



# Seasonal Influenza Vaccination Uptake and Its Socioeconomic Determinants in Patients and Staff of Hospitals in Shahroud, Northeast of Iran

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## Abstract

**Background:** Adequate research has been done on many factors associated with influenza vaccine uptake; however, some studies disagree on the relationship between socioeconomic status (SES) and the influenza vaccination.

**Objectives:** This study aims to investigate the relationship between SES (and related factors) and seasonal influenza vaccination in northeastern Iran.

**Methods:** This cross-sectional study was conducted in two tertiary hospitals in 2014. Demographic data was collected from the participants who were HCP (health care personnel) or were high-risk patients for the influenza disease. A principal component analysis (PCA) of the data was used to determine the participants' SES. Relevant statistical tests were then used to assess the association between influenza vaccinations and several independent variables, including demographic features, asset indices, and health-related factors.

**Results:** Of the 672 participants, 24.7% (166 people) had received an influenza vaccine within the past 12 months. The rate of vaccination in patients was 21.3% and 30.7% in HCPs ( $P = 0.007$ ). A higher SES was positively associated with a greater likelihood of vaccination in patients (adjusted odds ratio [AOR] = 2.7; 95% confidence interval [CI] = 1.35 - 5.43). However, there was no significant relationship between influenza vaccination and SES among HCPs. History of attending a training course on influenza vaccination was associated with vaccination coverage in both HCPs (AOR = 4.29; 95% CI = 2.39 - 7.69) and high-risk patients (AOR = 2.11; 95% CI = 1.24 - 3.56).

**Conclusions:** A low SES was associated with low rates of vaccination among high-risk patients. Higher vaccination rates were associated with attending a training course on the influenza vaccination among both HCPs and high-risk patients.

**Keywords:** Vaccine Uptake, Determinants, Seasonal Influenza, Iran

## 1. Background

The influenza virus is a major public health problem in our community. Infection increases morbidity, mortality, and duration of hospitalization, particularly in high-risk patients (1, 2). Annual vaccination is the most effective way to prevent influenza and related complications (3, 4). Vaccination of high-risk individuals and HCPs against influenza could help prevent the disease and even prevent or minimize the spread of influenza epidemics (5).

Since 2010 - 2011, the Advisory Committee on Immu-

nization Practices (ACIP) has recommended that all individuals older than six months receive annual vaccinations against the latest influenza strains, which are detected through viral surveillance data (6). Before 2010, only high-risk individuals and HCPs were required to receive the influenza vaccination (7). Currently, the Guidelines for Surveillance and Control of Influenza in Iran do not require that every individual over six months of age receive the vaccination. According to these guidelines, the influenza vaccine is recommended for HCPs, children, the elderly, weak or disabled people, people with chronic med-

ical conditions (such as individuals with respiratory disease, cardiovascular disease, or immunodeficiency), and pregnant women in their third trimester (8). However, in Iran, the influenza vaccine is not free of charge for all of these groups; therefore, the guideline does not guarantee vaccination.

Factors that affect the influenza vaccine uptake are well known and include age, gender, race, co-morbidities, and SES (9, 10). Although SES has been identified as an important factor affecting the influenza vaccination, the relationship between SES and influenza vaccination is still unclear (11, 12). Several studies have found a positive relationship between vaccination and high SES (12-14), while other studies do not report a correlation (11, 15).

A survey by Taheri Tanjani et al. found that the rate of the influenza vaccination in older adults in Iran is only 10.4%; the vaccination rate for other high-risk groups and HCPs was uncertain (16). Taheri Tanjani et al. investigated some factors affecting influenza vaccination rates; however, the study did not focus specifically on socioeconomic differences. In addition, their survey included only older adults and failed to examine other high-risk individuals and HCPs.

## 2. Objectives

To address this gap in the research, the current study will investigate the effect of SES on influenza vaccination rates in high-risk individuals and HCPs.

## 3. Methods

To assess influenza vaccination rates in HCPs and high-risk individuals (patients), a cross-sectional study was conducted in two tertiary hospitals in Shahroud, a city in northeastern Iran. The study received an ethics code (Ir.shmu.rec.1394.930.64) from Shahroud University of Medical Sciences. The study population included HCPs and patients in two hospitals in Shahroud. Sampling was conducted in two stages from June to August 2014. In the first stage, the quota of each ward in each hospital was calculated based on the proportion of HCPs and patients. In the second stage, participants representing a sample from each ward were randomly selected.

