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Factors affecting the willingness of nursing students to receive annual seasonal influenza vaccination: A large-scale cross-sectional study

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Abstract

Nursing students are at high risk of exposure to vaccine-preventable diseases such as seasonal influenza. However, due to the limited number of studies conducted in this area, the prevalence and factors affecting annual seasonal influenza vaccination (ASIV) uptake remain unclear. This was a large-scale cross-sectional survey study conducted among 902 nursing students in different years of study. The questionnaire was developed based on the Health Belief Model (HBM), and logistic regression was used to determine the predictors of ASIV uptake. The results of our study reveal that only 15.2% of nursing students declared having the vaccine in the previous year, and that ASIV uptake was self-reported. ASIV uptake was associated with perceived susceptibility (odds ratio = 2.76), perceived seriousness (odds ratio = 2.06) and perceived barriers (odds ratio = 0.50). The odds of receiving ASIV were 17.96 times higher for those participants having had ASIV at least once than those who had not received ASIV in the previous five years. In addition, the odds of receiving ASIV were 4.01 times higher for master's than undergraduate students. Our study concludes that the ASIV uptake among nursing students is low. In order to increase vaccination uptake in subsequent years, future studies should promote vaccination based on HBM, focusing on nursing students in undergraduate studies by emphasizing not only vaccination knowledge, but also their social responsibility to protect patients. Influenza vaccination can be viewed as an ethical professional responsibility and a patient safety issue, as well as being an infection control strategy.

Keywords: Influenza vaccination; Nursing students; Health Belief Model; Public health

1 Introduction

Nursing students are healthcare workers (HCWs), who are at high risk of exposure to vaccine-preventable diseases such as seasonal influenza while providing direct patient care during their clinical placement [1,2]. Seasonal influenza is an acute illness of the respiratory tract, caused by influenza viruses and affecting all age groups [3]. The virus is transmitted easily from person to person through droplet and direct contact [3,4]. It is significantly associated with hospital admissions and hundreds of deaths annually [4–6]. When seasonal influenza spreads to a global level and develops into a new virus by undergoing genetic changes, it can result in an influenza pandemic against which humans lack immunity [7]. Influenza infection outbreaks occurring in hospitals can have far more serious consequences than in the community, because an increasing proportion of hospital patients are elderly and/or immunocompromised [8]. Proactively, annual seasonal influenza vaccination (ASIV) is the most effective way to prevent the disease and its severe complications [4]. HCWs are considered a high-risk group recommended for ASIV [3,4]. This recommendation has two purposes: one is to protect HCWs from the infection, and the other is to prevent the transmission of acquired infection to patients or other staff, thereby reducing institutional outbreaks [9].

Despite the recommendation for ASIV by the CDCs (2016), WHO [4] and many countries [10], fewer than 60% of HCWs in various countries, such as France [11], the United Kingdom (UK) [12], Iran [13] and Hong Kong [14] are vaccinated. Among various health professions, nurses are persistently low in ASIV uptake [8,15–19], although their risk for influenza infection should be the highest since they provide direct care to patients with known or even unknown infection status [2].

Among nursing personnel, nursing students might be the most vulnerable group because they are required to provide direct patient care as learners. On the other hand, they are college students who already experience a high prevalence of influenza-like illness [20]. Additionally, nursing students are the future healthcare workforce, yet they are uniquely positioned in the college environment where education can be delivered and attitudes shaped early regarding future vaccination behaviours. Early education on ASIV might change the vaccination uptake among nurses. However, literature on the coverage of ASIV shows that the target participants in most studies were nurses and physicians; studies on nursing students remain limited. Only four such studies have been conducted, in the UK [16,21], Israel [19] and the United States (USA) [22], where the ASIV is recommended, but not mandatory, for nursing students. The ASIV uptake varied from 21% to 79% depending on the sample size, type of nursing students, and country of the study. The ASIV uptake in a USA study was 79% [22], but might not be generalizable due to the small sample size of 58. The other three studies, with sample sizes from 131 to 430, found that the ASIV uptake was from 21% to 34.1%, or lower than that of nurses. In Israel [19], with a sample size of 299, the uptake was 34.1%. This may have been country-specific, in addition to the fact that more than 90% of the nursing students in the study were female, so this might not represent the uptake of male students. Additionally, only two studies used regression analyses to identify the predictors; one used the Health Belief Model (HBM) [19] and the other used the Theory of Planned Behaviour to guide the study [16].

