Family Medicine & Primary Care Review 2024; 26(2): 170–176, https://doi.org/10.5114/fmpcr.2024.139025

ORIGINAL PAPERS

ISSN 1734-3402, eISSN 2449-8580

Participation of future medical personnel in building public trust in vaccinations

KAMIL KRZYSZTOF COŁOŚ[1, A–F], ANETA NITSCH-OSUCH[1, D–F], SABINA KARCZMARZ[2, D–F],
ORCID ID: 0009-0003-5304-6598 ORCID ID: 0000-0002-2622-7348 ORCID ID: 0000-0002-3161-2814
ANNA KORDOWSKA[3, D–F], ANNA OWCZARCZYK[4, D–F], PAWEŁ ŻUK[3, D–F],
ORCID ID: 0000-0001-5293-8517
MAGDALENA BOGDAN[1, A, D–F]
ORCID ID: 0000-0002-8856-9773

[1] Department of Social Medicine and Public Health, Medical University of Warsaw, Warsaw, Poland
[2] The International Foundation for Integrated Care Poland, Warsaw, Poland
[3] Medical and Diagnostic Center, Siedlce, Poland
[4] Department of Logistics, Security and Management, Military University of Technology, Warsaw, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Prevention through vaccinations in the group of healthcare professionals provides protection not only to this particular group but also to their environment. Students of the senior years of medical faculties are persons who will become healthcare professionals in the near future.

Objectives. The aim of the study was to analyze the attitudes of senior students of medical faculties towards vaccinations, analyze factors that influence these attitudes, and to assess their knowledge and awareness of the safety, effectiveness, and necessity of vaccinations.

Material and methods. The research tool was a self-made questionnaire. The study was conducted in a group of senior students of selected faculties at the Medical University of Warsaw.

Results. It has been shown that the vast majority of those surveyed were convinced of the importance and effectiveness of preventive vaccinations. The study also proves that proper education about vaccinations can increase the number of healthcare professionals who decide to undergo mandatory and recommended vaccinations. Persons who have the knowledge about vaccinations and their health and social benefits are more likely to decide to get vaccinated. The study also showed that the knowledge gained during medical studies is the basis for building awareness of future medical staff in the field of preventive vaccinations.

Conclusions. The results obtained in this study may be used to make a suggestion for medical universities and medical self-governing bodies on how to increase the vaccination rate among medical students and medical staff with mandatory vaccines and vaccines recommended for healthcare professionals.

Key words: vaccinations, medical staff, health occupations students, health education.

Cołoś KK, Nitsch-Osuch A, Karczmarz S, Kordowska A, Owczarczyk A, Żuk P, Bogdan M. Participation of future medical personnel in building public trust in vaccinations. *Fam Med Prim Care Rev* 2024; 26(2): 170–176, doi: https://doi.org/10.5114/fmpcr.2024.139025.

Background

Students of the senior years of medical faculties are those who will become healthcare professionals in the near future. Due to their contact with potentially ill patients, medical personnel are at an increased risk of contracting diseases that can be prevented by vaccination. Prevention through vaccination in medical personnel provides protection not only to this particular group but also to patients and co-workers. Awareness of and attitude towards vaccinations among future medical personnel are important for patient care and building public trust in vaccinations.

In Poland, the main document according to which preventive vaccinations are performed is the Preventive Vaccination Program [1]. This document is updated annually by the Polish Chief Sanitary Inspectorate. It is published in the Official Journal of the Minister of Health by October 31 of the year preceding its implementation as an Announcement of the Chief Sanitary Inspector on the Protective Vaccination Program for the subsequent year [2]. The Protective Vaccination Program includes a calendar of mandatory vaccinations that are fully reimbursed and a list of recommended vaccinations that are co-financed by the patient. There are two groups of patients subject to mandatory vaccinations: children and adolescents by age groups and persons at particular risk of infection [3].

According to the Preventive Vaccination Program, vaccination against hepatitis B is mandatory for medical professionals and students of medical schools and universities. This vaccination is financed from public funds. Vaccinations that are recommended for medical workers in the Protective Vaccination Program include vaccinations against hepatitis A, seasonal flu, whooping cough, measles, mumps, rubella, meningococcal infections, and chickenpox [1].

Vaccination against COVID-19 deserves special attention. This vaccination has not been included in the Protective Vaccination Program, but it is mandatory for medical professionals, pharmacists, medical students, and employees of medical entities pursuant to the Regulation of the Minister of Health of March 20, 2020 on the declaration of an epidemic state in the area of the Republic of Poland [4].