All participants were requested to complete the informed consent, and then they asked to respond to a questionnaire. The questions addressed demographic data, such as age, sex, job, and education. Participants were also questioned in regards to their employment history, health insurance status, disease history, and history of participation in a training course regarding the influenza vaccination. In addition, they were questioned on 33 SES-related

factors. These included questions regarding housing conditions, such as home ownership, the number of rooms in the house, home building materials, the presence of showers at home, the number of people living in a housing unit, and the presence of a separate area for cooking. Some SES questions addressed personal property, such as ownership of a private car or motorcycle, of an LCD or LED TV, or of a vacuum cleaner, washing machine, refrigerator, dishwasher, personal computer, or personal mobile phone; participants were also asked about their internet access and type of internet access. They were asked about the type of oven in their homes (microwave, electric, or cooking gas) and the presence of air conditioning or a water purifier in the house. The participants were also asked whether they had received an influenza vaccine in the past year or their lifetimes. Finally, the participants were questioned about their type of health insurance coverage, including basic or complementary health insurance for outpatient services.

### 3.1. Statistical Analysis

The response rate was 97.1%. Multiple imputation (MI) was used to replace the missing values based on a missing-at-random (MAR) assumption. A *t*-test and chi-square test were used to examine the univariate associations between influenza vaccine uptake and the independent variables. The SES index was determined using principal component analysis (PCA) (17, 18).

Variables with a P value lower than 0.2 in the univariate analysis were included in the PCA model, and the first component, with a total variance of 19%, and an Eigenvalue of 5.1 was used as the SES score. SES scores above the 80th percentile were categorized as rich, below the 40th percentile as poor, and those in the middle as moderate. The forward LR method was used to fit two separate multiple logistic regression models to HCPs and patients' groups; influenza vaccination was the outcome variable. SES, education, age, sex, and training on the influenza vaccination were entered simultaneously as independent variables. A two-sided P value < 0.05 was considered statistically significant. The odds ratio and 95% confidence intervals (95% CI) of the main variables were presented in the tables. Only the variables that were statistically significant in the univariate analysis ( $P < 0.2$ ) are listed. The primary analyses were performed using the Stata (version 11) and SPSS (version 18) software.

## 4. Results

The participants included 431 patients (64% of total participants) and 241 HCPs (36%). Four subjects were with-

drawn due to the fact that they did not complete the questionnaires fully. Of the 672 individuals, 24.7% (166) had received an influenza vaccine within the previous 12 months. The vaccination rate was 21.3% in patients and 30.7% in HCPs ( $P = 0.007$ ). The mean age of the patients was  $49.34 \pm 0.97$  years (mean  $\pm$  SE), and the mean age of the HCPs was  $30.36 \pm 0.89$ . The mean duration of the patients' education was  $6.84 \pm 0.31$  years, and the mean duration of the HCPs' education was  $15.43 \pm 0.26$  years. About 41% of the respondents were male. A total of 135 of the patients (31.3%) and 11 HCPs (4.6%) were living in rural areas. The HCPs included 40 physicians (16.6%), 29 paramedics (12.1%), 148 office workers (61.4%), and 24 administrators (9.9%). The patients included 63 individuals with upper-class jobs (14.6%), 91 with middle-class jobs (21.1%), 32 manual workers (7.4%), and 181 housewives (42.1%). A total of 64 (14.8%) patients were unemployed.

**Table 1** shows the univariate analysis. It illustrates the differences in vaccination rates according to SES factors. The variables shown in **Table 1** have a  $P$  value below 0.2.

As **Table 2** illustrates, the univariate analysis shows a significant association between vaccination rates and age, job, place of residence, the presence of chronic medical conditions, and attending a training course on the influenza vaccination. In particular, participation in a training course on the influenza vaccination was a strong determinant for vaccine uptake in both groups. Although the mean age of HCP participants had a significant relationship with vaccine uptake, age was a significant factor affecting influenza vaccination rates in all participants when age was divided into two categories: individuals under and over the age of 40. The vaccination rate for patients under 40 is 10.8% and 21.8% for patients over 40 ( $P = 0.004$ ). The vaccination rate for HCPs under 40 is 32.5% and 53% for HCPs over 40 ( $P = 0.007$ ). No correlation was found between literacy and influenza vaccination rates.

At the univariate level, no correlation was found between health insurance and influenza vaccination rates. However, when complementary insurance was assessed, a significant association was observed ( $P = 0.016$ ). The presence of a chronic medical condition was also associated with a higher rate of influenza uptake ( $P = 0.017$ ).

