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Association Between Influenza Vaccine Uptake and Health Awareness: A Cross-Sectional Questionnaire-Based Study Among Medical Students and Healthcare Workers in Northern Vietnam

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF 1 **Nguyen Minh Chau*** 
ABCDEF 1 **Thi Van Anh Nguyen***
B 2 **Minh Nguyet To**
CDEF 1 **Amr Sayed Ghanem** 
ACDEF 1 **Gergő Szöllősi**
E 3 **Marianna Móré**
CDEF 1 **Attila Csaba Nagy**

1 Department of Health Informatics, Institute of Health Sciences, Faculty of Health Sciences, University of Debrecen, Debrecen, Hungary
2 School of Preventive Medicine and Public Health, Hanoi Medical University, Hanoi, Vietnam
3 Institute of Social and Sociological Sciences, Faculty of Health Sciences, University of Debrecen, Debrecen, Hungary

* Nguyen Minh Chau and Thi Van Anh Nguyen share first authorship

Nguyen Minh Chau, e-mail: nguyen.chauminh@etk.unideb.hu

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Corresponding Author:

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Background: Seasonal influenza poses a significant global health concern. Despite the proven effectiveness of the influenza vaccine, its uptake remains low in Vietnam. This study aimed to assess the knowledge, attitudes, and practices of medical students and healthcare workers on influenza vaccine uptake in northern Vietnam.


Material/Methods: A cross-sectional survey was conducted among 585 participants from northern Vietnam institutions through an anonymous online survey via Google form from June to August 2022. The cut-off for a high level of knowledge and a positive attitude was set at 70% for each variable. Bivariate analysis was conducted to establish associations. Multiple binary logistic regression models were used to identify factors associated with knowledge, attitude, and practice.

Results: Among the participants, 463 (79.15%) were women, 354 (60.51%) were below 25 years old, 426 (72.82%) were of "Kinh" ethnicity, and 454 (77.61%) were single. Only 237 (40.51%) were vaccinated. Good knowledge and attitude were reported by 36.58% and 42.39% of the participants, respectively. Having a high level of knowledge was found positively associated with having a positive attitude (odds ratio 2.11 [1.48-3.01]). Kinh ethnicity was positively associated with knowledge (1.67 [1.12-2.49]) and attitude (1.97 [1.32-2.94]). Female participants displayed a more positive attitude (2.08 [1.33-3.25]). Several factors influenced the uptake, such as being single (2.07 [1.19-3.59]), being a medical doctor (2.34 [1.09-5.06]), and being advised by a healthcare provider (2.96 [2.00-4.37]).

Conclusions: A noticeable gap in knowledge and attitude related to influenza vaccine uptake was found among the target population. Tailored interventions are necessary to improve vaccination coverage.

Keywords: **Awareness • Cross-Sectional Studies • Health Knowledge, Attitudes, Practice • Influenza Vaccines • Primary Prevention • Vietnam**

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Background

According to the World Health Organization (WHO), seasonal influenza is responsible for 290 000 to 650 000 deaths and 3 to 5 million serious cases every year [1-3]. Influenza can also lead to a reduction in productivity at work and school and the overloading in hospitals during the peak of the epidemics [4]. In developing regions, data on seasonal influenza remains insufficient due to the absence of a robust surveillance infrastructure for seasonal influenza [1,5]. According to a WHO report, the South-East Asia region is one of the most vulnerable areas to viral infections, partly owing to low health literacy among populations [4]. There are between 1.6 and 1.8 million cases of influenza reported annually in Vietnam [6].

Influenza vaccine uptake is reported to be the most important public health strategy for preventing and controlling the spread of influenza and protecting patients from serious symptoms [6,7]. The WHO and the Centers for Disease Control and Prevention (CDC) recommend routine annual influenza vaccination for all individuals aged 6 months and older who do not have contraindications [3,8]. Despite the reported safety and effectiveness of influenza vaccines, they remain largely underused in many low- and middle-income countries [1,8].

