Research Article

Assessment of Influenza A (H1N1) Vaccination among Health Sciences Students in Northeast Brazil: A Cross-Sectional Study

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Abstract

Introduction: Influenza is a respiratory disease with high transmission capability that disseminates easily in seasonal epidemics, characterizing its global distribution. Vaccination is the most effective means of preventing the disease and morbidity, as it reduces the risk of horizontal transmission. Although research has explored influenza vaccination uptake in US and in Europe among college students and health care workers, there is a dearth of research in understanding influenza vaccination uptake and attitudes toward the vaccine among college students of the health sciences in Brazil.

Objective: The aim of this study was to evaluate the adherence to H1N1 vaccination campaigns among college students of health sciences in a private university in Brazil and to investigate the levels of knowledge, attitudes toward influenza vaccination and to identify the factors associated with reported seasonal influenza shots.

Materials and Methods: A cross-sectional study was performed among 353 students of five majors of health sciences - namely: Biomedicine, Nursing, Medicine, Psychology and Dentistry, at the University CEUMA, Campus Imperatriz - Maranhão, northeast of Brazil. Data collection (between July and August 2021) was performed using an online platform (Google Forms) questionnaire consisting of 15 multiple-choice questions to identify age, sex, marital status, housing conditions, undergraduate course, knowledge about the H1N1 vaccine and the reasons for its acceptance or refusal.

Results: Over 75% of the respondents were under the age of 24. Seventy-two percent declared themselves to be female; 62% white or Caucasian; 74% were medical students; 81% responded that they live with up to 4 people; 53% have health insurance, while 47% use public health services. Only 52% of students reported they had been immunized against H1N1, although 77% strongly agree with the vaccine's efficacy. Of the participants who reported receiving the vaccine, the majority were medical students with health insurance. There was found to be an association between the variables "having health insurance" and "receiving the vaccine for H1N1". When asked if they were informed or encouraged to receive the H1N1 vaccine, 31.16% reported having received encouragement from parents, relatives, or friends, while 18.13% reported not having received any guidance. Our findings indicate some barriers to the acceptance of influenza vaccination. These factors can be classified as: the attitude toward influenza vaccination among participants; and promotion, education, and information about the H1N1 vaccination.

Conclusions: Results demonstrated that only a half of students surveyed (52%) reported receipt of the seasonal H1N1 influenza vaccine. The low uptake results, when compared to the Brazilian population at large,

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are concerning, particularly considering that the students are majoring in health sciences. Our study has shown that knowledge alone may not be enough to increase adherence; attitudes about the value and risk, as well as misperceptions, may play a significant role. This indicates the need for targeted interventions within health sciences programs in universities. Students should be alerted they are role models to be followed by the rest of the general population. Maximizing seasonal influenza vaccination uptake in this population by addressing attitudes, barriers, and misperceptions may not only help improve vaccination rates in health sciences students, but also in the communities served by these prospective health professionals.

Keywords: Adherence; Attitudes; H1N1 Influenza; Health Sciences Students; Vaccination