**Table 3** shows the association between influenza vaccination rates and SES as determined using the PCA method. Among HCPs, no relationship was identified between influenza vaccination rates and SES. However, there is a significant correlation between SES and vaccination rate among patients.

As shown in **Table 4**, logistic regression models were fitted in the patient and HCP groups. Influenza vaccination was the outcome variable. Age, SES, and participation in training on influenza vaccination were the independent

variables.

Among HCPs, the odds of influenza vaccination increased by 5% with every year of age. The odds of influenza vaccination were twice as high among patients who had attended a training on the influenza vaccination as among those who had not; they were four times higher among HCPs who had attended such training. Furthermore, the odds of the influenza vaccination among wealthy patients were 2.7 times higher than poor patients. However, there was no significant association between income and vaccination among HCPs.

## 5. Discussion

Of the participants in the present study, around one-fifth of the patients and one-third of HCPs had received an influenza vaccination in the previous year. Patients with low SES were less likely to be vaccinated than those with a higher SES. Other factors, such as age and history of attending a training course on influenza vaccination, were associated with a higher rate of vaccine uptake in both groups (HCPs and patients). Overall, the highest OR of the influenza vaccination in both groups was among those who had attended a training course on the influenza vaccination.

This study also found that the rate of influenza vaccination was higher among HCPs than among patients. This finding is consistent with the results of studies in other parts of the world (6, 7, 19). However, only about one-third of the HCPs in this study had received vaccines. This suggests that the vaccination rate among HCPs in Iran does not comply with the recommendations of the WHO and the Ministry of Health; according to WHO recommendations, the vaccination of HCPs must be considered a priority in all countries (19). Although in a cross-sectional study on 144 health workers to assess their attitude and knowledge regarding the influenza vaccine, in Tehran, the coverage of the influenza vaccination in 2008 - 2009 was reported at 66.9%. The reason for the difference may be due to the greater availability of vaccine in the center of the country (20). Studies in other parts of the world have also found suboptimal influenza vaccination rates; according to three studies, the rate of influenza vaccinations among HCPs is 16.36% in Greece, 20.8% in Italy, and 33.9% in France (2, 21, 22). Some other countries have also reported a low rate of the influenza vaccination among HCPs (23-27). In contrast, one report found that 89.6% of HCPs working in US hospitals received the influenza vaccine in 2012 - 2013 (28).

The current study also found a suboptimal vaccination rate among at-risk patients, which is also in line with previous research. Other studies have reported patient vaccination rates of 17.3% in Italy and 33% in the US (10). A re-

**Table 1.** The Univariate Association Between Outcome Variables and Factors Associated with SES in both Groups<sup>a</sup>

Variables	Patients (N = 431)		P Value	HCPs (N = 241)		P Value
	Flu Vaccination Uptake			Flu Vaccination Uptake		
	No (N = 339)	Yes (N = 92)		No (N = 167)	Yes (N = 74)	
<b>Personal computer</b>			< 0.0001			0.611
Yes	120 (88.9)	15 (11.1)		40 (66.7)	20 (33.3)	
No	219 (74)	77 (26)		127 (70)	54 (30)	
<b>Washing machine</b>			0.002			0.486
Yes	79 (90.8)	8 (9.2)		21 (75)	7 (25)	
No	260 (75.6)	84 (24.4)		146 (68.5)	67 (31.5)	
<b>Microwave</b>			0.036			0.001
Yes	56 (70)	24 (30)		70 (59.3)	48 (40.7)	
No	283 (80.6)	68 (19.4)		97 (78.9)	26 (21.1)	
<b>Private car</b>			0.105			0.028
Yes	134 (74.9)	45 (24.1)		102 (64.6)	56 (35.4)	
No	205 (81.3)	47 (18.7)		56 (75.7)	18 (24.3)	
<b>Air conditioning</b>			0.010			0.907
Yes	18 (60)	12 (40)		35 (68.6)	16 (31.4)	
No	321 (80)	80 (20)		132 (69.5)	58 (30.5)	
<b>Dishwasher</b>			0.003			0.007
Yes	27 (61.4)	17 (38.6)		43 (57.3)	32 (42.7)	
No	312 (80.6)	75 (19.4)		124 (74.7)	42 (25.3)	
<b>Access to the Internet</b>			0.030			0.438
Yes	19 (70.4)	8 (29.6)		10 (71.4)	4 (28.6)	
No	320 (79.2)	84 (20.8)		157 (69)	70 (31)	
<b>Motorcycle ownership</b>			0.295			0.007
Yes	99 (83.2)	20 (16.8)		47 (84)	9 (16)	
No	247 (77.4)	72 (22.6)		120 (64.9)	65 (35.1)	
<b>Private home</b>			0.188			0.081
Yes	250 (77.2)	74 (22.7)		100 (65.4)	53 (34.6)	
No	89 (83.2)	18 (16.8)		67 (76)	21 (24)	
<b>Household water purifier</b>			0.387			0.197
Yes	172 (80.1)	42 (19.9)		120 (67)	59 (33)	
No	167 (77)	50 (23)		47 (75.8)	15 (24.2)	

<sup>a</sup>Values are expressed as No. (%).

cent study in Iran found that influenza vaccination coverage was about 10%; however, the subjects of that study were chosen exclusively from among the elderly (16).