Vaccination of medical personnel is considered an important element of the strategy for increasing safety in health care

and improving the quality of care through the reduction of the transmission of viruses of individual diseases, and thus it leads to a reduction in morbidity and mortality among patients and a reduction in morbidity and sickness absence among healthcare workers [5]. The social role of healthcare professionals is equally important, as it is related to building public trust in preventive vaccinations.

Due to the topicality of the research problem and its importance for public health, a study on the attitudes towards preventive vaccinations was conducted. The first stage of the study was an analysis of the attitudes of future medical staff, the results of which are presented in this publication. The further stage of the study was an analysis of patients' attitudes towards preventive vaccinations, the results of which were presented in separate publications.

The topic of preventive vaccinations is an important area of public health enhancement. Besides the introduction of further reimbursements for vaccines, public education is important, too. Currently, there are many programs and campaigns in Poland that are aimed at promoting health prevention [6]. Healthcare professionals also have a significant role to play in promoting preventive activities.

Objectives

The main aim of this study was to analyze the attitudes of senior students of medical faculties towards mandatory and recommended vaccinations. As a result, factors that affect the performance of mandatory and recommended vaccinations were identified in the group of senior students of medical faculties who were supposed to become future healthcare professionals.

The study was also conducted in order to assess the knowledge and awareness of the safety, effectiveness, and necessity of mandatory and recommended vaccinations among senior students of medical faculties and to identify the sources of their knowledge about vaccinations.

The analysis of attitudes and factors that affect the vaccination coverage in the group of senior students of medical faculties made it possible to identify the reasons for low performance of vaccinations against some infectious diseases among healthcare professionals and thus to assess the role of healthcare professionals in building public trust towards preventive vaccinations.

Material and methods

The research tool was a self-made questionnaire. The study was conducted in a group of students of the Medical University of Warsaw majoring in medicine (year 6), nursing (year 2, master's studies), midwifery (year 2, master's studies), and emergency medicine (year 3, bachelor's studies). The survey was conducted online using Google Forms, which was shared with the students representatives. Before they completed the survey, the students were informed about voluntary participation in the study and complete anonymity.

The survey consisted of three parts and a personal data section. The first part concerned the attitude towards vaccinations. In this part, respondents were asked about their attitude towards preventive vaccinations, conviction about the effectiveness of preventive vaccinations, influenza vaccination in the last 3 years, vaccination against COVID-19, and likelihood to recommend vaccinations after graduation. If the respondents gave a 'yes' or 'no' answer to the question about the likelihood to recommend vaccinations after graduation, they were additionally asked about the reason they chose that particular answer.

The second part was a test of knowledge of mandatory and recommended vaccinations for healthcare professionals. The test consisted of 10 questions about mandatory vaccinations for medical professionals, recommendations for influenza vaccinations, hepatitis A vaccinations, diphtheria, tetanus, pertussis vaccinations, contraindications to measles, mumps and rubella vaccinations, recommendations for varicella vaccinations and meningococcal vaccinations, hepatitis B vaccination schedule, the mechanism of action of COVID-19 vaccines, and absolute contraindications to vaccination.

Statistical analysis was carried out in STATISTICA 13 and MS Excel to create a part of the graph and a database. Non-parametric tests were used to analyze the results for independent variables with an ordinal scale (a scale of knowledge level), including the Mann-Whitney test for comparisons of two groups and the Kruskal-Wallis test for comparisons of three or more groups. Statistical analysis of the results recorded on the qualitative scale was carried out using the Pearson's chi-squared test. Significant differences between the groups were observed for the analyzed results when the p-value was < 0.05.

The study was not reviewed by the Bioethics Committee.

Results

There were 83 participants to the study, including 30 students of medicine, 22 students of nursing, 16 students of midwifery, and 15 students of emergency medicine. Regarding gender, the majority of the group were female – 66.7% of all participants (n = 55) versus 33.73% male (n = 28).

The age of the participants was 21–35 years, and more than half of the group were 21–25 years of age (60.24%, n = 50). 36.14% of the participants were aged 26–30 years (n = 30). The rest of the group, 3.61% (n = 3), were 31–35 years old.

Half of the group (50.60%) had secondary education. 34.94% had a bachelor's degree, and 14.46% had a master's degree. Table 1 shows the respondents' data by gender, age, and education.

Table 1. Characteristics of the study group by gender, age, and education

Question	Answer	*n*	%
Gender	female	55	66.27
	male	28	33.73
Age	21–25 years old	50	60.24
	26–30 years old	30	36.14
	31–35 years old	3	3.61
Education	secondary	42	50.60
	bachelor's	29	34.94
	master's	12	14.46

The vast majority of participants in the study were supporters of vaccinations, and they constituted 78.31% of the respondents. Individuals who provided the answer that their attitude depended on the type of vaccine constituted 13.25% of the group. The rest of the group (8.23%) were opponents of vaccinations or had no opinion.

