

# Influenza Vaccination Coverage Determinants among Employees of the Nazareth Hospital in Israel

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**ABSTRACT:** **Background:** Health care workers bear the risk of both contracting influenza from patients and transmitting it to them. Although influenza vaccine is the most effective and safest public health measure against influenza and its complications, and despite recommendations that HCWs be vaccinated, influenza vaccination coverage among them remains low.

**Objectives:** To characterize influenza vaccination coverage and its determinants among employees in an Arab hospital in Israel.

**Methods:** An anonymous self-administered questionnaire was distributed among employees involved in patient care in the winter of 2004–2005 at Nazareth Hospital in Israel. The questionnaire included items related to health demographic characteristics, health behaviors and attitudes, knowledge and attitude concerning influenza vaccination, and whether the respondent had received the flu shot during the previous winter or any other winter.

**Results:** The overall rate of questionnaire return was 66%; 256 employees participated in the study. The immunization coverage rate was 16.4%, similar to that reported for other hospitals in Israel. Logistic regression analysis demonstrated that influenza vaccination coverage was significantly and solely associated with the presence of chronic illness and influenza vaccination.

**Conclusions:** Influenza vaccination coverage among Nazareth Hospital health care workers was low. They did not view themselves as different from the general population with regard to vaccination. Three years after the study, an intervention program was launched with the aim of increasing knowledge on the efficacy and safety of the vaccine; it stressed the importance of vaccinating HCWs and administering the vaccine at the workplace. The program led to a 50% increase in vaccination coverage.

**KEY WORDS:** influenza, vaccination coverage, health care workers, factors affecting uptake

*IMAJ* 2010; 12: 338–341

Influenza causes substantial morbidity and mortality worldwide. In the United States about 5%–20% of the population suffer from influenza annually, resulting in about 36,000 deaths. Influenza and pneumonia (the most serious influenza complication) constitute the seventh leading cause of death in the U.S., and the fifth leading cause of death among individuals older than 65 [1-3].

The economic costs from influenza-related morbidity and mortality are significant. Molinari et al. [3] recently estimated that annual influenza epidemics in the U.S. result in an average of more than 600,000 life-years lost, 3 million hospitalization days, and 31 million outpatient visits, with a total economic burden of \$87 billion. Implementation of 100% vaccination coverage for all risk groups in France, Germany, Italy, Spain and Britain would result in estimated savings of 39 million Euros from reduced primary care visits and a further savings of 1.6 billion Euros in reduced hospitalizations in these countries [4].

For the general population and for high risk groups, influenza vaccination is the most effective and safest public health measure. Health authorities worldwide recommend annual administration [1,2,5]. The effectiveness of vaccination is substantial when circulating virus strains match with the vaccine [6,7]. Large observational studies point to the effectiveness of influenza vaccination across age and risk groups [5,8-10].

Health care workers carry a high risk of both contracting influenza from patients and transmitting it to patients [11,12]. Vaccination of HCWs reduces influenza infection among staff and significantly reduces patient mortality and influenza-like illness [12,13]. Despite long-standing worldwide recommendations and the documented benefits of vaccination, the coverage among HCWs remains low: 11% in Israel and up to 42% in the U.S. [1,14]. The main reasons for refusing vaccination are disbelief in the severity of influenza, concern about vaccine effectiveness, and fear of side effects [14-17]. On the other hand, a study among Israeli nurses found that vaccine acceptance was high and was linked to perceived benefits and reminders to get the shot [18]. Not many Israeli studies included occupation, health behavior and previous vaccination history, although these variables

HCWs = health care workers

are related to influenza vaccination coverage among HCWs [14,18,19].

The present study characterizes knowledge, attitudes and coverage relating to flu prevention among Arab employees of a hospital in northern Israel.

### SUBJECTS AND METHODS

The study population comprised Nazareth Hospital's 386 employees engaged in patient care (not including hospital maintenance staff), most of whom were Arabs. The purpose of the research was to investigate the employees' influenza vaccination coverage in the winter of 2004–2005 (performed out of hospital in health management organization clinics) and to probe associations with health demographic factors, knowledge and attitudes. In this cross-sectional survey conducted in April 2005, we used an anonymous self-administered questionnaire, which was a validated translation of the questionnaire developed and used by the Immunization Research Group, Department of Family Medicine, University of Pittsburgh [20], and by Habib et al. (2000) [14].