Razavy et al. also showed a rate of 10.7% influenza vaccine intakes in Iranian pilgrims (29). Due to the presence of pilgrims in high-risk groups, it is similar to the results of the present study.

According to a study that was conducted by Fazlollahi

et al. the influenza vaccination was current in 103 (59.54%) pediatric asthmatic patients (30). Getting more vaccine in their samples may be due to the recruiting of patients from a national registration center.

Previous studies on the socioeconomic determinants of the influenza vaccination rates have found a range of results. Jones et al. found no association between immunization rates and the household income of the respon-

**Table 2.** Univariate Association Between Outcome Variables and Independent Variables in Both Groups<sup>a</sup>

Variables/Categories	Patients (N = 431)			HCPs (N = 241)		
	Flu Vaccination Uptake		P Value	Flu Vaccination Uptake		P Value
	No (N = 339)	Yes (N = 92)		No (N = 167)	Yes (N = 74)	
<b>Age, y, mean ± SD</b>	48.85 ± 20.36	51.59 ± 18.60	0.245	27.53 ± 13.78	35.41 ± 10.84	< 0.0001
<b>Sex</b>			0.160			0.256
Male	131 (75.3)	43 (24.7)		74 (73.3)	27 (26.7)	
Female	208 (81.0)	49 (19.0)		93 (66.4)	47 (33.6)	
<b>Job position</b>						
Unemployed	58 (90.6)	6 (9.4)	< 0.0001	-	-	-
Housewife	148 (81.8)	33 (18.2)		-	-	
Worker	28 (87.5)	4 (12.5)		-	-	
Middle class job	73 (80.2)	18 (19.8)		-	-	
Upper class job	32 (50.8)	31 (49.2)		-	-	
Physician	-	-	-	27 (67.5)	13 (32.5)	0.878
Paramedical	-	-		20 (69)	9 (31)	
Staff	-	-		102 (68.9)	46 (31.1)	
Administrative	-	-		18 (75)	6 (25)	
<b>Place of residence</b>			0.006			0.453
Urban area	222 (75)	74 (25)		159 (69.1)	71 (30.9)	
Rural area	117 (86.7)	18 (13.3)		8 (72.7)	3 (27.3)	
<b>Health insurance</b>			0.094			0.327
Yes	311 (78.7)	84 (21.3)		158 (69)	71 (31)	
No	28 (77.8)	8 (22.2)		9 (75)	3 (25)	
Complementary	68 (70.8)	28 (29.2)		54 (70.1)	23 (29.9)	
<b>Presence of chronic medical conditions</b>			0.017			0.548
No	238 (86)	38 (14)		146 (69.0)	66 (31.0)	
At least one	101 (65)	54 (35)		21 (72.4)	8 (27.6)	
<b>Training on influenza vaccination</b>			0.003			< 0.0001
Yes	51 (66.2)	26 (33.8)		47 (51.6)	44 (48.4)	
No	288 (81.4)	66 (18.6)		120 (80)	30 (20)	
No	167 (77)	50 (23)		47 (75.8)	15 (24.2)	

<sup>a</sup>Values are expressed as No. (%) unless otherwise indicated.

dents (31). However, the current study found a significant relationship between SES and influenza vaccination rates among high-risk patients. This is consistent with the results of a study by Landi et al. which found that SES is significantly associated with vaccination rates. According to that global study, lower SES is associated with low influenza vaccination rates (32). Another study in Italy also found a correlation between low SES and lower rates of the influenza

vaccination (14). In contrast, Shuangsheng Wu et al. in China (30), and Ryu et al. in South Korea (15), found that individuals with a lower SES are more likely to receive the influenza vaccine. A US study also reported a direct association between low SES and higher vaccination rates in individuals over 50 years old (31).