Healthcare settings are the most common mediums for the spread of influenza; thus, the importance of preventing nosocomial transmission among medical workers is undeniable [7]. The WHO has recommended influenza vaccine uptake among medical personnel; however, the uptake of this vaccine among healthcare providers is low globally and often below the WHO's recommended level of 70% of all medical personnel within each institution [9].

In Vietnam, the government has recommended 4 types of seasonal influenza vaccination (Fluarix, Inflexal V, Inluvac, and Vaxigrip) for children aged 6 months to 8 years, the elderly, those with certain diseases, and healthcare workers [5]. However, the vaccines are available in mostly urban areas, and there is currently no vaccination funding in place; therefore, it is provided as a service immunization with cost [5,10], thereby lowering the uptake of the vaccine [10]. Medical staff and students are role models who can greatly affect patients' decisions to take the vaccine [10,11]. Prior studies suggest that inadequate knowledge and negative attitudes of medical providers regarding influenza vaccines and patient eligibility for vaccination led to low vaccination rates [5,12-16]. Hence, healthcare providers having adequate knowledge and positive attitudes toward influenza vaccine uptake is crucial in counseling the patients to take it [17].

Although people with medical backgrounds receive information about influenza vaccine uptake, their beliefs, attitudes,

and practice on seasonal influenza are still in question. This study aimed to assess the knowledge, attitudes, and practices of medical students and healthcare workers on influenza vaccine uptake in northern Vietnam.

Material and Methods

Study Design

A cross-sectional questionnaire-based design was used in this study. Ethical approval was obtained from the Scientific and Research Ethics Committee of the University of Debrecen (6462-2023). This study was conducted following institutional guidelines and was in accordance with the Helsinki Declaration. Participation in this study was voluntary. Informed consent was provided on the first page of the online questionnaire, and participants proceeded to filling the questionnaire upon clicking "accept".

Sample Size and Sampling

The sample size was calculated according to the formula of Pourhoseingholi MA et al, "Sample size calculation in medical studies" [18]:

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

Prevalence (P) was 53%, which was calculated by the average prevalence of influenza vaccine uptake from 2 studies in Vietnam from 2020 [10,19]. Level of confidence (Z) was set at 95% with precision (d) of 5%.

As a result, we had a sample size (n) of 90. In this study, 5 different provinces from northern Vietnam were included; therefore, the sample size was multiplied by 5. Hence, the target population size was set at 450. Taking rejection and exclusion criteria into account, 20% of the desired sample size was added, resulting in a final sample size of 540.

Vietnamese medical students and healthcare personnel from northern Vietnam institutions were eligible to participate in an anonymous online survey. The institutions included 4 public medical universities from 3 provinces and 5 public hospitals with more than 500 beds, up to more than 2000 beds, from 5 different provinces located in northern Vietnam.

The questionnaire was distributed from June to August of 2022 via Google form in 2 languages (Vietnamese and English, in parallel) and in a variety of ways to increase participant engagement, including announcements during medical training, postings on the websites of different healthcare organizations, and messages in medical-related social media groups. There

was a restriction of 1 response per participant (per email address) to the submitted questionnaire, with informed consent provided. This study required answering all questions and working or studying in the medical sector. Participants who worked or studied in non-medical universities and those who did not complete the questionnaire were excluded. To ensure anonymity and confidentiality, each participant was assigned a code number, and all data were stored in locked digital files and folders, accessible only to the researchers.

Questionnaire

The study utilized the questionnaire that was used in a study by Walker et al published in 2014 [20].

The first 28 questions focused on collecting personal medical history information, including the individuals' socioeconomic background and immunization status. The next 10 questions in the survey assessed the participants' previous vaccination history, current vaccination status (within the past 12 months), willingness to get vaccinated, and opinion whether vaccination should be mandatory for medical students and healthcare workers.

The next 30 questions assessed the participants' knowledge (14 questions) and attitudes (16 questions) toward influenza vaccine uptake. The questions related to knowledge were redesigned into "true/false" options, while a 5-point Likert scale (strongly agree, agree, neither, disagree, and strongly disagree) was used to examine participants' agreement to a series of statements on attitudes toward influenza vaccine uptake.

