-4.644	2.355
Environment & occupational health & public health & Paramedics	diploma	10.357(*)	2.699	18.015

* The mean difference is significant at the .05 level.
a Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 5. Knowledge about Influenza and Influenza Vaccination among HCWs.

Survey question (correct response)	**Proportion (%) of responses**		
	True	**false**	**"Not sure"**
Influenza vaccination isn't for all of people (false)	96(69.1)	32(23)	11(7.9)
New influenza vaccine is produced annually (true)	113(81.3)	15(10.8)	11(7.9)
Vaccination wouldn't cause influenza (true)	74(53.2)	53(38.1)	12(8.6)
What is the best time of vaccination? (October)	126(90.6)	8(5.7)	5(3.6)
What is the interval of vaccination? (annually)	130(93.5)	5(3.6)	4(2.9)
Side effects of vaccine are uncommon (true)	99(71.2)	28(20.1)	12(8.6)
How long do the antibodies of vaccine remain in the body? (6month)	21(15.1)	107(77)	11(7.9)
When dose the immunity begin after vaccination?(2weeks)	42(30.2)	81(58.3)	16(11.5)
Influenza could be lethal (true)	74(53.2)	65(46.8)	
Influenza is transmitted simply from person to person(true)	111(79.9)	28(20.1)	
People with asymptomatic influenza can transmit (true)	45(32.4)	94(67.6)	
HCWs can spread influenza to patients (true)	94(67.6)	45(32.4)	
Patients can spread influenza to HCWs (true)	86(61.9)	53(38.1)	
Populations recommended by the CDC to receive the influenza immunization.			
Persons ≥50 years of age (true)	104(74.8)	35(25.2)	
Long-term care residents (true)	90(64.7)	49(35.3)	
Physicians and nurses (true)	104(74.8)	35(25.2)	
Patients with: Diabetes (true)	62(44.6)	77(55.4)	
Patients with: Anemia (true)	34(24.5)	105(75.5)	
Patients with: chronic obstructive pulmonary disease (true)	64(46)	75(54)	
Patients with: hemoglobinopathy (true)	29(20.9)	110(79.1)	
Patients with: Asthma (true)	61(43.9)	78(56.1)	
Patients with: Renal failure (true)	47(33.8)	92(66.2)	
Patients with: HIV/AIDS (true)	57(41)	82(59)	
Patients with: Long-term steroids (true)	48(34.5)	91(65.5)	
Patients with: Chemotherapy (true)	49(35.3)	90(64.7)	
Patients with: chronic heart failure (true)	53(38.1)	86(61.9)	
In third trimester of pregnancy (true)	38(27.3)	101(72.7)	
After labor (true)	29(20.9)	110(79.1)	
Households with high-risk patients (true)	81(58.3)	58(41.7)	
Aspirin uptake in children (true)	41(29.5)	98(70.5)	
Injection of influenza vaccine couldn't cause influenza (true)	74(53.2)	53(38.1)	12(8.6)
Influenza vaccination has no increased risk of general complications in comparison of placebo (true)	55(39.6)	43(30.9)	41(29.5)
Influenza vaccination can prevent of avian influenza (false)	29(20.9)	100(71.9)	10(7.2)
Pregnancy is contraindication of vaccination (false)	59(42.4)	65(46.8)	15(10.8)
Breast feeding is contraindication of vaccination (false)	45(32.4)	78(56.1)	16(11.5)

Discussion

The influenza immunization rate for the 2008–2009 seasons was 66.9%. Recent national estimates of annual coverage of flu vaccines among health care workers are close to 20% in the five most populated countries in the European Union [25] and hover around 40% for several years in the United States [26,27]. In an assessment of individual vaccine status in a vaccinology experts' group, Duclos *et al*. [28] reported that approximately 70% of the workshop group's members (75% of those performing clinical activities) received annual influenza vaccination. But in the study by Abramson and Levi, influenza immunization rates of HCWs were 30.2% and 41.2% for the last and previous years, 2007 and 2006 respectively [29]. In other studies [30, 31], influenza immunization rates of HCWs were similar to the numbers reported in the study by Abramson and Levi. Earlier publications on influenza coverage rates [15-19] already noted a low coverage in health care workers in Germany, ranging from 8% [32] to 26% [31].

