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Medical Students' Attitudes Toward Influenza Vaccination in Turkey After the Pandemic

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ABSTRACT

Annual influenza vaccination is recommended for all healthcare workers, including medical students. This study examined the attitudes of medical students towards seasonal influenza vaccination, their vaccination status/intention, and the possible effects of the end of the pandemic during the first influenza season following the Coranavirüs-19 Disease (COVID-19) pandemic.

An online cross-sectional study was conducted at Gaziantep University Faculty of Medicine in October 2023. The questionnaire asked about socio-demographic characteristics, COVID-19 experience, their perceived level of anxiety and knowledge about influenza, and their vaccination/intention to be vaccinated during the pandemic and the 2023/2024 influenza season.

Among 325 participants (mean age: 21.8 years; 53.5% female), 55.7% reported very low or low concern about contracting the influenza. Knowledge about the influenza vaccine was reported as none (7.7%), very little (23.4%), or some (46.8%), with the internet/social media being the most common information source (36.9%). Only 2.5% had been vaccinated against influenza, and 9.8% considered vaccination. During the pandemic, 7.4% received the influenza vaccine, while 19.1% reported decreased willingness to vaccinate post-pandemic. Notably, 58.3% of students vaccinated during the pandemic either did not get vaccinated or consider vaccination afterward ($p<0.05$). The most cited reason for avoiding vaccination was the perception of influenza as a non-serious illness (37.9%). Higher vaccination rates were associated with greater family income and higher influenza -related concern.

The findings show that the rate of influenza vaccination is low and that the end of the COVID-19 pandemic has a negative impact on vaccination.

Keywords: İnfluenza vaccination**,** COVID-19, pandemic, medical students

Introduction

Influenza is a highly contagious respiratory illness that causes symptoms such as fever, fatigue, muscle pain and cough, but can also lead to serious and life-threatening complications such as upper respiratory tract infections and pneumonia (1). Approximately 5-10% of adults and 20-30% of children become infected each year due to influenza epidemics (2). Although influenza infection is usually an acute and self-healing infection, it can lead to serious complications and death, especially in the elderly, young children, people with weakened or suppressed immune systems, and people with chronic diseases (3, 4). The World Health Organization (WHO) estimates that there are approximately one billion cases of influenza worldwide each year, approximately five million serious illnesses, and 290,000 to 650,000 deaths due to seasonal influenza infection. (5).

Seasonal influenza vaccination is the most effective method to protect against influenza, prevent transmission of the disease to others, prevent hospitalizations, serious illnesses and possible deaths (6). It has been reported that influenza vaccination reduces the disease by 40-60% in the general population (7). Physicians, medical students and healthcare workers are at high risk of respiratory infections due to frequent occupational exposure to respiratory viruses (8). Approximately one fifth of healthcare workers are infected with influenza virus during the influenza season. This leads to the spread of hospital outbreaks and disruption of medical care (9). For these reasons, WHO, Centers for Disease Control and Prevention (CDC) and local health authorities recommend influenza vaccination for healthcare workers (5, 10). Similarly, in Turkey, the influenza vaccine is recommended for medical students (11). However, it is not mandatory, and the cost of the vaccine is borne by the medical student.

The symptoms of influenza are similar to the symptoms (such as fever, cough, runny nose) seen in Coronavirus Disease-2019 (COVID-19), which

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caused one of the largest pandemics in human history (12). Previous studies have shown that concern about illness during the COVID-19 pandemic was a motivating factor to receive influenza vaccination and increased influenza vaccination rates during the pandemic (13, 14). However, information on influenza vaccination intentions and rates after the end of the pandemic is limited in the literature. In our study, we aimed to assess the attitudes of medical students towards seasonal influenza vaccination, influenza vaccination status and related factors in the first influenza season after the end of the COVID-19 pandemic.

