

Knowledge, attitudes, and practices of medical students regarding adult immunization: a cross-sectional study^a

 Merve Taştan^{*1},  Füsün Ayşin Artıran İğde²

¹Department of Family Medicine, Faculty of Medicine, Amasya University, Amasya, Türkiye

²Department of Family Medicine, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Türkiye

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ABSTRACT

Aims: Our aim was to conduct a comparative assessment of medical students' knowledge, attitudes, and behaviors regarding adult vaccination by class year.

Methods: In a cross-sectional study conducted from January to May 2017 among medical students at a medical school, sociodemographic characteristics, knowledge levels regarding adult vaccines, and support for vaccination programs were assessed using a structured questionnaire. Knowledge scores were compared across class years; following univariate analyses of variables associated with support for vaccination programs, a binary logistic regression model was constructed.

Results: In our study, the rate of awareness of the Adult Immunization Guidelines was found to be significantly higher among sixth-year students ($p < 0.001$). In particular, the tendency to get vaccinated against hepatitis B and tetanus was also significantly higher among sixth-year students ($p < 0.001$). In a logistic regression analysis in which support for vaccination programs was taken as the dependent variable, it was found that a 1-unit increase in the score for skepticism regarding the necessity of vaccines reduced the likelihood of supporting vaccination programs by 55% (odds ratio (OR)=0.45), while an increase in the score for reluctance to get vaccinated reduced the likelihood of support by 38% (OR=0.62). It was found that a 1-unit increase in the belief that vaccinating adults is protective increased the likelihood of supporting vaccination programs by 3.70 times (OR=3.70), while an increase in the regular exercise score increased this likelihood by 1.54 times (OR=1.54) and an increase in the healthy eating score increased it by 1.81 times (OR=1.81).

Conclusion: Although it is observed that medical students' fundamental knowledge regarding adult immunization increases as the academic term progresses, their sense of being inadequately prepared in this area is likely to negatively affect their future ability to recommend vaccinations. Therefore, there is a need for structured educational interventions to raise awareness of adult immunization guidelines.

Keywords: Medical education, medical students, adult, immunization

^aA preliminary version of this study was presented as a poster presentation at the 16th International Eastern Mediterranean Family Medicine Congress in May 2017.

INTRODUCTION

Vaccination is among the most effective and cost-effective public health interventions for controlling infectious diseases and reducing mortality and morbidity. Vaccines administered in adulthood make a significant contribution to preventing serious infections, hospitalizations, and deaths. College students and students in the health sciences are both susceptible to infections and constitute a key group that can influence vaccination behavior in the community, due to their active social lives, their presence in crowded settings, and their potential to serve as role models for their peers.¹⁻³

Healthcare professionals and students are of particular importance both in terms of their own vaccination status and their approach to providing recommendations to patients. Medical students, as the doctors of the future, will play a decisive role in the planning, implementation, and counseling processes of adult vaccination programs after graduation. However, current findings indicate that even among

physicians and students, there may be gaps in knowledge regarding certain vaccines, misunderstandings or gaps in the understanding of guidelines, and hesitation or reservations about vaccines.⁴⁻⁷

The primary objective of this study is to examine medical students' knowledge and attitudes regarding adult immunization. In this context, assessing medical students' knowledge, attitudes, and behaviors regarding adult immunization is of critical importance for identifying gaps in current educational programs, developing targeted curricula and educational strategies, and ensuring that future physicians play an active role in adult immunization services. Given the goals of ensuring the success of national immunization programs and increasing adult vaccination rates, assessing medical students' level of preparedness regarding adult immunization is a critical requirement for both medical education and public health policies.^{1,2,8-10}

*Corresponding Author: Merve Taştan, drmtastan@gmail.com



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METHODS

Ethics

This study was approved by the Clinical Researches Ethics Committee of Ondokuz Mayıs University (Date: 01.12.2016, Decision No: OMÜ KAEK 2016/362). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study Design

The study was conducted using a cross-sectional and descriptive design among students at the Ondokuz Mayıs University School of Medicine.