The next question concerned the respondents' opinion about the effectiveness of preventive vaccinations. The majority of the group (73.48%) believed that vaccines are effective. A part of the group (18.09%) was of the opinion that the effectiveness of vaccines depends on its type. People who believed that vaccinations are not effective accounted for 7.23%. A small group of respondents (1.20%) had no opinion.

In another question, the respondents were asked whether they had been vaccinated against influenza in the previous 3 years. 36.14% of respondents had been vaccinated. Those who had not been vaccinated constituted 62.65%, and 1.20% of the respondents did not want to answer the question. 79.52% of the respondents were vaccinated against COVID-19. No vaccination was declared by 12.05%, and 8.43% of the respondents did not provide an answer to this question.

Yet another question concerned the likelihood to be vaccinated with the recommended vaccines after graduation and taking up a job in the medical profession. The majority (75.90%) were willing to be vaccinated in the future. 8.43% of the group did not declare their willingness to be vaccinated, and 15.66% had no opinion on this subject.

When asked about the reasons why they would like to have a recommended vaccination after taking up a job in the medical sector, the respondents indicated protection against diseases (61), protection of loved ones against diseases (58), and protection of patients against diseases (49). Much less frequently indicated answers were the conviction about the safety of preventive vaccinations (27) and the conviction about the effectiveness of vaccinations in the prevention of infectious diseases (35).

When asked about the reasons for no vaccinations in the future, the respondents most frequently indicated the fear of an adverse post-vaccination reaction (3), fear of an unknown substance (3), and conviction that vaccination is ineffective (3).

The most frequently mentioned source of knowledge about preventive vaccinations was university classes (90.36%), medical literature (89.16%), social media (59.04%), and friends/family (51.81%). Less than half of the group (46.99%) indicated that they gained knowledge from a doctor. 40.96% of the respondents used leaflets, brochures, and TV commercials as a source of information about vaccinations. A small group of respondents received information on vaccinations from a nurse (25.30%) or a midwife (16.87%). Pharmaceutical representatives (2.41%) and the Internet (1.20%) were the least frequent sources of knowledge. The results are shown in Figure 1.

Knowledge about vaccinations was assessed on a summary scale of correct answers. The results ranged from 0 to 11 correct answers. The mean score for the study group was 7.5, with a standard deviation of 2.33. The lowest score was 1 point, and the highest was 11 points. The interpretation of the results is presented in the figure below (Figure 2). A score of 0–2 points was assessed as lack of knowledge or low knowledge, scores of 3–4 points indicated mediocre knowledge, and 5–6 points showed average knowledge. The highest scores, 7 and 8 points, indicated extensive knowledge, and 9–11 points were interpreted as very extensive knowledge. In light of the above, 2.41% of

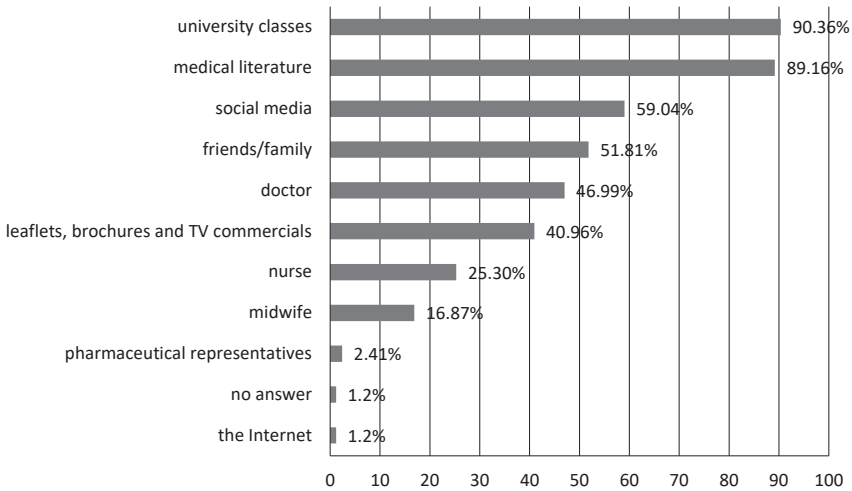

Figure 1. Sources of knowledge about preventive vaccinations among senior students of medical faculties (multiple choice question 100%, *n* = 83)