Data Analysis

By examining knowledge and attitude, this study aimed to provide a framework to understand the variables effecting influenza vaccination uptake. Participants' knowledge and attitudes were assessed separately in 2 sections of the questionnaire.

The knowledge section included 14 questions that referred to the understanding that participants possessed regarding the public health importance of influenza and influenza vaccination. This included the mechanisms by which the vaccine functions, who is at risk and recommended to get the vaccine, the appropriate timing and frequency of vaccination, and the benefits of getting vaccinated. The participants received 1 point for each question that had a positive answer.

On the other hand, the attitude section captured the psychological dispositions of individuals toward receiving the vaccine. This included not only willingness or hesitancy but also the underlying reasons for such attitudes – whether they stem from fear of potential complications, concerns about vaccine

efficacy, or other barriers that could inhibit vaccination. All 5-point Likert scales for measuring attitudes were condensed into agree (strongly agree and agree) and disagree (neutral, disagree, and strongly disagree). The participants received 1 point for each positive answer.

Participants were rated as having "good knowledge" and a "good attitude" if their overall score in each category was 70% or higher (10/14 and 11/16 positive responses for knowledge and attitude, respectively), which was based on a study on previous knowledge, attitude, and practice behavior on health problems [21]. There were 3 categories regarding the practice of the participants: their vaccination status, their willingness of getting vaccinated this year, and their willingness to advise others to get vaccinated. At the end of the survey, there was 1 question regarding whether influenza vaccine uptake should be compulsory among medical/health sciences students and healthcare workforce or not.

Bivariate analyses were performed using Pearson's chi-squared test. Variables achieving a significance level of $P < 0.05$ in bivariate analysis were subsequently incorporated into a regression model. Multiple binary logistic regression models were performed to identify the association between independent predictors (sociodemographic characteristics) and the key outcome variables (knowledge, attitude, and practice [vaccination status, willingness of vaccination/revaccination, willingness to advice others, belief in the policy of compulsory influenza vaccine uptake for medical students and healthcare workers]). Odds ratios and the corresponding 95% confidence intervals were reported. Intercooled Stata v17 (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC) and Microsoft Excel 2018 were used for data analysis. The significance threshold was set at < 0.05 .

Results

Sociodemographic Characteristics of the Participants

A total of 585 medical students and healthcare workers were included in the study. The sociodemographic characteristics of the participants are shown in **Table 1**. The sample population contained a disproportionate distribution of sexes (20.85% male vs 79.15% female participants). The age variable was separated into 2 categories: 60.51% of participants were below 25 years old and 39.49% were 25 years old or above. Of the 585 participants, 426 (72.82%) belonged to the "Kinh" ethnicity, and 454 (77.61%) were single. Regarding occupational status, 62.74% of the participants were students, 10.94% were medical doctors, 14.02% were pharmacists, and others (including preventive medicine doctors and laboratory technicians) made up of 12.37% of the study population. More than

Table 1. Sociodemographic characteristics of the participants (N=585).