Introduction

One of the greatest challenges of global public health is the prevention of diseases that may significantly interfere in the simple and fundamental activities of people's lives [1]. As the demand for primary (outpatient), secondary (hospital) and tertiary services (rehabilitation) increases, protective measures should be prioritized. Influenza, also known as the flu, is a respiratory disease, which can affect the upper and lower respiratory tracts, and symptoms can vary from sinusitis and cough to respiratory distress, such as pneumonia, asthma exacerbation and bronchiolitis. The three main routes of transmission of H1N1 are direct contact exposure, droplet spray exposure and airborne particles [2]. The disease has a high transmission capability and disseminates easily by seasonal epidemics, characterizing its global distribution, particularly in cold regions [3]. The economic impact of influenza epidemics in the world is often underestimated. The disease affects 5 to 10% of the working population, generating losses in productivity in the order of millions [4,5]. To combat the epidemic, vaccination of risk groups seems to be the most effective means of preventing the disease and mortality, as it reduces the risk of horizontal transmission among health professionals and among the public at large. Vaccination becomes, in this case, the best option to reduce economic expenses, as well as work/school absenteeism, effectively contributing to increased labor productivity [6]. With the rise of the COVID epidemic, flu vaccination has become even more relevant, considering that it is almost certain that influenza viruses circulate in conjunction with SARS-CoV-2. Furthermore, symptoms caused by both viral infections are usually similar, making a differential diagnosis difficult. Data collection on the rates of vaccination for health professionals in training is relevant as a part of the existing vaccination coverage overall, as well as providing information within the group on the use, acceptance and promotion of the vaccine. Several studies have examined seasonal influenza vaccination rates specifically among medical students and residents. Seasonal influenza vaccination rates for these groups in the United States have been found to vary from 48 to 58% [7–12]. However, the study of Merril et al. [13] reports that, in 2007, 22% of college students aged between 18 and 29 in the US received the vaccine, in contrast to 65% of older adults vaccinated in the same period. The students analyzed are mostly from the health area, which, according to the authors, jeopardizes the credibility of future professionals. Although research has explored influenza vaccination uptake among medical students, college students, and health care workers, there is a dearth of research in understanding influenza vaccination uptake and attitudes toward the vaccine among future health area practitioners. Undergraduate health area students represent an important part of the future public health workforce, who may be a significant educational resource for health information, including the importance of vaccination. It is therefore essential to assess vaccination coverage, attitudes, and beliefs among this specific population. Therefore, this study assesses undergraduate health area student's vaccination rates, attitudes and beliefs about the vaccine and factors impacting vaccination uptake. Unfortunately, data on vaccination coverage among future health area practitioners are not available either at the national or at the regional level in Brazil. In this context, the purpose of this study was to evaluate the adherence to influenza vaccination campaigns among students of the health sciences of a private university in Brazil and to investigate the levels of knowledge and attitudes toward influenza vaccination and to identify the factors associated with reported seasonal influenza shots.

Materials and Methods

A cross-sectional study was performed among students on five majors of health sciences—namely, Biomedicine, Nursing, Medicine, Psychology and Dentistry, at the University CEUMA, Campus Imperatriz - Maranhão, Northeast of Brazil. Data collection was performed using a digital questionnaire, based on the model developed by Merril et al. [13], which was adapted and translated into Brazilian Portuguese by the authors of this research after being authorized. The questionnaire consisted of 15 multiple-choice questions to identify age, gender, marital status, housing conditions, undergraduate course, knowledge about the H1N1 vaccine and the reasons for its acceptance or refusal. The questionnaire was transported to an online platform (Google Forms) to facilitate the access and participation of volunteers, particularly because of the restrictions on personal contact due to the COVID19 pandemic as the study took place between July and August of 2021. The participants were informed about the purpose the study. They were also informed of the voluntary, confidential, and anonymous nature of the study and that the delivery of the completed questionnaire also indicated consent to participate in the study. The present study was approved by the Ethics Committee of

CEUMA University (ID: 4696.512). Frequency distributions and descriptive statistics were used to assess demographic variables. Associations between demographic factors and vaccination coverage were calculated using chi-square tests (age, race/ethnicity, and semester/period of undergraduate course). Analyses were completed using SPSS software version 24, with statistical significance level set to 0.05.

Results

This research comprised 353 academics who voluntarily answered the questionnaire, representing 29.62% of the total number of students enrolled in courses in the health sciences during that period. Table 1 presents the frequency and percentages of the variable "age group" of the students who answered the questionnaire. Among the subjects, there is a prevalence of young people under the age of 24 (76%); of which, 47% aged between 20 and 24 years and 29% aged less than 20 years, while only 1% of participants were over 45 years old.

Seventy-two of the respondents declared themselves to be female. Reported race/ethnicity was 62% white or Caucasian, followed by 12% "other" (not included in the questionnaire options), 9% Afro descendant or black, 8% Latino or Hispanic and 1% biracial or multiracial; 8% preferred not to respond. Table 2 presents data on the course and the period (semester) of participants. Most of the students (74%) were medical students; followed by 19%, who were studying Nursing; 10%, Biomedicine; 8%, Psychology; and 2% from Dentistry. In addition, there was a higher prevalence of students from the initial periods, that is, until the 4th period, representing 66% of respondents.