This survey study was designed using the HBM to explain and predict health-protecting or disease-preventing behaviours [23]. It proposed that the likelihood of an individual performing a specific preventive behaviour is affected by their weighing of perceived benefits of and barriers to that preventive behaviour, namely their perceived threat of a specific illness, which is interactively influenced by their perceived susceptibility to and the severity of the illness, as well as cues to actions. Given the limited studies available, the prevalence and factors affecting ASIV uptake among nursing students remain unclear. Thus, the aim of this study was to fill these research gaps, and to investigate the prevalence of ASIV among nursing students and the predictors of their ASIV uptake using HBM to guide the study.

2 Methods

2.1 Design and subjects

This was a cross-sectional self-administered survey study. A convenience sampling method was used to recruit nursing students from the Hong Kong Polytechnic University from September to November 2011. It has been a routine practice to encourage nursing students to receive ASIV through email distributed by the university health clinic. Health care students including nursing students who are required to provide patient care in healthcare institutions are free of charge to receive ASIV at the university health clinic. But mandatory vaccination programmes particularly for nursing students are not available in Hong Kong.

Nursing students from pre-registration higher diploma, bachelor's and master's programmes were invited to complete the study questionnaire in classroom settings in a voluntary basis. Nursing students from higher diploma and bachelor's programmes were admitted based on their high school study results, while those from master's programmes were based mainly on their non-nursing degrees. Nursing students with local registered nurse licenses were excluded from the study. Ethical approval for the study procedures was obtained from the Hong Kong Polytechnic University to conduct the study.

2.2 Instrument

The study questionnaire was developed based on the literature review and questionnaires from [24,19], with the guidance of the HBM [23]. Permission to use and modify the original questionnaire was sought from the authors. The study questionnaire was also modified based on a panel of four experts in the area of infection control and relevant research, and on the two-week test-retest reliability among ten nursing students. The results showed that the questionnaire was valid and reliable, with a content validity index of 0.96 and reliability of 0.94. The Cronbach's alphas of the study subscales were reliable, ranging from 0.55 to 0.84 with an overall Cronbach's alpha of 0.82.

The survey questionnaire had three sections. First, nine items asked about participants' personal information: programmes, years of study, age, gender, marital status (single or married), ASIV in last flu season (yes or no), number of times receiving ASIV in the last five years, intention to get ASIV in the coming year (yes, no, or not sure), and reasonable cost of ASIV.

Second, participants were asked about their perceptions of ASIV. This section was developed based on the HBM and consisted of 56 items with seven subscales. They were all measured on a four-point Likert scale (1 = strongly disagree to 4 = strongly agree). Perceived susceptibility was measured by four items (e.g. "I am likely to get the flu if I do not get a yearly flu shot"). Perceived seriousness was assessed by seven items (e.g. "Flu can cause serious complications"). Perceived benefits were evaluated by eight items (e.g. "Flu shots can prevent me from getting the flu"). Perceived barriers were measured by nine items (e.g. "Flu shots are painful"). Cue to action was assessed by eight items (e.g. "I got the flu shot because my family encouraged me to do so"). Knowledge was evaluated by 13 items (e.g. "People aged 65 and older who do not get a flu shot can get a more severe case of the flu"). Health motivation was measured by seven items (e.g. "I have consistently had a physical examination at least once a year for the past 5 years"). The average score of each subscale was calculated, higher scores representing greater agreement with the respective subscale.

The last section consisted of four items asking participants for their health information. Those items included rating their health status on a four-point Likert scale (0 = poor to 3 = excellent), number of times visiting a

physician in the previous 12 months, suffering from any chronic illnesses (such as asthma, hypertension, etc.) with yes or no answers, and number of times suffering from flu or flu-like symptoms in the previous six months.