In the present study, no significant relationship was found between SES and influenza vaccination rates among

**Table 3.** Association Between Influenza Vaccination and SES<sup>a</sup>

Socioeconomic Status	Patients		HCPs	
	Receiving Influenza Vaccination	Not Receiving Influenza Vaccination	Receiving Influenza Vaccination	Not Receiving Influenza Vaccination
Poor	60 (28.2)	153 (71.8)	19 (33.9)	37 (66.1)
Moderate	61 (39.4)	94 (60.6)	48 (43.3)	63 (56.7)
Rich	30 (47.6)	33 (52.4)	36 (48.6)	38 (51.4)
P value	0.001	0.094		

Abbreviation: SES, socioeconomic status.

<sup>a</sup>Values are expressed as No. (%).**Table 4.** Comparing the Multiple Logistic Regression Models in Both Groups

Variables	Patients		HCPs	
	OR (95% CI for OR)	P Value	OR (95% CI for OR)	P Value
Age	1.03 (1.015 - 1.41)	0.000	1.05 (1.021 - 1.070)	0.000
Training on influenza vaccination	2.11 (1.241 - 3.582)	0.006	4.29 (2.390 - 7.690)	0.000
SES (ref. group: Poor)		0.011		0.231
Rich	2.70 (1.110 - 7.411)	0.005	2.94 (0.170 - 6.803)	0.149
Moderate	1.64 (0.312 - 1.202)	0.154	4.76 (0.105 - 8.219)	0.091
Constant	0.78	0.509	0.13	0.000

HCPs. This lack of association may be due to hospital vaccination policies, due to the fact that many hospitals provide free vaccines to employees. This suggests that it is necessary to adopt a nationwide vaccination policy (33). Lee et al. found that the vaccination rate among eligible individuals nearly doubles when the vaccine is provided free of charge (34). In a recent study in Beijing, the implementation of a free vaccination policy led to a significant increase in vaccination rates (35).

In accordance with previous reports, this study also found that influenza vaccination rates increase with age (16, 31). This is due to the fact that older people are more likely to visit healthcare centers and receive more information and services; therefore, they are more likely to receive vaccines (30). Another reason for the higher rate of influenza immunization among the elderly is the presence of morbidity conditions in this age group. Some studies have found that influenza vaccination rates decrease in the absence of chronic medical conditions (15, 31, 36, 37). The current study also found that the influenza vaccination rate was significantly higher in subjects with at least one reported chronic medical condition.

Although many other studies have reported an association between higher education level and vaccination rates (38-41), this study found no correlation between educational level and influenza immunization. This finding is consistent with the results of the studies by Jones et al. (31),

Sarria-Santamera and Timoner et al. (36), and Andrew et al. (37) The current study also found that attending a training course on influenza vaccination was associated with a higher vaccination rate.

In contrast to some other studies, this study did not find any correlation between influenza vaccination rates and basic insurance status in the studied group (41). However, a positive relationship was identified between complementary health insurance and vaccine uptake. In Iran, having complementary health insurance for outpatient services does not guarantee an influenza vaccination (42). This finding is consistent with the results of a recent study in Iran (16), which found an association between high insurance levels and access to preventive health care services as well as a better understanding of healthy lifestyles and, consequently, the importance of vaccination.

So far, few studies have examined the correlation between SES and influenza vaccination rates in high-risk individuals and HCPs. However, this study has several limitations. The first is one of the usual limitations of retrospective surveys, i.e., recall bias since it was based on self-reports. Second, this study included only a small sample of HCPs, which might have caused the lack of significant relationships between some variables and influenza vaccine uptake. Third, data was collected only from a small geographic area and not nationwide.

### 5.1. Conclusions

Low SES was associated with low vaccination rates in at-risk populations. Furthermore, higher vaccination rates were associated with attending a training course on influenza vaccination in both HCPs and high-risk individuals. No significant association was identified between vaccination rates and education levels.

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### Footnotes

**Authors' Contribution:** Conception and design: Seyed Mohammad Mirrezaie, Mohammad Shariati, Parastoo Hanifehzad Masooleh; Literature search, data acquisition, analysis and interpretation of data: Seyed Mohammad Mirrezaie, Roqayeh Aliyari, Shakiba Imani, Tooba Rezaei; drafting the manuscript: Seyed Mohammad Mirrezaie, Mohammad Shariati, Roqayeh Aliyari, Shakiba Imani, Tooba Rezaei, Parastoo Hanifehzad Masooleh; critical revision of the manuscript for important intellectual content: Seyed Mohammad Mirrezaie, Mohammad Shariati, Roqayeh Aliyari, Shakiba Imani, Tooba Rezaei, Parastoo Hanifehzad Masooleh.

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