#### DEMOGRAPHIC AND HEALTH DATA

Self-administered questionnaires were distributed to employees in the first week of April 2005. The questionnaire included 39 items on demographic and health characteristics (age, gender, occupation, religion, religiosity, education, presence of chronic diseases), health behaviors (smoking, physical activity, history of vaccination against influenza and hepatitis B) and knowledge and attitudes (toward immunization and influenza vaccination, as well as perceived efficacy and safety).

#### STATISTICAL ANALYSIS

The statistical analysis was performed using SPSS® software. We first performed descriptive analysis of the demographic and health variables potentially affecting the influenza vaccination rate. We used either chi-square or Fisher exact test, depending on the distribution of the data. Significant factors were included in the model, and forward stepwise multiple logistic regressions were performed. A *P* value less than 0.05 (two-tailed) was considered statistically significant and set as the significance threshold for filtering out variables in the multiple logistic regression analysis.

### RESULTS

Completed questionnaires were returned by 256 (66.3%) of the HCWs. The mean age, gender distribution and occupation category did not significantly differ between respondents and all the employees of the hospital (according to the hospital's Human Resources department data). Of the 256 HCWs, 42 (16.4%) received the flu shot. In univariate

**Table 1.** Characteristics of health care workers by vaccination status against influenza in Nazareth Hospital, winter 2004–2005 (percentages in parenthesis)

	Vaccinated N=42 (16.4)	Non-vaccinated N=214 (83.6)	<i>P</i> value
Female gender	21 (50.0)	134 (62.6)	0.167
Mean age (yrs, SD in parenthesis)	42.9 (11.2)	38.0 (9.4)	0.003
Mean duration of employment (yrs, SD in parenthesis)	17.1 (10.8)	13.0 (8.8)	0.010
<b>Occupation</b>			
Physician	11 (26.2)	34 (15.9)	–
Nurse	18 (42.9)	104 (48.6)	0.168
Health care assistant/paramedical specialties	2 (10.0)	31 (23.0)	0.036
Other	11 (28.6)	45 (21.5)	0.631
<b>Level of education</b>			
Less than high school	1 (2.4)	26 (12.1)	–
High school	16 (38.1)	68 (31.8)	0.086
College/Academic degree	25 (59.5)	120 (56.1)	0.105
Presence of chronic diseases	13 (31.0)	11 (5.1)	< 0.001
Previous influenza vaccination	26 (61.9)	19 (9.0)	< 0.001
Regular exercise	30 (71.4)	131 (61.2)	0.223
Smoking	8 (19.0)	39 (18.2)	0.900
Vaccinated against hepatitis B	32 (76.2)	168 (78.5)	0.740
<b>Knowledge of and attitude about influenza vaccination</b>			
Influence on the immune system	36 (85.7)	140 (65.4)	0.009
Complying with target groups recommendations	34 (81.0)	188 (87.9)	0.222
Perception of him/herself in target group	34 (81.0)	119 (55.6)	0.002
Belief that vaccine is effective	29 (69.0)	123 (57.5)	0.174
Non-recipients are more prone to influenza	23 (54.8)	57 (26.6)	< 0.001
Agrees with compulsory vaccination of HCWs	28 (66.7)	107 (50.0)	0.048

analysis, the immunization rate was significantly associated with age, years of employment, presence of chronic diseases, and previous influenza vaccination. "Perception of HCWs in the target groups for influenza vaccination," and a positive attitude toward the phrase "vaccine's non-recipients are more prone to influenza" and "agree with compulsory vaccination of HCWs" were also significantly associated with immunization rates. Gender, occupation, smoking, regular exercise and vaccination against hepatitis B were not significantly associated with getting the flu shot [Table 1].

Logistic regression analysis demonstrated a significant association only with a previous influenza vaccination (odds ratio 3.5, 95% confidence interval 6.03–30.3) and the presence of chronic diseases (OR 4.9, 95% CI 1.7–14.4). No statistically significant associations were found with the demographic variables or variables of knowledge and attitudes regarding influenza vaccination [Table 2].