2.3 Data analysis

The Statistical Products and Services Solutions (SPSS) for Windows 22.0 (SPSS, Inc, Chicago, IL), was used for analysing all collected data. Descriptive statistics such as means, standard deviations, and percentages were used to describe all the variables under study. Parametric statistics were used for analyses because the data were assumed to be normally distributed since the sample size was far greater than 100 [25]. The dependent variable of receiving ASIV or not in the last influenza season was dichotomous. Bivariate analyses such as the chi-square test and independent *t*-test, would be performed to determine the relationship between the independent variables and the ASIV uptake. Those independent variables with significant relationship with the ASIV uptake were checked for mulitcollinearity, and then were entered in the logistic regression to determine the predictors of ASIV uptake. The level of statistical significance was set at $p < 0.05$.

3 Results

Of 1200 eligible participants invited, 903 returned questionnaires. One questionnaire was considered invalid because the dependent variable item was not answered. Thus, 902 valid questionnaires were used for data analysis, giving a relatively high response rate of 75.2%.

3.1 Characteristics of participants

The 902 participants (Table 1) were predominately female and from bachelor's programmes, which was consistent with the gender ratio and programme distribution of students enrolled in the programmes. In general, they considered their health status fair to good. Only a few had chronic diseases such as asthma (2.7%, n = 24), anemia (1.0%, n = 9), heart diseases (0.6%, n = 5), or bronchitis (0.1%, n = 1), while none of them had hypertension, diabetes, cancer, or emphysema. Two thirds of them (n = 597, 66.4%) had influenza or influenza-like symptoms in the previous six months. About half of them (49.0%, n = 441) had consulted a physician once or twice in the previous 12 months.

Table 1 Characteristics of the participants (N = 902).

Characteristics	Number (%)
Gender	
Male	271 (30.1%)
Female	630 (69.9%)
Marital status	
Single	893 (99.1%)
Married	8 (0.9%)
Programme	
Higher diploma	264 (29.3%)
Bachelor	557 (61.8%)
Master	81 (9.0%)
Year of study	
Year 1	366 (40.6%)
Year 2	190 (21.1%)
Year 3	211 (23.4%)

Year 4	135 (15.0%)
ASIV received in last influenza season	
Yes	137 (15.2%)
No	765 (84.8%)
No. of times receiving ASIV past 5 years	
None	506 (56.1%)
1–4 times	377 (41.8%)
Annually	19 (2.1%)
Plan to receive ASIV in the coming year	
Yes	275 (30.5%)
No	306 (33.9%)
Not sure	321 (35.6%)
Current health status	
Poor	27 (3.0%)
Fair	422 (46.9%)
Good	418 (46.4%)
Excellent	33 (3.7%)
	Mean (SD) (Range)
Age (N = 886)	21.09 ± 2.2 (Ranged from 18 to 32)
Perceived susceptibility (N = 861)	2.4 ± 0.5 (Ranged 1–4)
Perceived seriousness (N = 854)	2.7 ± 0.4 (Ranged from 1 to 4)
Perceived benefits (N = 861)	2.4 ± 0.4 (Ranged from 1 to 3.9)
Perceived barriers (N = 858)	2.3 ± 0.4 (Ranged from 1 to 3.56)
Cue to action (N = 860)	2.2 ± 0.5 (Ranged from 1 to 3.38)
Knowledge (N = 843)	2.8 ± 0.2 (Ranged from 1.85 to 3.54)
Health motivation (N = 859)	2.5 ± 0.3 (Ranged from 1.14 to 3.71)

Regarding ASIV, the 12-month prevalence of uptake was 15.2%. More than half of the participants had not received the vaccination in the previous five years. About one-third planned to get the vaccination in the coming year. Most of them (41.0%, n = 369) considered that it would be reasonable for the vaccination to be free of charge.