Despite the close contact of midwives and nurses to high-risk groups and the importance of knowledge about this matter, the knowledge scores of midwives and nurses were significantly lower than those of other groups.

Similar to other studies [29,33], the knowledge of medical physicians and dentists was significantly higher than that of other groups (p-value = 0.008 and 0.006 for midwives and nurses and participants with high school diplomas, respectively). Other studies established that HCWs who get vaccinated generally believe that adopting this behaviour is a professional responsibility [34-36].

Most HCWs had basic knowledge about influenza vaccination and the mean knowledge score was 17.37, whereas in the study of Ofstead *et al*. [37], the mean number of correct responses was 9.6 (73.8%) of 13 (range, 0-13). In some studies, knowledge of HCWs was low [33] and in other studies, knowledge was high [29,37].

Most HCWs were unaware that antibodies against vaccine antigens survive six months in the body, with immunity beginning at two weeks after vaccination; hence people with asymptomatic influenza can transmit influenza to others. The CDC therefore recommends immunizing HCWs. Esposito *et al*. [38] reported that only a small number of respondents considered influenza a serious disease, and only a few were aware of its epidemiology or knew the preventive recommendations and measures.

Just as previous studies reported that 27% to 45% of HCWs think that the influenza vaccine could cause influenza infection [4,39], 38.1% of all respondents in our study shared this misconception.

In our study, the major reasons identified for accepting vaccination were that the influenza vaccine is effective and that influenza as a serious disease. In the study of Blank *et al*. [23], the belief that influenza is a serious illness and recommendation by a family physician were the principal reasons for immunization. In other studies a considerable proportion of the respondents claimed that were immunized because they considered it their responsibility to protect their patients a [13,29].

As reported in previous studies [40,41], the main reasons given for not immunizing in our study were concerns regarding adverse effects, the belief that immunization was not needed, unavailability of vaccine, forgetting and lack of time, belief in low efficacy of the vaccine, and not interested.

Unavailable vaccination or forgetting or lack of time were reasons for not immunizing given by a total of 33.8% of those not immunized. These are all reasons which can be easily be overcome. Other reasons given for not vaccinating require better education of the population regarding vaccines. Some of the reasons, notably the misconception that vaccination can cause influenza (given by 4.6% of the participants), may be relatively easy to address with targeted educational material. However, as noted by an earlier study, "family encouragement to receive influenza vaccination was a factor that reinforced HCWs' intentions to get vaccinated. Education of family members may increase vaccination rates of HCWs" [42]. Age and sex and marital status, having children aged 16 years or younger living at home, and educational level did not significantly predict whether HCWs would take influenza immunization. As found in one study [43], influenza vaccination was not significantly associated with age, gender, having children at home, ward type, or shift pattern, whereas Ajenjo *et al*. [44] had shown that those factors increased vaccination rates. Part-time versus full-time work also affects vaccination rates [45]. In other studies, old age is a consistent factor associated with increased acceptance of the vaccine, but association with other factors such as length of employment, previous vaccination and marital status have also been demonstrated [41,46].

In this study, 45.3 % of the participants had work that brought them into contact with influenza patients, thus the increased risk of disease

transmission was consistent with that seen in other studies [47-50].

Conclusion

Although the coverage rate seen in our study was high in comparison with that seen in other studies, we would expect our rate to be even higher because of free vaccine availability. The study results indicate that there is a need for the on-going education of HCWs in Iran, especially about influenza, vaccine action, and CDC recommendations to increase the rate of influenza vaccination coverage in our country.

As reported in the study of Vaux *et al*. [51], training sessions and organized staff meetings increased vaccine uptake among nurses and nurse assistants (RR:1.2, 95% CI: 1.11 - 1.32, $p < 0.001$) and non-medical staff members (RR: 1.2, 95% CI: 1.07 - 1.30, $p < 0.001$). Also, alternative influenza vaccination campaign strategies have also proven successful in raising the vaccination rate [52,53].

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