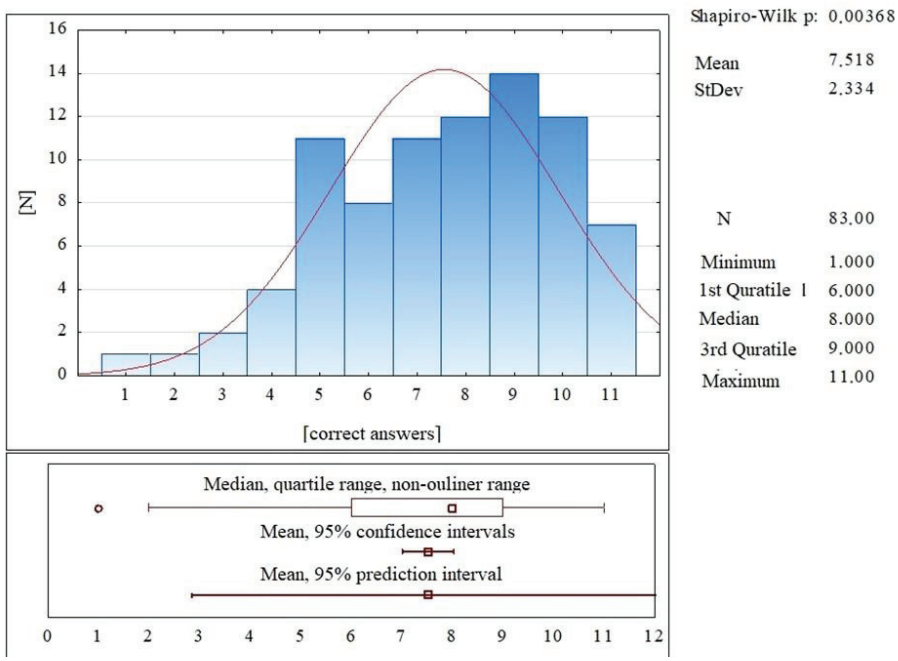

Figure 2. Assessment of knowledge about vaccinations

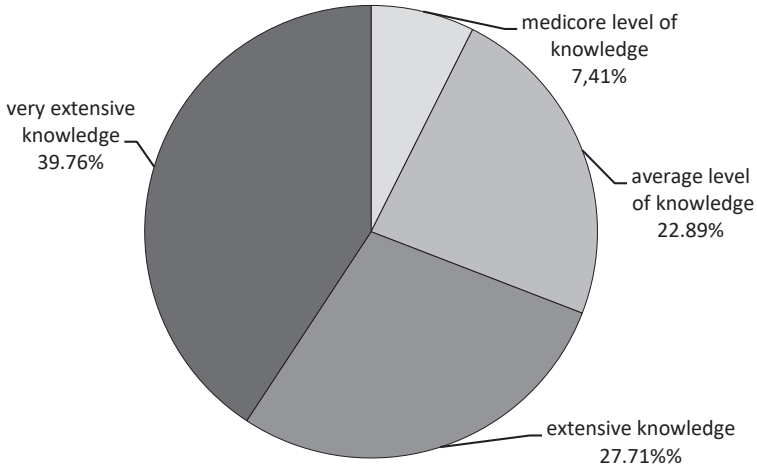

Figure 3. Knowledge about vaccinations

83 respondents had no or very low knowledge about vaccinations (*n* = 2). 7.23% of the respondents (*n* = 6) showed a mediocre level of knowledge, and 22.89% of the respondents (*n* = 19) showed an average level of knowledge. Individuals with extensive and very extensive knowledge constituted 27.71% and 39.76% of the respondents, respectively (*n* = 23 and 33). The results presented above are shown in the figure below (Figure 3).

The study showed that students of the faculty of medicine have significantly higher knowledge about preventive vaccinations compared to the students of other faculties. Table 2 presents the results of the assessment of knowledge about vaccinations of senior students of medical faculties, broken down by faculty.

It was shown that the attitude towards vaccinations and conviction about the effectiveness of vaccinations significantly modify the level of knowledge about vaccinations (Table 3). The supporters of vaccinations had an average of 8.06 ± 1.97 correct answers. The opponents of vaccinations obtained only 3.25 ± 1.71 correct answers. Intermediate results were obtained by those respondents who indicated that their attitude towards vaccination depended on the type of vaccination. The result in this group was 6.21 ± 2.39. Statistical analysis with the Kruskal-Wallis test shows a value of $p < 0.001$. Respondents who were convinced of the effectiveness of preventive vaccinations had the highest scores, with an average of 8.25 ± 1.93 correct answers. Those who were not convinced about the effectiveness of vaccinations had a score of only 4.0 ± 1.79, with a median of 4.5. Respondents with intermediate results, who indicated that their conviction about the effectiveness of vaccination depends on the type of vaccination, scored on average 6.06 ± 2.11 points.