3.2 Comparisons between participants who received and those who did not receive ASIV last year

Table 2 shows the differences between participants who received and those who did not receive ASIV in the previous year. Participants were more likely to receive the vaccination if they were older, married, studying on a master's programme, studying in year two or year three, had received the vaccination in the previous five years, and planned to receive the vaccination in the coming year. In terms of the HBM, participants were more likely to receive the vaccination if they perceived high susceptibility, seriousness, benefits, cues to action, and health motivation but low barriers to the vaccination. Although the prevalence of uptake for male nursing students (12.5%, n = 34) was lower than that for females (16.3%, n = 103), the difference was not significant (χ^2 = 2.1, df = 1, p = 0.15). Other statistically non-significant associations included cost of vaccination (χ^2 = 1.7, df = 2, p = 0.43), general health (χ^2 = 0.2, df = 1, p = 0.62), number of times they had consulted a physician in the previous 12 months (χ^2 = 2.3, df = 3, p = 0.52), and number of times they had suffered from influenza or influenza-like symptoms in the previous six months (χ^2 = 0.2, df = 1, p = 0.70). In addition, knowledge of vaccination (*t*-test = −1.33, df = 841, p = 0.18) and chronic diseases were not associated with vaccination uptake.

Table 2 Bivariate analyses to determine the relationship between independent variables and the ASIV uptake by comparing participants who had and those who had not received ASIV (N = 902).

Characteristics	Receiving number (%)	Not receiving number (%)	p-value
Marital status	N = 137	N = 764	<0.0001
Single	132 (96.4%)	761 (99.6%)	(χ^2 14.0 df 1)
Married	5 (3.6%)	3 (0.4%)	(Phi 0.13)
Programme	N = 137	N = 765	<0.0001
Higher diploma	30 (21.9%)	234 (30.6%)	(χ^2 27.1; df 1)
Bachelor	79 (57.7%)	478 (62.5%)	(Phi 0.17)
Master	28 (20.4%)	53 (6.9%)	
Year of study	N = 137	N = 765	0.004
Year 1	44 (32.1%)	332 (42.1%)	(χ^2 13.2; df 3)
Year 2	42 (30.7%)	148 (19.3%)	(Phi −0.12)
Year 3	37 (27.0%)	174 (22.7%)	
Year 4	14 (10.2%)	121 (15.8%)	
No. of times receiving			
ASIV Past 5 Years	N = 137	N = 765	<0.0001
None	13 (9.5%)	493 (64.4%)	(χ^2 170.3; df 2)
1–4 times	110 (80.3%)	267 (34.9%)	(Phi 0.44)
Yearly	14 (10.2%)	5 (0.7%)	
Plan to receive ASIV in			
Coming year	N = 137	N = 765	0.029
No/not sure	58 (42.3%)	569 (74.4%)	(χ^2 56.3; df 1)
Yes	79 (57.7%)	196 (25.6%)	(Phi 0.25)

	Mean	SD	*t*-test (df)	P

Age	Receiving (n = 130)	21.62	2.59	−3.0 (884)	0.003
	Not Receiving (n = 756)	21.01	2.05		
Perceived susceptibility	Receiving (n = 124)	2.63	0.51	−5.8 (859)	<0.0001
	Not receiving (n = 737)	2.37	0.46		
Perceived seriousness	Receiving (n = 124)	2.81	0.42	−3.8 (852)	<0.0001
	Not receiving (n = 730)	2.66	0.42		
Perceived benefits	Receiving (n = 125)	2.59	0.43	−4.4 (859)	<0.0001
	Not receiving (n = 736)	2.41	0.41		
Perceived barriers	Receiving (n = 124)	2.13	0.42	3.8 (856)	<0.0001
	Not receiving (n = 734)	2.27	0.39		
Cues to action	Receiving (n = 124)	2.38	0.48	−4.1 (858)	<0.0001
	Not receiving (n = 736)	2.19	0.48		
Health motivation	Receiving (n = 122)	2.58	0.35	−2.6 (857)	0.01
	Not receiving (n = 737)	2.49	0.35		

Note: other independent variables were tested but their results were non-significant. Those variables included gender, cost of vaccination, general health, number of times consulting a physician in the previous 12 months, number of times suffering from influenza or influenza-like symptoms in the previous six months, knowledge of vaccination, and chronic diseases.