When asked about their housing situation, 81% responded that they live with up to 4 people, while 19% reported living alone. In addition, 53% of students said they have health insurance, while 47% use public health services. Additionally, 67% of academics reported having sought a health facility in the last 12 months, while 33% of students have not had the same need. The majority of the study population (77%) reported they received the vaccine against Influenza A (H1N1) at least once in their lives. In addition, 79% of the students reported they had received information about the immunizing agent. Fifty two percent of students reported that they had been immunized against H1N1 in the previous six months. Thirty seven percent responded that they were immunized before the previous six months. Eleven percent of academics stated they did not receive the H1N1 vaccine at all. When the students were asked if they were informed or encouraged to receive the H1N1 vaccine, 31.16% reported having received encouragement from parents, relatives or friends; 18.13% reported not having received any guidance; 15.29% received information from the TV, billboards, advertising, leaflets, or advertising outside the University Campus; 1.13% by other University students; 11.61% by nurses; 9.6% by professors of

their undergraduate course; 4.53% through advertising within the university campus; and 5.10% by medical doctors (Table 3).

When respondents were asked if they intended to be vaccinated during that season (winter), 51% said no, 38% did not respond, and only 11% still intended to be vaccinated that winter. Still on issues related to vaccination, 54% did not respond, 19% reported not receiving the vaccine against H1N1, 14% said they did not have time to receive the vaccine, 5% were not informed about the vaccine against H1N1, 4% believed that even vaccinated they may get sick and 4% reported not believing they are in danger of contracting H1N1. Nevertheless, most students (77%) strongly agreed with the vaccine's efficacy; 20% agreed; 2% disagreed; and 1% strongly disagreed. To test associations between some categorical variables, independence tests were performed using the Pearson's Chi-square test. In the presence of significant associations, we sought to elucidate the nature of the association, using Pearson's standardized residuals for correspondence analysis. To carry out these tests, we considered the following variables: course, gender, having health insurance, having visited a health center in the last 12 months, having received the vaccine against H1N1, having obtained information about the vaccine, propensity to taking the vaccine against H1N1, housing situation and race. Initially, we tested whether the "course" variable was correlated with the other variables, that is, whether the fact that the student was studying an undergraduate course in the health area could influence the results. Thus, the results of Pearson's $\chi2$ test obtained for this correlation are presented in Table 4.

The variables "having health insurance", "vaccinated for H1N1", "willingness to take the vaccine" and "race" had p values < 0.05 indicating that these results are significant, that is, there is a correlation between the student enrolled in a course in the health sciences and these variables. On the other hand, the variables "gender", "visited a health center on the last 12 months", "received vaccine information" and "housing situation" did not present a statistically significant correlation. Based on the results of Pearson's $\chi2$ tests, we sought to elucidate the nature of the association through the

Table 1: Frequency and Percentages of the Variable "Age Group" of the Students.

Age (Years)	Frequency	Percentage
18 - 20	103	29,18
20 - 24	166	47,13
25 – 29	31	8,91
30 - 34	27	7,76
35 – 39	9	2,14
40 – 44	11	3,16
45 – 49	2	0,57
50 – 54	4	1,15

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Table 2: Distribution [N (%)] of Participants According to Course and Period.

Period	Medicine	Nursing	Biomedicine	Psychology	Dentistry
First	35 (13,36)	-	3 (8,33)	-	-
Second	69 (26,33)	1 (5,26)	19 (52,77)	4 (14,28)	-
Third	35 (13,36)	1 (5,26)	3 (8,33)	3 (10,71)	3 (37,5)
Fourth	34 (12,98)	6 (31,58)	5 (13,89)	4 (14,28)	5 (62,5)
Fifth	36 (13,74)	-	1 (2,78)	-	-
Sixth	45 (17,17)	-	3 (8,33)	5 (17,86)	-
Seventh	2 (0,76)	-	2 (5,55)	-	-
Eighth	1 (0,38)	11 (57,89)	-	1 (3,57)	-
Ninth	3 (1,14)	-	-	1 (3,57)	-
Tenth	-	-	-	10 (35,71)	-
Total	262 (74,22)	19 (5,38)	36 (10,17)	28 (7,93)	8 (2,3)

Table 3: The Source of Information about Vaccination Reported by Students.