The study showed that undergoing a vaccination against COVID-19 had a significant impact on the level of knowledge about vaccinations. Those who had been vaccinated showed a higher average knowledge about vaccinations than those who

Table 2. Descriptive and statistical analysis of the knowledge about preventive vaccinations of senior students of medical faculties, broken down by faculty

Compared faculties	*n*	$\overline{x}$	SD	Min	Q_1	Me	Q_3	Max	Score	*p*
Faculty										
Medicine	30	9.03	2.11	3	9	10	10	11	28.398	**< 0.001**
Nursing	22	7.05	1.89	3	5	7	9	10		
Midwifery	16	7.25	1.91	2	6.5	7.5	8.5	10		
Emergency medicine	15	5.47	1.88	1	4	5	7	8		

H – Kruskal-Wallis test.

Table 3. Descriptive and statistical analysis of the knowledge about preventive vaccinations among senior students of medical faculties, broken down by attitude towards vaccinations and conviction about the effectiveness of vaccinations

Compared groups	*n*	$\overline{x}$	SD	Min	Q_1	Me	Q_3	Max	Score	*p*
Attitude to preventive vaccinations										
Supporter	65	8.06	1.97	4	7	8	10	11	28.398	**< 0.001**
It depends on the type of vaccine/no opinion	14	6.21	2.39	2	5	6	8	10		
Opponent	4	3.25	1.71	1	2	3.5	4.5	5		
Preventive vaccinations are effective										
Yes	61	8.25	1.93	4	7	8	10	11	22.155	**< 0.001**
It depends on the type of vaccine/no opinion	16	6.06	2.11	2	5	6	7.5	9		
No	6	4.00	1.79	1	3	4.5	5	6		

H – Kruskal-Wallis test.

Table 4. Descriptive and statistical analysis of the knowledge about preventive vaccinations of senior students of medical faculties, broken down by vaccination per group in the previous 3 years, vaccination against COVID-19, data on the likelihood of having a recommended vaccination after graduation, and taking up a job in the medical profession, e.g. influenza vaccination

Compared groups	*n*	$\bar{x}$	SD	Min	Q_1	Me	Q_3	Max	Score	*p*
Influenza vaccination in the previous 3 years										
Yes	30	7.73	2.30	2	6	8	9	11	0.621	0.534
No/I don't want to give an answer	53	7.40	2.36	1	6	7	9	11		
Vaccination against COVID-19										
Yes	66	7.89	2.08	2	7	8	9	11	2.532	**0.011**
No/I don't want to give an answer	17	6.06	2.73	1	5	6	8	10		
After graduation and taking up a job in the medical profession, are you planning to have recommended vaccinations for healthcare professionals, e.g. vaccination against influenza?										
Yes	63	7.73	2.22	2	6	8	9	11	1.246	0.213
No/No opinion	20	6.85	2.60	1	5	6.5	9.5	10		

U – Mann-Whitney test.

had not been vaccinated or did not want to provide an answer to the question. No significant impact was observed on the level of knowledge in the group of individuals who had been vaccinated for influenza in the previous 3 years or not. Similarly, the results in the level of knowledge are not affected by whether the respondents showed any or no will to be vaccinated after graduation and taking up a job in the medical profession. The statistical analysis is presented in Table 4, for which the Mann-Whitney test was used.

Discussion

Healthcare professionals are often exposed to a variety of pathogens, including those that can cause serious illness. Vaccinations provide protection against diseases, but they also help to prevent infections in patients and individuals in a patient environment. There are few studies on the attitudes of medical staff in Poland towards vaccinations. Most studies concern vaccination of medical personnel against influenza. The study by Sternal and Owsianko showed that only a small percentage of medical staff reported undergoing vaccinations against influenza, doctors are the largest group of healthcare workers who declare their willingness to get vaccinated against influenza, and the main reason for undergoing vaccination was the wish to prevent falling ill, whereas the reason for not undergoing vaccination was a lack of faith in the effectiveness of the vaccine [6]. In the study by Zielonka et al., which studied medical students and medical staff, they showed that the percentage of medical staff of Warsaw university hospitals who regularly take vaccines against influenza is low. Additionally, it has been shown that physicians justified their decisions not to undergo vaccination by no need to vaccinate, laziness, and lack of time, nurses by no need to vaccinate and costs, and students by costs and laziness [7]. There are also new studies on the attitudes of medical staff towards vaccinations against COVID 19. Jędrzejek and Mastalerz-Migas conducted a survey on the attitudes and behaviors of Polish healthcare workers, which included physicians and healthcare administrative staff, towards vaccination against COVID-19. They concluded that fear of long-term complications and other possible COVID-19 side effects is the strongest negative factor influencing the willingness to get vaccinated [8].