Study Population and Sample Size

The study population consisted of 800 students in first-, second-, third-, and sixth-year at the Ondokuz Mayıs University School of Medicine during the 2016–2017 academic year. Only students who completed the family medicine internship were included in the study population; fourth- and fifth-year students who did not undertake this internship were excluded. The sample size was determined to be 260 participants using the OpenEpi 3.01 program, based on a 95% confidence level and a 5% margin of error. The study included students who voluntarily agreed to participate and provided informed consent. A total of 499 students participated in the study, which was conducted from January to May 2017.

Procedures and Data Collection

After reviewing previous national and international studies on the subject, a 73-question survey was administered to investigate medical students' knowledge, perceptions, and attitudes regarding adult immunization, as well as their sociodemographic characteristics, vaccination status, and levels of knowledge and attitudes toward vaccines. The survey was administered in person to students in first- to third-year students prior to their vocational skills laboratory courses, and sixth year students during their family medicine rotations.

Statistical Analysis

The research data were imported into a computer system and analyzed using "Statistical Package for Social Sciences (SPSS) for Windows 22.0 (SPSS Inc., Chicago, IL, USA)." Descriptive statistics were presented as mean±standard deviation (minimum–maximum), frequency distribution, and percentages. The distribution of the data was evaluated using the Kolmogorov-Smirnov test. For comparisons between groups, the Pearson Chi-square test and Fisher's exact test were used for categorical variables, and for comparisons of group means, the independent samples t-test was used when the data followed a normal distribution. The Mann-Whitney U test was used for a nonparametric between-groups analysis to compare scores for attitudes, knowledge, and healthy lifestyle behaviors. Multivariate logistic regression analysis was conducted to identify the independent variables influencing participants' support for the vaccination program. Variables found to be statistically significant in univariate analyses or considered clinically or theoretically significant were included in the model. The findings were presented with adjusted odds ratio (OR) and 95% confidence intervals (CI). The values used in the model included the Hosmer–Lemeshow

test, multicollinearity check, Nagelkerke R^2 , and VIF values. Statistical significance was set at $p < 0.05$.

RESULTS

Medical students' knowledge, attitudes, and behaviors regarding adult immunization showed significant differences across years. The gender distribution was similar across years ($p = 0.910$) (Table 1). The 'Year' variable, presented in Table 1 of our study, represents the age distribution of the cases.

Table 1. Distribution of participants' descriptive and behavioral characteristics

Variables	1 st -3 rd years, n (%) (n=399)	6 th year, n (%) (n=100)	P
Gender			
Female	206 (51.6)	51 (51.0)	0.910
Male	193 (48.4)	49 (49.0)	
Year, (mean±SD (medi- an) (min-max)	19.7±1.3	24.3±1.2	<0.001
Are you familiar with the adult immunization guidelines in our country?			
Yes	59 (16.0)	39 (42.4)	<0.001
No	113 (30.7)	17 (18.5)	
Undecided	196 (53.3)	36 (39.1)	
I'll get the flu shot.			
No	263 (65.9)	71 (71.0)	0.334
Yes	136 (34.1)	29 (29.0)	
I'll get the hepatitis B vaccine.			
No	133 (33.3)	11 (11.0)	<0.001
Yes	266 (66.7)	89 (89.0)	
I'll get the pneumococcal vaccine.			
No	264 (66.2)	65 (65.0)	0.826
Yes	135 (33.8)	35 (35.0)	
I'll get the tetanus vaccine.			
No	127 (31.8)	14 (14.0)	<0.001
Yes	272 (68.2)	86 (86.0)	
I'll get the HPV vaccine.			
No	250 (62.7)	63 (63.0)	0.949
Yes	149 (37.3)	37 (37.0)	
I think I'm healthy.			
I disagree	49 (12.3)	7 (7.0)	0.432
Undecided	68 (17.1)	15 (15.2)	
I agree	280 (70.6)	77 (77.7)	
I support vaccination programs.			
No	28 (8.9)	7 (8.1)	0.827
Yes	287 (91.1)	79 (91.9)	
I think there is a lack of information regarding adult immunization			
I disagree	33 (8.3)	15 (15.0)	0.108
Undecided	90 (22.6)	26 (26.0)	
I agree	275 (69.1)	59 (59.0)	
HPV: Human papillomavirus, SD: Standard deviation, Min: Minimum, Max: Maximum			