Materials and Method

Study Design and Participants: This study is a cross-sectional study conducted among students studying at Gaziantep University Faculty of Medicine between 15/10/2023-30/10/2023. The population of the study consisted of 1986 students studying at Gaziantep University Faculty of Medicine in 2023-2024. The minimum required sample size was calculated as 323 participants, based on a 50% expected prevalence, 95% confidence level, and 5% margin of error. The use of a 50% prevalence value ensured the largest possible sample size, as no prior data were available regarding influenza vaccination attitudes or uptake rates among medical students in Turkey following the COVID-19 pandemic.

The online questionnaire form prepared via Google forms was sent to the medical faculty student class representatives by informing them about the study, and then the questionnaire was shared in student class groups via WhatsApp application.

Students were informed about the aims of the study, that participation was voluntary and anonymous, and that the information would be used only for scientific purposes. Digital consent was obtained from the participants.

Questionnaire form: A questionnaire form consisting of 19 questions and three parts was created by the researchers by reviewing the literature. The first section of the questionnaire included questions on the students' socio-demographic characteristics (age, gender, class, family income, chronic diseases) and previous experience with and vaccination status regarding the COVID-19.

In the second section, the participants were asked about their perceived level of knowledge about influenza vaccination, their sources of information about influenza vaccination, levels of concern about influenza vaccination, their influenza vaccination status during the pandemic, and the effect of the end of the pandemic on their desire to have influenza vaccination.

Students' intention to get a influenza vaccine and to get a influenza vaccine was asked with the following question; "Have you received your influenza vaccine this year (2023/2024)? a) I have been vaccinated, b) I am considering getting vaccinated, c) I have not been vaccinated/I do not plan to get vaccinated." Finally, the reasons for accepting and refusing to be vaccinated were questioned.

Statistical Analysis: Data analysis was performed using SPSS 22.0 program. Descriptive data in the study were shown as numbers and percentages. Categorical variables were compared using Pearson's Chi-square test. To meet Chi-square test assumptions and maintain adequate expected cell counts for valid odds ratio estimation, some multi-category variables were dichotomized prior to analysis. Specifically, family income level was grouped as low/moderate vs. high; level of concern about influenza transmission as very low/low vs. moderate/high/very high; and knowledge about influenza vaccine as none/very limited vs. moderate/extensive/very extensive.

This recoding enhanced statistical robustness, minimized sparse data bias, and improved interpretability while preserving the variables' conceptual meaning. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify associations between categorical variables. Given that multiple comparisons were performed, the possibility of Type I error (false positive findings) increases. Therefore, p-values were interpreted as descriptive, and no formal correction (e.g., Bonferroni adjustment) was applied due to the exploratory nature of the study. Statistical significance was assessed at $p < 0.05$.

Ethics: The study was conducted with the approval of the Gaziantep University Clinical Research Ethics Committee dated 20/09/2023 and numbered 2023/314. Permission to conduct a survey for the study was obtained from the Dean of the Faculty of Medicine.

Results

Of 325 medical students who completed the questionnaire, 47.4% were preclinical students and 52.4% were clinical students with a mean age of

Table 1: Characteristics of Students

Characteristics		n	%
Age (years)	≤21	128	39.4
	>21	197	60.6
Gender	Male	151	46.5
	Female	174	53.5
Class	Preclinical (1, 2, 3)	154	47.4
	Clinical (4, 5, 6)	171	52.6
Family Income Level	Low	18	5.5
	Medium	233	71.7
	High	74	22.8
Chronic Disease	Yes	17	5.2
	No	308	94.8

Table 2: Students' Influenza Concerns, Vaccination Status, and Knowledge Levels

		n	%
Concern Level About Influenza Transmission	Very Low	77	23.7
	Low	104	32.0
	Moderate	106	32.6
	High	30	9.2
	Very High	8	2.5
Knowledge Level About Influenza Vaccination	None	25	7.7
	Very Limited	76	23.4
	Moderate	152	46.8
	Extensive	57	17.5
	Very Extensive	15	4.6
Source of Knowledge About Influenza Vaccine	Internet/Social Media	120	36.9
	Medical School Education	99	30.5
	Relatives/Friends	37	11.4
	Healthcare Professionals	28	8.6
	Medical Literature	23	7.1
	Television	3	0.9

21.87 ±2.02 years (range 18-32). The majority of the participants (71.7%) reported that their families were middle-income and 5.2% had chronic diseases (Table 1).