	N (%) (N=585, 100%)	High knowledge (%) (n=214, 36.58%)	P value*	Positive attitude (%) (n=248, 42.39%)	P value*	Vaccinated (n=237, 40.51%)	P value*	Willingness (n=111, 18.97%)	P value*	Policy (n=318, 54.36%)	P value*
Sex											
Male	122 (20.85)	49 (40.16)	0.356	38 (31.15)	0.005	54 (44.26)	0.343	21 (17.21)	0.577	60 (49.18)	0.197
Female	463 (79.15)	165 (35.64)		210 (45.36)		183 (39.52)		90 (19.44)		258 (55.72)	
Age group											
<25	354 (60.51)	130 (37.72)	0.930	142 (40.11)	0.167	133 (37.57)	0.073	47 (13.28)	<0.001	194 (54.80)	0.790
25+	231 (39.49)	84 (36.36)		106 (45.89)		104 (45.02)		64 (27.71)		124 (53.68)	
Ethnicity											
Kinh	426 (72.82)	168 (39.44)	0.019	199 (46.71)	0.001	180 (42.25)	0.160	82 (19.25)	0.782	242 (56.81)	0.052
Others	159 (27.18)	46 (28.93)		49 (30.82)		57 (35.85)		29 (18.24)		76 (47.80)	
Marital status											
Single	454 (77.61)	172 (37.89)	0.223	188 (41.41)	0.370	168 (37.00)	0.001	65 (14.32)	<0.001	239 (52.64)	0.121
Not single	131 (22.39)	42 (32.06)		60 (45.80)		69 (52.67)		46 (35.11)		79 (60.31)	
Occupational status											
Student	367 (62.74)	137 (37.33)	0.074	149 (40.60)	0.636	140 (38.15)	0.328	55 (14.99)	0.011	208 (56.68)	0.451
Medical doctor	64 (10.94)	28 (43.75)		31 (48.43)		32 (50.00)		17 (26.56)		30 (46.88)	
Pharmacist	82 (14.02)	32 (39.02)		37 (45.12)		35 (42.68)		23 (28.05)		42 (51.22)	
Other (Preventive medicine doctor/Lab technician)	72 (12.37)	17 (23.61)		31 (45.06)		30 (41.67)		16 (22.22)		38 (52.78)	
Seeking healthcare											
At least once per year	305 (52.14)	111 (36.39)	0.922	139 (45.57)	0.104	143 (46.89)	0.001	76 (24.92)	<0.001	179 (58.69)	0.028
Less than once per year	280 (47.86)	103 (36.79)		109 (38.93)		94 (33.57)		35 (12.50)		139 (49.64)	
Advised by HCP											
Yes	164 (28.03)	62 (37.80)	0.701	74 (45.12)	0.405	99 (60.37)	<0.001	57 (34.76)	<0.001	102 (62.80)	0.018
No	421 (71.97)	152 (36.10)		174 (41.33)		138 (32.78)		54 (12.83)		216 (51.31)	

HCP – healthcare providers. * Pearson chi-squared test. Vaccinated: vaccinated within the past 12 months. Willingness: willing to get vaccinated or revaccinated. Policy: agree that influenza vaccination should be compulsory for medical students and healthcare workers. Bold values represent significant associations.

Table 2. Association of sociodemographic characteristics with knowledge, attitude, vaccination status, willingness, and agreement of policy on compulsory influenza vaccination using multiple binary logistic regression.

	Knowledge (OR [95% CI])	Attitude (OR [95% CI])	Vaccination status (OR [95% CI])	Willingness of vaccination and/or revaccination (OR [95% CI])	Willingness to advise others (OR [95% CI])	Policy on vaccination (OR [95% CI])
Sex						
Female/Male	0.91 [0.60-1.38]	2.08 [1.33-3.25]	0.85 [0.55-1.31]	1.24 [0.70-2.18]	2.88 [1.59-5.20]	1.29 [0.85-1.95]
Age group (years)						
25+/ 25	1.23 [0.69-2.22]	1.14 [0.63-2.04]	0.77 [0.42-1.42]	1.43 [0.69-2.99]	1.26 [0.47-3.37]	1.03 [0.58-1.85]
Ethnicity						
Kinh/other	1.67 [1.12-2.49]	1.97 [1.32-2.94]	1.44 [0.96-2.15]	1.22 [0.73-2.04]	1.92 [1.07-3.43]	1.43 [0.98-2.08]
Marital status						
Not single/single	0.81 [0.47-1.40]	1.02 [0.60-1.75]	2.07 [1.19-3.59]	2.42 [1.30-4.51]	1.10 [0.42-2.89]	1.75 [1.02-2.99]
Occupational status						
Student/other	2.04 [0.98-4.27]	1.06 [0.53-2.11]	1.39 [0.68-2.85]	1.86 [0.78-4.44]	0.54 [0.13-2.26]	1.89 [0.95-3.78]
Medical doctor/ others	2.45 [1.13-5.33]	1.39 [0.66-2.95]	2.34 [1.09-5.06]	2.28 [0.93-5.59]	0.48 [0.11-2.15]	1.04 [0.50-2.17]
Pharmacist/other	2.11 [1.03-4.32]	1.20 [0.61-2.35]	1.33 [0.67-2.65]	2.01 [0.90-4.48]	0.39 [0.10-1.56]	1.12 [0.58-2.17]
Seeking healthcare						
At least once per year/less than once per year	0.97 [0.68-1.38]	1.27 [0.89-1.81]	1.40 [0.98-2.00]	1.68 [1.04-2.69]	1.29 [0.73-2.30]	1.38 [0.98-1.95]
Advised by HCP						
Yes/no	1.17 [0.79-1.73]	1.14 [0.77-1.69]	2.96 [2.00-4.37]	3.14 [1.98-4.97]	2.31 [1.08-4.99]	1.44 [0.98-2.13]
Knowledge						
High/low		2.11 [1.48-3.01]	1.02 [0.71-1.46]	1.38 [0.87-2.18]	1.49 [0.81-2.74]	1.41 [0.99-2.00]