HPV: Human papillomavirus, SD: Standard deviation, Min: Minimum, Max: Maximum

The rate of awareness of the adult immunization guidelines in our country was 16.0% among students in years 1–3, but rose to 42.4% in year 6, and this increase was found to be statistically significant ($p < 0.001$). There was a significant increase in the tendency to get vaccinated, particularly for the hepatitis B vaccine (1st–3rd years: 66.7%; 6th year: 89.0%;

$p < 0.001$) and the tetanus vaccine (1st–3rd years: 68.2%; 6th year: 86.0%; $p < 0.001$). However, the proportion of students who indicated that they believed knowledge regarding adult immunization was insufficient remained high in both years; specifically, the proportion of those who agreed was 69.1% in 1st–3rd years and 59.0% in 6th year (Table 1).

For most statements—particularly regarding the *Haemophilus influenzae* type b (Hib) vaccine, the recommendation for adult Td/Tdap booster shots, the long-term protection provided by the hepatitis B vaccine, and pregnancy following the varicella vaccine—information scores were found to increase from the 1st–3rd years to the 6th year. A significant decrease in scores for incorrect statements—such as “The measles-mumps-rubella (MMR) vaccine is safe for use in pregnant women” and “Those

who receive the human papillomavirus (HPV) vaccine do not need cervical cancer screening”—in later stages indicates that students become better able to distinguish misinformation over time. The absence of a significant difference between cohorts in statements regarding pet bites, pneumococcal vaccine boosters, and the HPV vaccination schedule suggests that knowledge on these topics has increased only slightly, or that students already possessed a relatively good or moderate level of knowledge on these topics from the outset. As students advance to higher grades, there is a significant improvement in their understanding of basic and critical information regarding adult immunization; however, the increase in knowledge regarding certain specific or detailed topics remains more limited (Table 2).

Table 2. Participants' knowledge levels regarding vaccines

Proposition	First-year medical student mean (min–max)	Second-year medical student mean (min–max)	Third-year medical student mean (min–max)	Sixth-year medical student mean (min–max)	p
The <i>Haemophilus influenzae</i> type b (Hib) vaccine should be administered to individuals with functional or anatomical asplenia, immunoglobulin deficiencies, complement deficiency, or those undergoing chemotherapy or radiation therapy for malignancy following a stem cell transplant.	2.99 (1–5)	2.93 (1–5)	3.54 (1–5)	3.61 (1–5)	<0.001
Bites from domestic animals such as cattle, sheep, goats, horses, and donkeys are not considered a risk for rabies transmission.	2.88 (1–5)	2.75 (1–5)	2.70 (1–5)	2.87 (1–5)	0.539
For adult immunization, a tetanus-diphtheria (Td) booster is recommended every 10 years, including at least one dose of the diphtheria, tetanus, and acellular pertussis (Tdap) vaccine.	3.12 (1–5)	3.10 (1–5)	3.88 (1–5)	3.82 (1–5)	<0.001
The seasonal flu vaccine can be administered to children older than 2 months.	2.89 (1–5)	2.56 (1–5)	2.92 (1–5)	2.71 (1–5)	0.007
Recombinant flu vaccines can be safely administered to people with egg allergies.	2.87 (1–5)	2.76 (1–5)	2.70 (1–5)	2.47 (1–5)	0.005
Polysaccharide pneumococcal vaccines can be administered up to three times, with an interval of at least 5 years between doses, in accordance with the recommended schedules.	2.97 (1–5)	2.90 (1–5)	3.11 (1–5)	3.11 (1–5)	0.031
In the hepatitis B vaccination series, an anti-HBs level of ≥ 10 mIU/ml after the third dose provides long-term protection.	3.03 (1–5)	2.94 (1–5)	3.44 (1–5)	3.82 (1–5)	<0.001
Women who may become pregnant within 4 weeks of receiving the chickenpox vaccine should not be vaccinated.	3.25 (1–5)	3.11 (1–5)	3.66 (1–5)	3.96 (1–5)	<0.001
The herpes zoster (shingles) vaccine should be recommended.	3.03 (1–5)	2.93 (1–5)	3.23 (1–5)	2.92 (1–5)	0.013
The measles-mumps-rubella (MMR) vaccine can be safely administered to pregnant women.	3.02 (1–5)	2.79 (1–5)	1.97 (1–5)	1.86 (1–5)	<0.001
The HPV vaccine administered to girls aged 9–13 is the most cost-effective method for preventing cervical cancer.	3.05 (1–5)	3.10 (1–5)	3.52 (1–5)	3.21 (1–5)	<0.001
The vaccination schedule must be completed before engaging in sexual activity.	3.40 (1–5)	3.14 (1–5)	3.55 (1–5)	3.31 (1–5)	0.007
Women who have received the HPV vaccine do not need to undergo cervical cancer screening.	2.81 (1–5)	2.64 (1–5)	1.91 (1–5)	2.12 (1–5)	<0.001
The HPV vaccination schedule consists of 3 doses administered at 0, 2, and 6 months.	3.00 (1–5)	3.03 (1–5)	3.31 (1–5)	3.13 (1–5)	0.009