It was determined that 31.4% of the students had contracted COVID-19 at least once (confirmed by a positive test), and 32.4% of those reported experiencing mild symptoms. The majority of participants (90.5%) had received at least one dose of the COVID-19 vaccine. Regarding concerns about influenza transmission, 23.7% of the students reported very low, 32% low concern, 32.6% moderate, 9.2% high, and 2.5% very high.

Among the students, 23.4% reported having very limited knowledge about the seasonal influenza vaccine, 46.8% assessed their knowledge as moderate, 17.5% as extensive, and 4.6% as very extensive. Notably, 7.7% stated they had no knowledge of the vaccine at all. The most common sources of information about the influenza vaccine were the internet/social media (36.9%) and medical school education (30.5%) (Table 2).

A total 68.6% of the students had not been advised by a health professional to get a influenza vaccination. It was found that 7.4% of the students received the influenza vaccine during the pandemic, and 2.5% received it during the current influenza season (2023/2024). Additionally, 9.8% of the students indicated that they were considering getting the influenza vaccine during

Table 3: Reasons for Acceptance and Refusal of the Influenza Vaccine Among Medical Students

Reasons*	n	%
Reasons for Acceptance (n=40)		
Self-protection	30	75
Not to infect family and relatives with the influenza	10	25
Recommended by health professionals	5	12.5
Other reasons†	3	7.5
Reasons for Refusal (n=285)		
Perception that influenza is not a serious illness	108	37.9
Lack of time to get vaccinated	51	17.9
Limited effectiveness of the influenza vaccine	45	15.8
Insufficient knowledge about the influenza vaccine	29	10.2
Side effects of the vaccine/unreliability of the vaccine	25	8.8
Receiving a large number of COVID vaccines during the pandemic	12	4.2
Cost of the influenza vaccine	11	3.9
Difficulty accessing the influenza vaccine	9	3.2
Other reasons‡	15	5.3

*Students may report more than one reason

† Other reasons (acceptance): Preventing transmission to patients (n=2, 5.0%) and Frequent occurrence of the influenza (n=1, 2.5%).

‡ Other reasons (refusal): Considering the influenza vaccine unnecessary (n=5, 1.8%); immune system is adequate (n=2, 0.7%); laziness (n=2, 0.7%); mild flu symptoms (n=2, 0.7%); not wanting to get vaccinated (n=2, 0.7%); other precautions to prevent disease (n=1, 0.4%); not being risky (n=1, 0.4%).

the 2023/2024 season. Approximately one-fifth of the students (19.1%) stated that the end of the pandemic had a decreasing effect on the desire to receive influenza vaccination.

Among the reasons for accepting the influenza vaccine among the students (n=40) who had/would consider having the influenza vaccine, the most common reasons were to protect themselves (75%), not to infect their family and relatives with the influenza (25%), and the recommendation of health professionals (12.5%). The main reasons for refusing the influenza vaccine among students who did not receive the vaccine and did not plan to do so (n=285) were the belief that influenza is not a serious illness (37.9%), concerns about the limited effectiveness of the vaccine (15.8%), and the lack of time to get vaccinated (17.9%) (Table 3).

No significant relationship was found between students' age category (21 years), gender, class category, chronic illness, history of COVID-19, COVID-19 vaccination status, level of knowledge about the influenza vaccine, and their status of receiving or considering receiving the influenza vaccine (p>0.05).

Intention to get/have a influenza vaccine was significantly higher among students with high family income (24.3%) compared to those with low/middle income (8.8%). Additionally, it was significantly higher among students with moderate/high/very high concern about catching flu compared to those with very low/low concern (p=0.001, p=0.033, respectively).

It was found that more than half of the students who received the influenza vaccine during the pandemic did not get vaccinated or did not plan to get vaccinated during the 2023/2024 season (p=0.001).