The study showed that students of the faculty of medicine had significantly higher knowledge about preventive vaccinations than the students of other faculties. The students of other faculties, such as nursing and midwifery, showed similar results, while those who studied emergency medicine showed the lowest knowledge about preventive vaccinations. The students of medicine might have a higher knowledge about vaccinations than students of other faculties for several reasons. The study program in the faculty of medicine might focus more on theoretical medical issues, including vaccinations, than the study programs of other faculties. Students of medicine have more specialist classes related to immunology, infectious diseases, pediatrics, family medicine, and public health.

In addition, it has been shown that the attitude towards vaccinations and the conviction about the effectiveness of vaccinations can significantly affect the level of knowledge about vaccinations. Those who were supporters of vaccinations got more correct answers than those who were opponents of vaccinations. There is a similarity between the results presented above and the results obtained by the Center for Public Opinion Research in a study on the opinion of Polish people on the effectiveness of preventive vaccinations [9]. The authors of that study observed that as many as 93% of Poles were convinced that vaccination is the most effective way to protect children against serious diseases, and 86% had no doubt about the safety of vaccines. Therefore, it can be concluded that the vast majority of Poles believe in preventive vaccinations, which has been confirmed by the results of both studies.

Our study showed that vaccination against COVID-19 had a significant impact on the level of knowledge about vaccinations. Respondents who had been vaccinated had a higher average score in the test of knowledge than those who had not been vaccinated or did not want to answer the question about the vaccination. Vaccination against influenza or lack of vaccination in the previous 3 years did not significantly affect the results obtained in the test of knowledge. This may be due to low influenza vaccination coverage among students, as only 36.4% declared having undergone influenza vaccination in the previous 3 years. However, since no similar studies were found in the review of literature, it is impossible to clearly state the characteristics of the phenomenon observed in the study or confirm its occurrence. Therefore, the author of the study presented in this paper argues that it would be worth considering this factor and examining it better in future research.

When asked about their attitude towards preventive vaccinations, the vast majority of respondents indicated that they were supporters of vaccinations, and they constituted 78.31% of the study group. Those whose attitude depended on the type of vaccination constituted 13.25% of the respondents. 8.23% of the study group were opponents of vaccinations or had no opinion. However, when asked about the effectiveness of vaccinations, the majority of respondents (73.48%) were of the opinion that vaccinations were effective. 18.09% of the study group were of the opinion that the effectiveness of vaccinations depended on the type of vaccine. Respondents who believed that

vaccinations are not effective accounted for 7.23% of the study group. A small group of respondents (1.20%) had no opinion on this matter. The vast majority of respondents were supporters of vaccinations, and they considered vaccinations to be effective. However, in the study group, there were also opponents of vaccinations or those who believed that vaccinations are not effective. This is a worrying phenomenon, because senior students of medical faculties will soon become qualified healthcare professionals who will set an example for patients, and they may negatively affect public health in Poland.

When asked about vaccination against influenza in the previous 3 years, 36.14% of the respondents indicated that they had undergone this vaccination. Respondents who had not been vaccinated constituted 62.65% of the study group, and 1.20% of the respondents did not want to answer the question about influenza vaccination. 79.52% of the study group were vaccinated against COVID-19. No vaccination was declared by 12.05%, and 8.43% of respondents did not provide an answer to this question. The discrepancy between COVID-19 and influenza vaccination rates may be related to respondents' fear of mixing two different vaccines. It is worth noticing that in the years 2020–2022, a campaign promoting preventive vaccinations against COVID-19 was organized in Poland [10], while influenza vaccinations were not promoted at that time, as the whole world, including Poland, was struggling with the COVID-19 pandemic. Considering the above, the author of the study suggests a theory that perhaps Polish people, fearing the effects of double vaccination, chose the COVID-19 vaccination, as in their opinion, this vaccination could bring greater benefits, including not becoming ill with COVID-19, and influenza was, in their opinion, lesser or no threat at all. However, this is only a theory supported by the above study results, as research literature in this area is limited, and no research on COVID-19 has confirmed a similar phenomenon.

When asked about their willingness to have recommended vaccinations after graduation and taking up a job in the medical profession, the majority (75.90%) expressed their willingness to be vaccinated in the future. 8.43% of respondents did not declare their willingness to have recommended vaccinations, and 15.66% did not have any opinion on this subject. The most frequently selected factors that motivated respondents to be vaccinated were protection of oneself against diseases, protection of loved ones against diseases, and protection of patients. The study shows that the vast majority of respondents planned to have recommended vaccinations in the future. This may result from the awareness of the benefits of vaccinations, which ensure safety not only for those vaccinated but also for their environment.