HPV: Human papillomavirus, Min: Minimum, Max: Maximum

“Yes” responses regarding vaccines that can be used in adult immunization were compared among medical students in their 1st–3rd years and 6th year. According to the results of the statistical analysis, reports regarding Hepatitis A ($p < 0.001$), Influenza ($p < 0.001$), HPV ($p = 0.004$), Herpes Zoster ($p = 0.009$), Pneumococcal ($p = 0.017$), Meningococcal ($p = 0.018$), and Hepatitis B ($p = 0.032$) vaccines, a statistically significant increase was observed in favor of 6th-year students. However, no statistically significant difference was observed between the two groups in the rates of vaccination for varicella ($p = 0.903$),

rabies ($p = 0.910$), Tdap ($p = 0.940$), Hib ($p = 0.506$), and MMR ($p = 0.58$) vaccines (Figure 1).

The scores for attitudes, knowledge, and behaviors related to a healthy lifestyle among medical students participating in the study were compared. No statistically significant difference was found between the students in terms of attitude scores ($p = 0.257$) and knowledge scores ($p = 0.314$). It was observed that attitude scores were concentrated at high levels in both groups, while knowledge scores clustered within a similar distribution range (centered around 3 points). An analysis

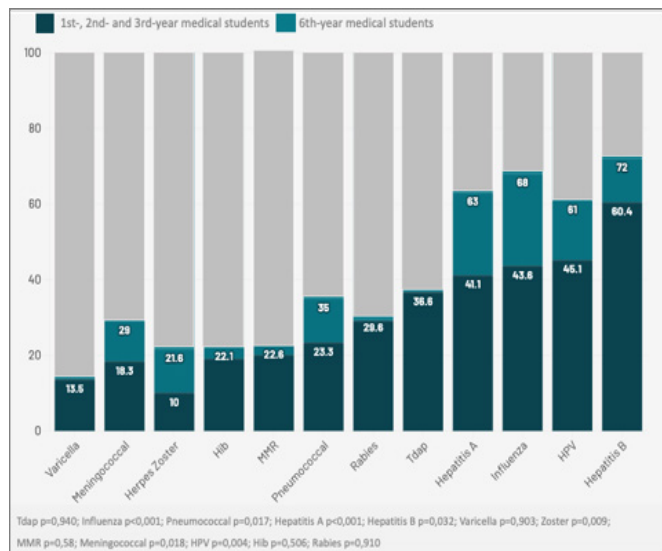


Figure 1. Comparison of “yes” responses regarding vaccines usable in adult immunization among students. Hib: *Haemophilus influenzae* type b, MMR: Measles-mumps-rubella, HPV: Human papillomavirus

of students’ healthy lifestyle behavior scores revealed a statistically significant difference between the 1st–3rd years and 6th year groups ($p < 0.001$) (Figure 2).