Discussion

The present study aimed to investigate the attitudes and practices of medical students towards seasonal influenza vaccination in the first post-pandemic influenza season and the possible effects of the end of the pandemic. To our knowledge, this is the first study investigating the attitudes and practices of medical students towards seasonal influenza vaccination after the end of the COVID-19 pandemic. In our study, it was found that 7.4% of medical students received influenza vaccination during the pandemic and 2.5% after the pandemic (2023/2024 season). A total 9.8% of the students stated that they were planning to be vaccinated in the 2023/2024 season. Additonaly, 19.1% of the students thought

Table 4: Comparison of Students' Characteristics and İnfluenza Vaccination Receive/İntend To Receive

Characteristics		Received/Intend (n=40)	Did Not Receive/ Do Not Intend (n=285)		
		n (%)	n (%)	OR (95% CI)	p
Age category	≤21	14 (10.9)	114 (89.1)	1.24 (0.62–2.47)	0.544
	>21	26 (13.2)	171 (86.8)	Ref	
Gender	Male	16 (10.6)	135 (89.4)	1.35 (0.69-2.65)	0.382
	Female	24 (13.8)	150 (86.2)	Ref	
Class	Preclinical (1,2,3)	18 (11.7)	136 (88.3)	1.12 (0.57-2.17)	0.747
	Clinical (4,5,6)	22 (12.9)	149 (87.1)	Ref	
Family income level	Low/Moderate	22 (8.8)	229 (91.2)	3.35 (1.68-6.66)	0.001
	High	18 (24.3)	56 (75.7)	Ref	
Chronic diseases	Yes	3 (17.6)	14 (82.4)	1.57 (0.43-5.72)	0.450
	No	37 (12.0)	271 (88.0)	Ref	
History of COVID-19 Infection	Yes	14 (13.7)	88 (86.3)	1.21 (0.60–2.43)	0.599
	No	26 (11.7)	197 (88.3)	Ref	
COVID-19 vaccination	Yes	36 (12.2)	258 (87.8)	0.94 (0.31–2.79)	0.915
	No	4 (12.9)	27 (87.1)	Ref	
Concern about influenza transmission	Very Low/Low	16 (8.8)	165 (91.2)		0.033
	Moderate/High/Very High	24 (16.7)	120 (83.3)	2.06 (1.05–4.05)	
Knowledge about influenza vaccine	None/Very Limited	8 (7.9)	93 (92.1)	Ref	0.135
	Moderate	19 (12.5)	133 (87.5)	1.67 (0.69–4.05)	
	Extensive/Very Extensive	13 (18.1)	59 (81.9)	2.56 (0.98–6.66)	
Influenza vaccination during the pandemic	Yes	10 (41.7)	14 (58.3)	6.45 (2.64-15.79)	0.001
	No	30 (10)	272 (90)	Ref	

Note: OR = Odds Ratio; CI = Confidence Interval; Ref = Reference category. p-values were calculated using the Chi-square test

that the end of the pandemic had a decreasing effect on the desire to receive influenza vaccination. The results of our study show that the rate of influenza vaccination among medical students is low and the end of the pandemic has a partially negative effect on vaccination behavior.

A 2018 study conducted in 28 family health centers in Turkey investigating influenza vaccination rates found that 13.4% of participants received the vaccine irregularly, while 8.1% were vaccinated annually (15). These findings indicate that the influenza vaccination rate among medical students is similarly low, reflecting the general population.