Source of Information	Frequency	Percentage
Parents, relatives, or friends	110	31.16
I did not receive guidance to receive the H1N1 vaccine	64	18.13
TV, Billboard, advertising, folder, advertising outside the University Campus	54	15.29
Advertising inside the University Campus	16	4.53
Nurses	41	11.61
Undergraduate course professors	32	9.06
Other students	4	1.13
Medical Doctors	18	5.10
Others	14	997

Table 4: Association Test between the Course and Other Variables.

Variables	P Value
Gender	0.071
Has health insurance	<0.05
Visited a health center on the last 12 months	0.74
Vaccinated for H1N1	<0.05
Received Vaccine information	0.054
Willingness to take the vaccine	<0.05
Housing situation	0.514
Race	<0.05

calculation of Pearson's standardized residuals, as a way of identifying the categories of variables that might present an association tendency. In Table 5 we present the results obtained from the association between the courses in the health area and the other variables. We found that most of the academics participating in this research, except for medical students, reported not having health insurance. In addition, except for the dentistry course, more than 50% of the students were willing to receive and/or received at least one dose of the vaccine against H1N1. When analyzing the association of students' ethnicity with their course, we found that most academics in health courses are self-declared

white/Caucasian, except for the dentistry course, which has a predominance of self-declared Afro-descendants/Blacks.

As the independent hypothesis was accepted, we deepened the inferences to find and identify the most statistically relevant aspects. In this way, we calculated Pearson's standardized residuals, which are shown in Table 6. The results show that medical students proportionally have the lowest percentages of unvaccinated students and the highest rates of health insurance.

Discussion

The present study explored the seasonal influenza vaccination rates, attitudes, and knowledge regarding such vaccine, as well as factors associated with vaccine uptake among undergraduate students majoring in the health sciences. Results demonstrated that 52% of students reported having taken the seasonal influenza vaccine. These low uptake results, if compared to the Brazilian population at large, [14] were concerning, particularly considering that the students are from an undergraduate degree in public health education.

Walker et al. [15] conducted a survey of medical students in the US and found that the key factors in H1N1 vaccine adherence are: living on campus, having clinical experience,

Table 5: Association between the Course and Other Variables.

Variables	Biomedicine	Medicine	Nursing	Dentistry	Psychology
Has health insurance					
Yes	13	156	5	3	9
No	23	106	14	5	19
Vaccinated for H1N1					
Yes	23	212	13	4	18
No	13	50	5	4	10
Willingness to take the vaccine					
Yes	17	134	11	1	16
No	7	22	2	2	6
Race					
Afro-descendant/ Black	8	19	4	3	4
Biracial/Multiracial	4	23	3	0	1
White/Caucasian	15	173	7	1	11
Latino/Hispanic	1	21	2	1	2
Other	11	23	2	0	5
Declined to answer	1	1	1	1	2

Table 6: Standardized Person Residuals from Chi-Squared Test, of the Dependent Variables.

Variable	Biomedicine	Medicine	Nursing	Dentistry	Psychology
Has health insurance					
Yes	-1.37	1.53	-1.58	-0.59	-1.5
No	1.45	-1.61	1.67	0.62	1.58
Vaccinated for H1N1					
Yes	-0.88	0.78	-0.22	-0.86	-0.75
No	1.59	-1.41	0.39	1.56	1.36
Willingness to take the vaccine					
Yes	-0.61	0.52	0.1	-0.93	-0.49
No	1.31	-1.12	-0.21	2	1.04
Race					
Afro-descendant Black	1.8	-1.7	1.3	2.9	0.8
Biracial/Multiracial	0.2	0	1	-0.7	-0.8
White/Caucasian	-1.8	1.6	-1.3	-1.4	-1
Latino/Hispanic	-1.2	0.2	0.4	0.8	0.1
Other	2.9	-1.4	-0.2	-0.8	1.2
Declined to answer	0.4	-1.6	1.2	2.8	2.4