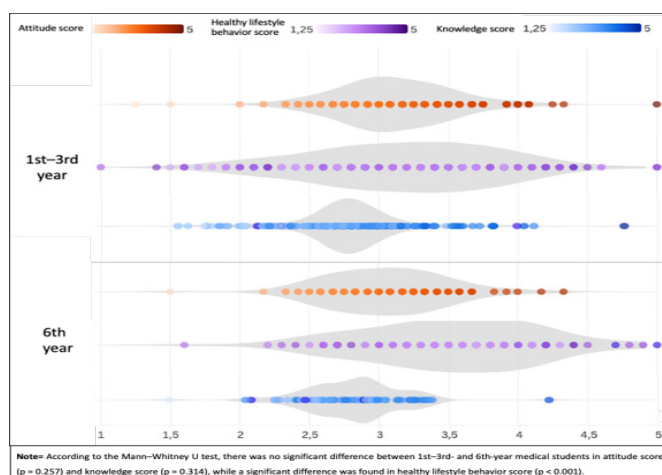


Figure 2. Distribution of knowledge, attitude, and healthy lifestyle behavior scores among 1st–3rd- and 6th-year medical students

A binary logistic regression model was constructed using the enter method with certain independent variables that were found to be significant ($p < 0.05$) in univariate analyses, as well as those that were not significant but had p -values below 0.20. A total of 366 individuals were included in the analysis due to missing data, and 6 outliers were excluded. The dependent variable is support for vaccination programs. A 1-unit increase in the score for skepticism regarding the necessity of vaccines reduces the likelihood of supporting vaccination programs by 55.4% (OR=0.45, 95% CI=0.24–0.83). An increase in the score for reluctance to get vaccinated also reduces the likelihood of support by 38% (OR=0.61, 95% CI=0.40–0.93). A 1-unit increase in the belief that vaccinating adults is protective was associated with a 3.70-fold increase in the likelihood of supporting vaccination programs (OR=3.70, 95% CI=1.89–7.25), an increase in the score for regular exercise increases the likelihood by 1.54 times (OR=1.54, 95% CI=1.08–2.20), and an increase in the score for healthy eating increases the likelihood by 1.81 times (OR=1.81, 95% CI=1.10–2.99) (Table 3).

DISCUSSION

Although the percentage of sixth-year medical students who are aware of the national vaccination guidelines has increased, a significant portion of students believe their knowledge of adult immunization is insufficient. The fact that more than half of these future physicians—who will graduate and be prescribing medications and administering vaccines to patients—feel insecure about this topic serves as the most striking warning sign that the “adult immunization” component of the medical school curriculum needs to be reviewed. In this study, the examination of medical students’ knowledge, attitudes, and behaviors regarding adult immunization is largely consistent with findings in the national and international literature on health students’ readiness regarding vaccination. Numerous studies have highlighted that the level of knowledge about vaccines among students in medicine, nursing, and other health-related fields is mostly moderate or inadequate, and that knowledge gaps are frequently observed, particularly regarding certain adult vaccines (HPV, influenza, hepatitis B, meningitis, etc.).^{1-4,11,12} Studies on HPV conducted in Brazil and India have shown that a lack of knowledge is more pronounced among male students in the early grades and

Table 3. Logistic regression analysis of factors associated with supporting vaccination programs among participants

Variables	β	Standard error	Wald	df	p	OR (95% CI)
I have my doubts about the necessity of vaccines.	-0.808	0.317	6.495	1	0.011	0.446 (0.24–0.83)
The views of people who serve as role models in society influence my decision on the issue of vaccination.	-0.358	0.242	2.177	1	0.140	0.699 (0.44–1.13)
Vaccinating adults is a method of protection.	1.309	0.343	14.598	1	<0.001	3.703 (1.89–7.25)
It is important to improve vaccination rates.	0.262	0.285	0.844	1	0.358	1.300 (0.74–2.27)
It is important for all adults to be fully vaccinated.	-0.070	0.284	0.061	1	0.805	0.932 (0.53–1.63)
I have my doubts about the effectiveness of vaccines.	-0.039	0.332	0.014	1	0.906	0.961 (0.50–1.84)
I exercise regularly.	0.434	0.181	5.733	1	0.017	1.543 (1.08–2.20)
I eat a healthy diet.	0.594	0.257	5.353	1	0.021	1.811 (1.10–2.99)
I wash my hands frequently.	0.588	0.305	3.719	1	0.054	1.801 (0.99–3.28)
I don't like getting vaccinated.	-0.491	0.215	5.208	1	0.022	0.61 (0.40–0.93)
Just as there is a vaccination program for childhood, there should also be one for adulthood.	0.386	0.271	2.036	1	0.154	1.472 (0.87–2.50)
Year	-0.145	0.120	1.455	1	0.228	0.865 (0.68–1.10)