3.3 Predictors for receiving ASIV among nursing students

Multivariate logistic regression identified five predictors for ASIV uptake (Table 3). According to Nagelkerke's R^2, 38.3% variations in the outcome variable were explained by the logistic regression model. Six predictors of ASIV uptake have been identified. Nursing students who studied in master's degree, received ASIV in past five years with high perceived susceptibility, more perceived seriousness, and low perceived barriers would receive vaccination.

Table 3 Logistic regression analysis to identify predictors for ASIV uptake among nursing students (N = 902) with Nagelkerke's R^2 = 38.3%.

	OR	95% CI	p-value
Marital status			
Single (reference)	–	–	
Married	15.01	0.96–234.91	0.05
Programme			
Higher diploma (reference)	–		
Bachelor	1.83	1.00–3.34	0.05
Master	4.01	1.09–14.73	0.04
Year of study			

Year 1 (reference)	–	–	–
Year 2	1.93	0.98–3.78	0.06
Year 3	0.92	0.40–2.09	0.84
Year 4	0.59	0.21–1.70	0.33
No. of times receiving ASIV past 5 years			
None (reference)	–	–	–
Yes (more than 1 time)	17.96	8.69–37.12	<0.0001
Age	0.95	0.79–1.15	0.61
Perceived susceptibility	2.76	1.62–4.69	<0.0001
Perceived seriousness	2.06	1.12–3.80	0.02
Perceived benefits	1.48	0.78–2.78	0.23
Perceived barriers	0.50	0.26–0.95	0.04
Cues to action	1.15	0.66–2.01	0.63
Health motivation	1.21	0.60–2.48	0.59

4 Discussion

In this study, 15.2% nursing students reported having received ASIV during the previous influenza season, while fewer than 50% of them reported having received the vaccination in the previous five years, although more than 50% intended to receive the vaccination in the following year. There was no statistically significant gender difference, but the male nursing students had a lower vaccination uptake. On the other hand, our students' percentage of ASIV uptake was relatively lower than that among their counterparts in other countries (21~~% to~~ 79%) [19,22]. This could be explained by the study results of perceived low barriers as one of the predictors for ASIV uptake. The time to offer vaccination was during their examinations and assignment submission period. They might have been afraid of side effects from the vaccination affecting their test performance. This concern is supported by the study data showing that 72.9% (n = 654) of nursing students were concerned about having fever, muscle soreness, and allergic reactions from the vaccination. In addition, they might not have been fully aware that the vaccination was free in charge.

Our findings showed that previous vaccination was a strong predictor for ASIV uptake. This is well supported by other findings in nursing students [21], nurses [26] and healthcare workers [8,27]. Study results also showed that nursing students were more likely to receive ASIV if they have planned to receive ASIV and in their higher years of study. Thus, promoting vaccination to nursing students in junior years or undergraduate studies may be a strategic approach to increase vaccination uptake in subsequent years. Strategies such as integrating vaccination knowledge and the social responsibility to protect patients into the curriculum can be considered. Instilling professional attitudes is an important role of nursing schools to our next generation [28]. Influenza vaccination can be viewed as an ethical professional responsibility and a patient safety issue, as well as being an infection control strategy. Research evidence has shown that nurses who perceived vaccination as a professional responsibility were more likely to receive vaccination [26,29]. Occupational health and safety delegates within schools of nursing may play a role in encouraging nursing students to participate in their professional responsibilities towards society in terms of health-promoting behaviour [21,26].