HCP – healthcare provider; OR – odds ratio; 95% CI – 95% confidence interval. Bold values represent significant association.

half of the participants (52.14%) reported seeking healthcare providers (of any purpose) at least once a year. However, only 164 participants (28.03%) reported that they had been advised by healthcare providers to get vaccinated against influenza, and 237 of them (40.51%) were vaccinated. Regarding knowledge and attitude on influenza vaccine uptake, only 214 (36.58%) showed a good level of knowledge, and 248 (42.39%) showed a positive attitude. Moreover, of the 585 participants, 237 (40.51%) were vaccinated within the past 12 months, 111 (18.97%) were willing to get the vaccine or revaccinate, and 318 (54.36%) agreed that influenza vaccination should be compulsory for medical students and healthcare workers.

Bivariate Analysis

Bivariate analysis results are shown in **Table 1**. Female participants tended to have higher rate of positive attitudes than did male participants (45.36% vs 31.15%, $P=0.005$). Participants aged 25 or above had higher rate of willingness to get vaccinated/revaccinated than did younger participants (27.71% vs 13.28%, $P<0.001$). Kinh ethnicity had higher rate of knowledge (39.44% vs 28.93%, $P=0.019$) and positive attitude (46.71% vs 30.82%, $P=0.001$) than did other ethnicities. Participants who were not single had higher rate of vaccination (52.67% vs 37.00%, $P=0.001$) and willingness to get

vaccinated/revaccinated (35.11% vs 14.32%, $P < 0.001$) than did single participants. There was a significant difference between the rate of willingness to get vaccinated/revaccinated based on occupational status ($P = 0.011$), whereby pharmacists had the highest rate, compared with others (28.05%). Participants who reported regularly seeking healthcare at least once a year had a higher rate of vaccination (46.89% vs 33.57%, $P = 0.001$), were more willing to get vaccinated/revaccinated (24.92% vs 12.50%, $P < 0.001$), and had a higher rate of agreement on compulsory influenza vaccination policy (58.69% vs 49.64%, $P = 0.028$) than did those who reported seeking healthcare less often. The participants who were advised to get the vaccine by a healthcare provider had higher rate of vaccination (60.37% vs 32.78%, $P < 0.001$), were more willing to get vaccinated/revaccinated (34.76% vs 12.83%, $P < 0.001$), and had a higher rate of agreement on compulsory influenza vaccination policy (62.80% vs 51.31%, $P = 0.018$) than did those who were not advised to get the vaccine.

Multiple Binary Logistic Regression Models

The associations between the sociodemographic characteristics of the study population and their knowledge and attitudes are shown in **Table 2**. Participants with Kinh ethnicity had significantly better knowledge than did those of other ethnicities (OR [95% CI]=1.67 [1.12-2.49]). Female sex and Kinh ethnicity showed significantly better attitudes toward the vaccine (2.08 [1.33-3.25] and 1.97 [1.32-2.94], respectively). Medical doctors and pharmacists had better knowledge than did preventive medicine doctors and laboratory technicians (2.45 [1.13-5.33] and 2.11 [1.03-4.32]). No significant association was found between age groups, marital status, frequency of seeking healthcare, advice by healthcare provider, and knowledge and attitudes of the participants.