*Overall percentage=93.7%, Nagelkerke R Square=0.470, Hosmer and Lemeshow p value=0.897. df: degrees of freedom, OR: Odds ratio, CI: Confidence interval

among those who have not been vaccinated, and that students do not acquire a complete understanding of key concepts (indications, special populations, use during pregnancy, and HIV-positive individuals) by the time they graduate.^{4,12} Similarly, for hepatitis B, a disconnect between knowledge and practice among health students has been reported; despite high levels of knowledge, full-course vaccination rates remain quite low.¹¹

The findings of our study indicate that students' attitudes toward adult vaccinations are generally positive, but the rate at which these attitudes translate into behavior is limited; this aligns with the phenomenon described in the literature as the "knowledge–attitude–behavior gap." It has been shown that acceptance and intention rates for COVID-19, influenza, and HPV vaccines are significantly higher among both nursing and medical students than actual vaccination rates; safety and side-effect concerns, "perceiving the risk of contracting the disease as low," cost and access issues, and institutional organizational shortcomings have been identified as barriers to vaccination.^{1,6,11–14} A meta-analysis of university students found that the intention to get routine vaccinations was around 54% for HPV and 43% for the flu, but that this intention was often hindered by contextual factors such as cost and availability.²

While awareness of the adult immunization guidelines published in our country is quite low among students in 1st–3rd years, it has increased significantly among 6th year students, though it has not yet reached an adequate level. In addition, a large proportion of students consider their knowledge of adult immunization to be insufficient. Lack of familiarity with the guidelines has led students to provide correct answers at a lower-than-expected rate to questions about which vaccines are recommended for adults. In knowledge-assessment questions on adult immunization administered to medical students, it was observed that 6th-year students scored higher on many vaccines, although the overall averages remained low. This finding suggests that greater exposure to adult immunization during clinical training and the opportunity to observe vaccine indications in practice contribute positively to students' knowledge levels.

It is an expected finding that the differences in knowledge and attitudes identified in our study are associated with variables such as gender, grade level, and subject area. Numerous studies have reported that female students have a higher level of knowledge on reproductive health topics such as HPV and family planning, whereas male students may be associated with both a knowledge gap and lower vaccine acceptance.^{1,4,12,15} The observation that both knowledge and vaccination behavior increase positively as the grade level rises reflects the impact of education on infectious diseases and public health provided prior to graduation; however, some studies have also shown that graduation does not guarantee an increase in knowledge on certain subtopics.⁴ This situation underscores the need to structure the curriculum specifically for adult immunization and to clearly define and assess core competencies based on current guidelines.^{8,10}

The fact that students exhibit hesitant or divided attitudes toward mandatory vaccinations—particularly those against highly contagious diseases—is consistent with the literature on vaccine hesitancy. A mixed-methods study conducted

among medical students in Germany showed that while there is greater support for mandatory vaccination against highly contagious diseases such as measles and COVID-19, mandatory vaccination is less widely accepted for diseases perceived as less serious.¹⁶ These findings indicate that medical students need educational activities that address not only biomedical knowledge but also the ethical, legal, and health policy dimensions.