The most common reasons for rejecting vaccinations, indicated by the respondents, were the fear of an adverse post-vaccination reaction, fear of the unknown content of the substance, and the conviction that the vaccination is ineffective. It seems natural that some individuals are concerned about the side effects of vaccinations or the impact of vaccinations on their health. However, it is remarkable that some respondents share the opinion that vaccinations are ineffective. This opinion may be spread by the so-called anti-vaccine movements. The modern anti-vaccination movement emerged in the 1990s when Andrew Wakefield published an article in the medical journal *The Lancet*, in which he suggested that the measles, mumps, and rubella (MMR) vaccine could cause autism in children. The anti-vaccine movement is a social movement whose members oppose the use of vaccines and spread doubts about vaccines' effectiveness and safety [11]. Currently, the anti-vaccine movement can be found all over the world, and it involves various groups, organizations, and individuals. Their convictions and activities may have a negative impact on public health, especially in light of the COVID-19 pandemic, when vaccination is crucial for combating the disease.

The most popular sources of knowledge about preventive vaccinations are university classes (90.36%), medical literature (89.16%), social media (59.04%), and friends/family (51.81%). Less than half of the study group (46.99%) indicated that they gained knowledge from a doctor. 40.96% of respondents used leaflets, brochures, or TV commercials as a source of information about vaccinations. A small group of respondents received information about vaccinations from a nurse (25.30%) or a midwife (16.87%). The least frequently given answers included pharmaceutical representatives (2.41%) and the Internet (1.20%). This is quite an interesting phenomenon, because doctors were the most popular source of knowledge in similar studies, e.g. in the study by Stroba-Żelek et al. [12]. In the study by Faleńczyk et al. [13], the respondents mainly indicated leaflets, and doctors and nurses were the second most popular source of information. Both studies were conducted primarily on parents, i.e. individuals with a diverse level of medical knowledge. In the study presented in this paper, the study group were students of medical faculties, which, in the author's opinion, may have a significant impact on the final results of the study. Nevertheless, there is a fairly serious discrepancy between the results obtained in the study and the results of other studies concerning the same phenomenon, i.e. knowledge about preventive vaccinations. According to the author, the differences may result primarily from different sources of information about vaccinations. Using the results obtained in the study presented in this paper, it can be concluded that the knowledge gained during studies is the basis of students' knowledge in the field of preventive vaccinations. This shows how important studies are in shaping the subsequent behavior of healthcare professionals, setting a good example, and passing this knowledge on to the patients.

Recently, communication between the patient and the doctor or nurse, who play an important role in restoring trust in vaccinations, has gained importance. Various courses are organized to develop communication skills [6]. The study by Borah and Hwang showed that doctor–patient communication plays a key role in building patients' trust in doctors, which in turn positively affects a patient's attitude towards vaccination. In addition, information gained in the doctor's office has been shown to be an effective strategy for promoting vaccinations during or after a pandemic [14].

The vast majority of respondents (69.88%) indicated that during theoretical classes, they had not gained enough knowledge about vaccinations. 15.66% of those surveyed had no opinion on this subject, and only 14.46% indicated that they had gained sufficient knowledge about mandatory and recommended vaccinations for medical staff during classes. The obtained results show that students receive only basic knowledge about preventive vaccinations during their studies, which briefly present the subject of mandatory and recommended vaccinations for healthcare workers. 66.27% of the respondents claimed that during university classes, there should be more information on mandatory and recommended vaccinations for healthcare workers. 19.28% of the respondents had no opinion on this subject, and those who gave a negative answer constituted 14.46% of the group. In light of the above, it seems that most students are willing to expand their knowledge about preventive vaccinations and vaccinations recommended for healthcare workers.

Special classes and lectures on mandatory and recommended vaccinations for healthcare workers could help students gain knowledge about vaccinations. These classes could be a part of classes included in the curriculum of a particular faculty or inter-faculty optional classes. In the lectures, the benefits of using vaccinations and different types of vaccines could be presented, and the most common doubts and fears reported by the students could be discussed. Another promising idea could be to develop educational materials on vaccinations, such as brochures, articles, videos, and websites, which would allow students to individually learn and gain knowledge about mandatory and recommended vaccinations for healthcare professionals in a convenient way.

Conclusions

In conclusion, it should be emphasized that the vast majority of respondents were convinced of the importance and effectiveness of preventive vaccinations. Future healthcare professionals showed a high level of awareness of the need for preventive vaccinations, which are one of the most important and effective interventions in public health.

The study shows that education about vaccinations can increase the number of healthcare professionals who decide to have mandatory and recommended vaccinations. Individuals who have knowledge about vaccinations and their health and social benefits are more likely to get vaccinated. It can be assumed that in the long run, they will also be more involved in patient education and promotion of preventive vaccinations in the population.