and understanding that the vaccine is important. Another research indicates positive results in relation to students of the health sciences, showing that adherence to vaccination was related in a statistically significant manner to knowledge about the H1N1 vaccine and to reading scientific articles on the subject [12]. In addition, this research indicates that educational institutions in the health area play a key role in the prevention and control of vaccine-preventable diseases, since concepts and values are based on academic training. The Health Belief Model, applied in previous studies with the objective of evaluating adherence to the influenza vaccine, suggests that individual beliefs can influence the adoption of health-related behaviors and, consequently, vaccination [16]. In this way, the results of the present study indicate that students in courses in the health sciences are more predisposed to be vaccinated. According to De Souza Penteado et al. [17], 13 to 20% of unvaccinated healthcare professionals are infected with the influenza virus annually. Most of the workers who have mild and moderate symptoms usually continue to work and contaminate others. Thus, it is

estimated in the aforementioned study that 50% of influenza infections are subclinical, and the transmission of the virus begins one day before the onset of symptoms, which facilitates its spread. The results obtained show a difference in the distribution between the racial characteristics of the academics. Medical students are the most prevalent in the white/Caucasian category, while the biomedicine course contributes positively and proportionally to the races not represented in the survey. The most effective way to fight influenza is prophylaxis, and its most important element is the inactivated, intramuscular influenza vaccine. The vaccine reduces serious morbidity and mortality associated with the influenza infection. About 80 years have passed since the invention of the first influenza vaccine; however, flu vaccines must be constantly updated, and annual vaccinations are still needed as the flu viruses present high variability and rates of mutation. The seasonal flu vaccine is developed to combat the strains that are believed to predominate during a particular year's flu season, based on recommendations from the World Health Organization [18]. The flu vaccine is constantly being improved to make it more effective and safer. However, due to too low annual vaccination coverage, the virus has not yet been eradicated, and it remains in the top ten most common global diseases in the 21st century. Our findings indicate some barriers to the acceptance of influenza vaccination among five majors of health sciences students: Medicine, Biomedicine, Nursing, Psychology and Dentistry. These factors can be classified as the attitude toward influenza vaccination among participants, and promotion, education, and information about the flu vaccination among students at the health sciences courses. The main problem was the lack of knowledge and distrust toward vaccination. Additionally, the attitude toward the flu vaccination among the participants played a significant role in our findings. Although fewer than 5% of students in all majors directly indicated a negative attitude toward flu vaccination, this is one of the factors preventing the achievement of the WHO recommended immunization levels in many countries around the world. This reluctance has been attributed to the need for annual vaccinations, the lack of belief in the effectiveness of the vaccine, and fear of its side effects. To reduce the fear of vaccination and to maintain knowledge and awareness of the need for influenza vaccination, training in vaccination should be introduced regularly within the university. If students are not accustomed to getting vaccinated during their studies or performing vaccination, they are unlikely to become vaccinated after graduation and to promote vaccination among patients. Health sciences students should be alerted they are also best role models to be followed by the rest of the general population. Although health sciences students should be receiving information about vaccinations within their curricula in their courses, it cannot be assumed that they will have positive attitudes and beliefs toward the seasonal influenza vaccine. Our study has shown that knowledge alone may not be enough to increase uptake in vaccination; attitudes about the value and risk, as well as misperceptions, may play a significant role. Our findings support the need for targeted intervention within public health programs in universities. Specific efforts to educate health sciences students and address the risks and importance of seasonal influenza vaccine may assist in correcting misinformation. Additional information included in the curriculum should focus on changing the perceived risk and impact of acquiring seasonal influenza as well as addressing the limited risks from receiving vaccination. Many health sciences students will as professionals promote vaccination. Maximizing seasonal influenza vaccination uptake in this population by addressing attitudes, barriers, and misperceptions may not only help improve vaccination rates in health science students, but also in the communities served by these prospective health practitioners. It is important to point out, however, the limitations of the present study for some categorical statements. To confirm or refute other correlations presented here, this study must be expanded, using the same systematics and methodology, to increase the sample population, the inclusion of other courses and the collection of data at different times of the year. Furthermore, in addition to research with the population of health professionals and students from other areas, other investigations should be carried out, with emphasis on institutions and their mechanisms for dissemination of information and the promotion of influenza vaccination.

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