The associations between the sociodemographic characteristics of the participants and vaccination status, willingness, and agreement of policy on compulsory influenza vaccination are shown in **Table 2**. Participants with female sex and Kinh ethnicity were shown to have a higher willingness to advise others to get vaccinated (2.88 [1.59-5.20] and 1.92 [1.07-3.43], respectively). Age groups were not associated with any practice categories. People who were not single (either married, in partnership, or living together) were more likely to be vaccinated (2.07 [1.19-3.59]) and had a higher willingness of getting vaccinated or revaccinated (2.42 [1.30-4.51]). Medical doctors were more likely to get vaccinated than were preventive medicine doctors and laboratory technicians (2.34 [1.09-5.06]). Participants who visited healthcare providers at least once a year had a higher willingness of getting vaccinated/revaccinated than did those who did not (1.68 [1.04-2.69]). Participants who were advised to receive the vaccine by healthcare providers had a higher likelihood of being vaccinated (2.96 [2.00-4.37]),

higher willingness of getting vaccinated/revaccinated (3.14 [1.98-4.97]), and higher willingness to advise others to get vaccinated (2.31 [1.08-4.99]) than were those who never got advised by healthcare providers. Marital status was associated with the belief that “influenza vaccine uptake should be compulsory for medical and healthcare-related students and healthcare workforce”, with participants who were not single being more likely to agree with this belief (1.75 [1.02-2.99]). Among the study’s participants, those who had good knowledge tended to have more positive attitudes (2.11 [1.48-3.01]) regarding influenza vaccine uptake. However, there were no associations found between good knowledge and vaccination status or with willingness to get vaccinated/revaccinated. Also, no association was found between having good knowledge and agreement on mandatory influenza vaccination policy for medical students and healthcare workers.

Discussion

Among the study population, there was a relatively low proportion of participants showing a high level of knowledge and positive attitudes regarding the influenza vaccine uptake. Influenza vaccination rate was found to be low among the study participants, as was their willingness to get vaccinated or revaccinated. More than half of the study participants agreed that influenza vaccination should be compulsory among medical students and healthcare workers. The results of this study suggested that sex, ethnicity, marital status, occupational status, frequency of seeking healthcare, and being advised from healthcare providers were potential factors affecting key outcomes.

While the COVID-19 vaccination coverage and the population’s positive attitude toward vaccination was high in Vietnam [22], seasonal influenza vaccination was still neglected by the population due to its similar symptoms to the common cold [23,24]. As this study’s population included only medical students and healthcare staff, we expected the participants to have a high level of knowledge and positive attitudes regarding influenza vaccination due to their medical background and their future responsibility in providing healthcare services for the whole society. However, the results showed that the level of knowledge and degree of positive attitudes regarding influenza vaccine were low. Similar to a study in Vietnam by Ha et al [19], the vaccination rate was low among the participants in the present study.

Along with other studies among healthcare workers in Vietnam, female sex was overrepresented in the study population [10,25]. However, in this study, female participants showed a better attitude toward influenza vaccine uptake than did male participants, which was not indicated in previous studies about

knowledge, attitude, and practice of the medical population on influenza vaccine uptake [20,26-29]. This could also be explained by the higher concern of women in Vietnam toward health problems [10,21,25].

Ethnicity was one sociodemographic factor associated with knowledge and attitudes regarding influenza vaccine uptake. People of Kinh ethnicity are consistently the largest ethnic group in Vietnam, living in all provinces and cities, making up 87% of the total population in Vietnam, and having overrepresentation in technical fields, including medicine, and higher educational and technical qualifications than other ethnic groups [30,31]. Hence, ethnicity was separated into 2 groups of "Kinh" and "others". People of Kinh ethnicity showed greater knowledge and more positive attitudes regarding influenza vaccine uptake than did other ethnic groups. Our results also indicated that people who were not single were more likely to be vaccinated and have higher willingness to get vaccinated or revaccinated.