The study also showed that the knowledge gained during studies shaped the awareness of future medical staff in the field of preventive vaccinations. It can therefore be concluded that studies play a key role in creating preventive attitudes of healthcare workers. During the classes, the students acquire knowledge and skills needed to provide effective and safe health care for patients.

The results obtained in the study presented in this paper may be used as guidelines for medical universities and medical organizations on activities that could increase the vaccination coverage among medical students and medical staff with regard to mandatory and recommended vaccinations for healthcare professionals, as these vaccinations could increase the safety of healthcare workers, their patients, and the general population.

Source of funding: This work was funded from the authors' own resources.
Conflicts of interest: The authors declare no conflicts of interest.

References

1. Program szczepień ochronnych (PSO) [cited 15.04.2023]. Available from URL: https://www.gov.pl/web/zdrowie/program-szczepien-ochronnych-pso- (in Polish).
2. Narodowy Instytut Zdrowia Publicznego Państwowy Zakład Higieny – Państwowy Instytut Badawczy Na czym polega kalendarz szczepień? [cited 20.03.2023]. Available from URL: https://szczepienia.pzh.gov.pl/wszystko-o-szczepieniach/na-czym-polega-kalendarz-szczepien/?strona=2#co-to-jest-kalendarz-szczepien (in Polish).
3. Obuchowicz A. *Badanie podmiotowe i przedmiotowe w pediatrii*. Warszawa: Wydawnictwo Lekarskie PZWL; 2016 (in Polish).
4. Ministerstwo Zdrowia. Obowiązek szczepienia służb medycznych [cited 21.03.2023]. Available from URL: https://www.gov.pl/web/zdrowie/obowiazek-szczepienia-sluzb-medycznych, (in Polish).
5. Stelmach M. Wiedza buduje zaufanie społeczne do szczepień. *Kurier Med* 2019; 4: 9–11 (in Polish).
6. Sternal D, Owsianko A. Opinie personelu medycznego na temat zalecanych szczepień przeciwko grypie. *Med Og Nauk Zdr* 2019; 25(1): 16–21, doi: 10.26444/monz/104752 (in Polish).
7. Zielonka TM, Lesiński J, Życińska K, et al. Szczepienia przeciwko grypie personelu medycznego warszawskich szpitali klinicznych i studentów Warszawskiego Uniwersytetu Medycznego. *Med Pracy* 2009; 60(5): 369–376 (in Polish).
8. Jędrzejek MJ, Mastalerz-Migas A. Influenza vaccination in healthcare workers – vaccination coverage, determinants, possible interventions. *Med Pracy* 2021; 72(3): 305–319, doi: 10.13075/mp.5893.01068.
9. CBOS. Polacy przekonani o skuteczności szczepień [cited 15.04.2023]. Available from URL: https://pulsmedycyny.pl/cbos-polacy-przekonani-o-skutecznosci-szczepien-951018 (in Polish).
10. Szczepienie przeciwko COVID-19 [cited 14.04.2023]. Available from URL: https://www.gov.pl/web/szczepimysie/szczepienie-przeciwko-covid-19 (in Polish).
11. Nitsch-Osuch A. Lęk, odrzucenie, teorie spiskowe. *ACADEMIA* 2016; 1(2). Wyd. Spec. Szczepienia: 21–23 (in Polish).
12. Stroba-Żelek A, Kubala P, Krawczyk A, et al. Analiza postaw rodziców i ich wiedzy na temat szczepień ochronnych dzieci. *Pediatr Med Rodz* 2019; 15(2): 171–179, doi: 10.15557/PiMR.2019.0029 (in Polish).
13. Faleńczyk K, Piekarska M, Pluta A, et al. Czynniki wpływające na postawy rodziców wobec szczepień ochronnych u dzieci. *Post Nauk Med* 2016; 29: 380–385 (in Polish).
14. Borah P, Hwang J. Trust in Doctors, Positive Attitudes, and Vaccination Behavior: The Role of Doctor–Patient Communication in H1N1 Vaccination. *Health Commun* 2022; 37(11): 1423–1431, doi: 10.1080/10410236.2021.1895426.

Tables: 4
Figures: 3
References: 14

Received: 08.08.2023
Reviewed: 30.08.2023
Accepted: 28.09.2023

Address for correspondence:
Magdalena Bogdan, PhD
Department of Social Medicine and Public Health
Medical University of Warsaw
3 Oczki St, 02-007 Warsaw
Poland
Tel.: +48 226215256
E-mail: mbogdan@wum.edu.pl