This study has the strength of being theory-driven and was designed to use the HBM's modifiable variables to explain the health protection behaviours of influenza vaccination among nursing students. Theory-driven research has the value and ability to explain and predict outcomes. HBM was identified in a recent systematic review as the most frequently used behaviour change framework to predict influenza vaccine uptake among HCWs, including nurses and nursing students, in all reviewed studies [30]. Consistent with the previous work of Corace et al.~~, 2016~~ [30], this study demonstrated that all HBM evaluated constructs were successful in differentiating between vaccinated and non-vaccinated nursing students. Our study found that perception of being susceptible to influenza and perceived severity of influenza were able to predict whether nursing students would receive vaccination. Similarly, those who were vaccinated were more likely to report higher perceived susceptibility, perceived seriousness, and perceived efficacy of influenza

vaccination [30].

However, our study did not find perceived benefits to be a significant predictor. Perceived benefits was the most commonly reported variable in other studies [19,31–33]. These benefits include that the vaccine is safe, reduces infection risk for self and patients, and offers protection for one's family. The non-significant result in our study could be due to inadequate knowledge in this area among the nursing students. Our study found that 28.8% (n = 260) of nursing students did not believe the vaccination was safe, and 31.6% (n = 285), 44.4% (n = 401), 50.1% (n = 451) did not think the vaccination could protect them, their patients and their families respectively. This may be one of the reasons for the low vaccination uptake. Another plausible explanation is that they do not believe in the benefits but rather possess a negative attitude towards the vaccination. This notion needs to be further explored. Some nurses refused or were indecisive about vaccination based on having been 'significantly unwell' after previous vaccinations [26].

While the HBM is a promising tool to raise influenza vaccination uptake among HCWs [30], future studies are needed to develop and evaluate novel interventions based on the HBM with the aim of increasing uptake rates among nursing students. Future health-promoting interventions should focus on the HBM variables identified in the current study. A health education approach should include the risks of pandemic influenza outbreak [34] and virus mutation, attitudes relating to the efficacy and safety of influenza vaccination, the benefits to self and others [30], and knowledge of influenza vaccine recommendations [19,32,33]. Research evidence suggests that educational interventions highlighting the benefits of vaccination and addressing safety concerns are likely to be effective [34,35]. Cues for action may be considered as useful strategies to improve uptake. In places where telecommunication is readily accessible, the use of mobile health technologies such as short message service may be incorporated into future interventions to provide a timely reminder as a cue for action [36].

This study has several limitations. The large survey sample was taken from one university's school of nursing. Thus, the findings may not be representative of the situation of influenza vaccination uptake among nursing students in Hong Kong as a whole. However, it is important to note that this school is one of the largest schools of nursing in the region. Secondly, although there was a high response rate (75%), the non-response rate may affect the accuracy in target population estimates. Since non-respondents' data were not collected, this makes it difficult to reveal whether those who did not respond were significantly different from those who responded. As a result, there may have been non-response bias. Thirdly, this survey data was collected based on self-reporting, which poses a risk of potential recall bias. Recall bias may represent a threat to the internal validity of findings. However, for ethical and practical reasons, as in other studies of HCWs influenza vaccine uptake, health records were not verified [21]. Finally, the cross-sectional study design limits understanding of the longitudinal pattern of influenza vaccination uptake and characteristic changes in this studied population.

Our study concludes that the ASIV uptake among nursing students is low. In order to increase vaccination uptake, future studies should promote vaccination based on HBM, focusing on nursing students in their undergraduate studies by emphasizing on the susceptibility and severity of contracting influenza to healthcare workers and reducing the barriers to receive the ASIV. Furthermore, their social responsibility to protect patients should be reinforced. Influenza vaccination can be viewed as an ethical professional responsibility and a patient safety issue, as well as being an infection control strategy.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.vaccine.2017.02.001.

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Appendix A. Supplementary material

Multimedia Component 1

Supplementary data 1

Highlights

- Nursing students are at high risk of exposure to seasonal influenza. But, limited studies have investigated their prevalence and factors affecting annual seasonal influenza vaccination (ASIV) uptake.
- Our study concludes that the ASIV uptake of 15.2% among nursing students is low. Five predictors for ASIV uptake include perceived high susceptibility, high seriousness, low barriers, studying in master's programme and receiving ASIV at least once in past five years.
- Promotion of ASIV should emphasize on the social responsibility to protect patients.

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