### DISCUSSION

We found a low rate of vaccination (16.4%) against influenza among employees involved in patient care in Nazareth

OR = odds ratio  
CI = confidence interval

**Table 2.** Logistic regression model on the factors affecting the vaccination against influenza among health care workers in Nazareth Hospital in the winter of 2004-2005<sup>§</sup>

Explanatory variable	Dependent variable			
	Influenza vaccination status			
	Regression coefficient*	P value**	Odds ratio	95% Confidence interval
<b>Significant variables (variables in the model)</b>				
Presence of chronic diseases	1.599	0.003	4.946	1.699–14.401
Previous influenza vaccination	2.604	< 0.001	13.524	6.028–30.341
Constant	-2.653	< 0.001	0.070	
<b>Insignificant variables (excluded variables)</b>				
	Score		Significance	
Age (yrs)	0.063		0.802	
Duration of employment (yrs)	0.061		0.806	
Influence on the immune system	3.414		0.065	
Non-recipients are more prone to influenza	2.635		0.105	
Perception of him/herself in target group	3.123		0.077	
-2 Log likelihood – 165.700				

Hosmer and Lemeshow test: chi-square 0.419, significance 0.518

<sup>§</sup> Variables are reported in alphabetical order; number of observations = 253; method = binary logistic regression / forward stepwise (likelihood ratio).

\* Unstandardized regression coefficient

\*\* Actual significance

Hospital, which was similar to the vaccination rate (10%–15%) in the general Israeli population a decade earlier [14,18]. Recent data from Europe, Canada and the U.S. demonstrate widely varying rates of vaccination coverage (2%–82%) among HCWs, with high coverage during vaccination campaigns, particularly in the U.S. [1,16].

In the present study we noted only two significant variables associated with influenza vaccination coverage: previous influenza vaccination and presence of chronic diseases. In contrast to recent studies which revealed associations with attitudes and knowledge regarding influenza vaccination [16,19,21,22], our study demonstrated only borderline statistical significance with similar variables. Agreeing with a law mandating vaccination of health care workers did not differ between vaccinated and non-vaccinated persons (the hypothetical question in the questionnaire was formulated as: "Do you agree with mandatory vaccination by law among health care workers, yes or no?").

The Israel Central Bureau of Statistics Health Survey and other studies using the ICBS survey data demonstrated that individuals with a chronic disease were more likely to get a flu shot than those who had no chronic disease, which is comparable to our results [23,24]. The association of vaccination coverage with previous vaccination was also demonstrated in previous studies [22,23,25].

ICBS = Israel Central Bureau of Statistics

An earlier study performed in Haifa's general hospitals found that female gender, recommendation by the hospitals' administration to get the vaccine, and high level of awareness were associated with a high vaccination rate [14]. A recent study among HCWs of Clalit Health Services in Jerusalem (the largest of the four health funds in Israel) revealed a twice-higher vaccination rate (30.2%) than in our or the Haifa study [19]. Additional significant factors in the Jerusalem study associated with influenza vaccination coverage were physician's specialty, knowledge and attitudes towards immunization, previous immunization or immunization anytime in the past, and the family doctor's recommendation to vaccinate [19].

Our study demonstrated that HCWs at Nazareth Hospital did not view themselves as different from the general population with regard to vaccination. Our findings showed that vaccination coverage against influenza among this group of Arab HCWs is low and similar to that of Jewish HCWs in the rest of the country. We conclude that in the absence of an intervention program focusing on the specific obligation of HCWs to be immunized in order to protect their patients, vaccination coverage remains low [16].

Such a program was implemented at Nazareth Hospital 3 years after this study was completed. The 2007/2008 vaccination campaign, entitled "Nazareth Hospital Vaccinated and Protected against Flu," was led personally by the general director of the hospital. It focused on self- and patient protection and included staff meetings and personal and group counselling, together with ongoing reports in the hospital's newsletter of achievements by hospital units. Instead of getting the vaccine in the health fund clinics, it was provided at the worksite itself. Mobile vaccination staff moved between departments and vaccinated employees at each shift. The campaign resulted in a vaccination rate of about 50%. The campaign led to the conclusion that vaccination in the workplace is the most effective intervention to improve coverage (Dr. B. Bisharat, personal communication, 2009).

#### Acknowledgments:

We express our gratitude to personnel of Nazareth Hospital, Nazareth, Israel.

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