Medical doctors reported being more likely to get vaccinated than did preventive medicine doctors and laboratory technicians, which was in line with recent research [32]. However, no association was found between vaccination and other occupational groups. In addition, the willingness of influenza vaccine uptake was associated with recommendation from healthcare providers. These results were in line with those of another study that showed there is an association between access to healthcare providers and social encouragement [15]. Also, getting advice from healthcare providers was found to increase the willingness to be vaccinated and to advise others to get vaccinated. Thus, future public health programs of influenza vaccine uptake should target this young medical population, which will have a high level of influence on patients and the whole community in general [6,10]. Their attitudes and practices would affect their medical advice and health service consultancy in the future, which, again, could influence vaccination uptake in the general population.

Previous studies have suggested that increased knowledge could improve the influenza vaccine uptake rate [33,34]; however, the present study did not show that having a high level of knowledge was associated with a higher willingness of getting vaccinated, or with willingness of advising others to get vaccinated. However, high level of knowledge was positively associated with positive attitude regarding influenza vaccination. Thus, by improving the understanding of influenza vaccine uptake, the attitudes regarding influenza vaccine uptake can be improved and potentially increase the vaccination rate, which is the first step of actual practice and advising other people. A strategy to enhance people's knowledge of vaccination was also suggested in prior studies [26,33,35,36].

Moreover, participants who were not single and participants with a higher level of knowledge supported compulsory influenza vaccine uptake for medical/healthcare-related students and healthcare workers, which was in line with other studies [10,29]. Thus, the issue of policies that require people to get vaccinated against influenza has the backing of the young generation of medical professionals. This outcome may signify a change the perspective within the medical community regarding the importance of influenza vaccine uptake. However, as prior studies indicated, the cost of influenza vaccine could be the barrier for the population hesitant to be vaccinated; hence, the vaccination rate among the studied population was found to be low [10,26,37]. In China, a neighboring country of Vietnam, Beijing authorities made immunizations and vaccination services available at no cost, which greatly increased the influenza vaccine uptake in the beneficial groups [38]. Therefore, the improvement of knowledge and attitudes and appropriate policies of the government should be implemented to improve the accessibility of the vaccine by making it free of charge. In Vietnam, there is no free influenza vaccination program for medical students, who would also join in practical sessions in hospitals and serve the larger community in the future [5,6]. The influenza vaccination rate in the medical population was found to be low [29,39,40]. Although there was a decision issued in 2021 by the Ministry of Health to increase influenza vaccine uptake to 90% among healthcare workers in hospitals of some provinces in Vietnam [6], the results from the present survey showed that more attempts should be made to tackle barriers and improve knowledge and attitudes (vaccination acceptance) as the first step to positively change healthcare provider practices. Also, more attention should be paid to medical students, the next generation of healthcare providers in Vietnam.

A few methodological limitations that can be found in this study, as follows. First, there was a limited sample (585 participants). Second, with the cross-sectional online design, recall bias could not be avoided. Third, owing to the voluntary nature of the study, the student respondents, as well as respondents with a favorable attitude toward immunizations, may have been overrepresented in the study sample. With the mentioned-above biases, the results of this study can be skewed and do not represent the general population. However, the outcomes of this study can stimulate future researchers to expand the breadth and quality of their studies.

Conclusions

The findings of this study suggest that there is a significant gap in knowledge and attitudes regarding influenza vaccine uptake among medical students and healthcare workers in Vietnam. Only a small proportion of participants demonstrated a high

level of knowledge and positive attitudes, indicating a need for targeted educational interventions to increase their understanding of the importance and benefits of influenza vaccine uptake. The study's results also suggest that sociodemographic factors, such as ethnicity, sex, marital status, and healthcare-seeking behavior, can influence vaccination practices and beliefs. Therefore, tailored interventions targeting these factors may also be necessary to improve influenza vaccination rates among this population. Overall, the results of this study provide insights into the factors that may impact influenza vaccine

uptake in Vietnam and highlight the need for tailored interventions to improve vaccination coverage among healthcare workers and medical students in the country.

Department and Institution Where Work Was Performed

Department of Health Informatics, Institute of Health Sciences, Faculty of Health Sciences, University of Debrecen, Debrecen, Hungary.

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