The impact of the COVID-19 pandemic on influenza vaccination status has been investigated in various studies. It has been reported that the prevalence of influenza vaccination among students at a medical school in China increased from 6.7% in 2019 to 25% in 2021. In addition, it was determined that the majority of students' knowledge about the influenza vaccine and their willingness to get vaccinated increased due to the pandemic (14). An Italian study conducted in a teaching and research hospital reported that the influenza vaccination rate among healthcare workers increased from 21.5% during the 2019–2020 influenza season to 43.1% during the 2020–2021 season following a vaccination campaign (16). The influenza vaccination rate among medical students in Poland was 36.5% in 2019-2020, significantly higher than in 2014-2015 (10.6%) (10). Similarly, Grochowska et al. showed in another study of medical students and healthcare workers in Poland that the proportion of those who intend to be vaccinated against influenza in 2020/2021 (61.6%) was approximately twice as high as the reported vaccination rate for 2019/2020 (32.9%) (17). Another study by Robbins et al in a tertiary hospital in the United Kingdom found that 44% of healthcare workers were likely to receive an influenza vaccination due to the COVID-19 pandemic (18). Research conducted in three hospitals in Italy during the 2020–2021 influenza season revealed that 30.5% of healthcare workers changed their negative opinions about the influenza vaccine due to the COVID-19 pandemic, and 53.4% considered getting vaccinated (19).The results of our study and other studies show that the COVID-19 pandemic has had a significant positive impact on attitudes and behaviors towards influenza vaccination, increasing awareness and vaccination rates.

Our study found that students with higher family income levels were more likely to receive or consider receiving the influenza vaccine. This may be attributed to the fact that influenza vaccination services are not free for medical students in Turkey. Similarly, previous studies have reported the negative impact of vaccine costs on vaccination rates or the positive effect of providing free vaccination services on vaccine uptake (12, 20-22).

The present study revealed a relationship between the level of concern about influenza transmission and the status/intention to receive the influenza vaccination. The primary reason for not wanting to be vaccinated was the perception that influenza is not a serious disease. Similarly, a study conducted among medical students in Poland, not being afraid of influenza was determined as the biggest reason for not getting vaccinated (23). A study conducted among healthcare workers in Italy reported that concerns about COVID-19 and increasing mortality rates increased the tendency to get a influenza vaccine (19). Another study of health students in Western Australia found that influenza vaccination rates increased from 2018 to 2020, and that concerns about COVID-19 and mandatory vaccination were effective in this increase (24). These findings show that concern about disease transmission is a strong determining factor on individuals‘ vaccination intention and behaviors, and that individuals' disease risk perceptions are effective in the development of vaccination behaviors.

In our study, no significant association was found between knowledge level about influenza vaccination and vaccination intention. This finding contrasts with previous studies (e.g., from China and several European countries) reporting higher uptake among individuals with greater knowledge (14,25,26). Several explanations are possible: First, knowledge was assessed through self-report, which may not accurately reflect actual knowledge. Second, the single-center design with a relatively limited sample size may have reduced the statistical power. Third, factors beyond knowledge—particularly vaccine cost, perceived severity of illness, and accessibility—may have played a stronger role in decision-making. Indeed, the most common reason for refusing vaccination in our study was the perception that 'influenza is not a serious disease.' Therefore, strategies to increase uptake should not only aim to improve knowledge but also strengthen perceptions of disease severity and address cost/access barriers.

In our study, more than one-third of the students (36.9%) reported the internet as their main source of information about influenza vaccination. This finding highlights the risk of reliance on potentially unreliable sources and suggests the need for strengthening immunization education in medical schools. Consistent with previous studies (21, 25-27), our results indicate that the internet is increasingly used to obtain vaccination-related information in today's world where digital technologies are widely utilized. This underscores the importance of enhancing the medical education curriculum to improve students' knowledge about influenza vaccination.

Limitations: This study was conducted in a single centre with the participation of a limited number of students. The study, which has a cross-sectional design, was conducted in a short period of time and with the online survey method without considering the exam periods of the students. These factors may have led to low participation and biased responses to some questions. In our study, 9.5% of students reported considering vaccination; however, this does not necessarily indicate that all will get vaccinated. Therefore, multicenter studies covering the entire vaccination season are recommended.

The results of our study revealed that the influenza vaccination rate among medical students was low and the end of the pandemic further reduced this rate. Improving the educational curriculum to increase the knowledge and awareness of medical students about influenza vaccination and making vaccination services free and compulsory may increase vaccination rates.

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