Attitudes toward supporting vaccination programs are strongly associated with vaccine skepticism and beliefs about healthy living. The data show that beliefs and attitudes are the most important determinants of support for vaccination programs. A 1-unit increase in the vaccine necessity doubt score reduces support by approximately 55% (OR≈0.45), which is consistent with the literature on "vaccine hesitancy"; as trust and the perceived necessity of vaccination decrease, the intention to get vaccinated and acceptance of the vaccine decline significantly.^{17–20} Similarly, the finding that an increase in the "reluctance to get vaccinated" score reduces support is consistent with studies showing that negative emotional attitudes are a strong barrier to intention.^{20–22} On the other hand, the fact that support increases by approximately 3.7 times for every 1-unit increase in the belief that adult vaccination is protective is consistent with findings indicating that the "perceived benefits of vaccination" are the primary determinant of intention.^{18–20} In areas such as COVID-19 and HPV, it has been shown that individuals with a high perception of the benefits of the disease and the vaccine are much more likely to embrace the vaccine and vaccination programs.^{18,19,23}

The fact that increases in scores for regular exercise and healthy eating boost support for the vaccination program by 1.5–1.8 times suggests that a general health-oriented lifestyle is associated with preventive health behaviors, including vaccination.^{24–26} Findings indicating that physical activity and healthy eating improve both the risk of infection and the immune response to vaccines support the notion that these behaviors stem from the same foundation of health awareness.^{25,26}

Our study has important implications for policy and education. First, identifying the knowledge, attitudes, and behavior profiles of medical students regarding adult immunization provides a foundation for targeted curriculum revisions. Systematic reviews show that case-based learning, simulations, role-playing, and video-based online training can significantly increase knowledge about vaccination, self-efficacy, and the ability to address vaccine hesitancy.^{8,10,16} Second, it has been reported that there is a positive correlation between healthcare students' own vaccination status and their tendency to recommend vaccines to patients in the future; students who trust vaccines and have been vaccinated themselves are more likely to strongly recommend them to their patients.^{1,11,13,27} For this reason, it is important for medical schools to establish structured programs (such as free vaccination campaigns, on-campus reminder and appointment systems, etc.) to ensure that students complete their basic adult vaccinations before beginning clinical practice, both to protect the students and to reinforce the role model effect.^{6,8,10,11}

Limitations

There are some limitations that should be taken into account when interpreting this study. One of the most significant limitations is that the data were collected in 2017, that is, before the COVID-19 pandemic, which had a profound impact worldwide. As is well known, the pandemic has led to a dramatic increase in anti-vaccine sentiment, vaccine hesitancy, and negative attitudes toward vaccines on a global scale (particularly due to manipulation on social media and misinformation). Therefore, it is clear that perceptions of vaccination among the general public and among healthcare workers have taken on a new dimension in the wake of the pandemic. However, this does not diminish the value or relevance of the findings of our study. A review of the current literature on medical students in the post-pandemic period reveals that, as medical education progresses, the level of theoretical knowledge regarding adult immunization increases; however, issues such as specific vaccination schedules, awareness of guidelines, and feelings of inadequacy among students nearing graduation persist to a similar extent. In other words, despite the global vaccine debates sparked by the COVID-19 pandemic, the chronic shortcomings in medical education curricula regarding adult immunization and students' knowledge and attitude patterns remain valid in the literature. In this context, our study serves as a fundamental reference point in highlighting the time-independent, structural issues within medical education dynamics; it reaffirms, even during crisis periods such as the pandemic, just how critical adult vaccination education in the medical curriculum is and how much it needs to be improved. Since the sample was limited to a single faculty, the generalizability of the results to all medical students is limited. The fact that differences between groups based on the gender variable were not examined in the design of the current study constitutes one of the primary limitations of the research.

CONCLUSION

In awareness campaigns regarding adult vaccination, it is important to address both the cognitive and behavioral dimensions together. Reducing vaccine hesitancy and strengthening the perception of vaccine effectiveness are fundamental strategies for increasing public trust in vaccination programs. Accordingly, medical education programs should be structured to place greater emphasis on adult immunization, and students should be provided with opportunities to gain awareness in this area at both the theoretical and clinical levels. This will enable future healthcare professionals to play a more active role in preventive healthcare and help increase adult vaccination rates.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Clinical Researches Ethics Committee of Ondokuz Mayıs University (Date: 01.12.2016, Decision No: OMÜ KAEK 2016/362)." All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights—including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: MT, FAAİ; Design: MT; Control: FAAİ; Data Collection and/or Processing: MT; Analysis and/or Interpretation: MT, FAAİ; Literature Review: MT; Article Writing: MT; Critical Review: FAAİ.

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