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Awareness of young and middle-aged patients about vaccinations against Human Papillomavirus (HPV) in selected voivodeships in Poland (Lodzkie, Wielkopolskie, Pomorskie, Mazowieckie, Dolnoslaskie)

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

Summary **Background.** HPV is responsible for 95% of cases of cervical cancer. Vaccination is a proven method of prevention. Free vaccination for children aged 12–13 years was introduced in Poland lately. Knowledge among society and awareness among physicians seem essential for success.

Objectives. The aim is to assess public knowledge about HPV and HPV vaccination and to identify the factors that encourage or discourage the vaccination.

Material and methods. An anonymous questionnaire was completed by 348 primary care patients aged 13–54 (31.61% men; 68.39% women) in March–April 2023 in Poland. Statistical analysis was performed using Statistica ver 13.3 (Statsoft, Poland).

Results. 73% of the respondents were not vaccinated against HPV. Women know more about HPV infection as a risk factor of cervical cancer (62.6% women vs 45.45% men) and are more aware about the need for the vaccination than men (78.15% women vs 62.7% men). Knowledge about the HPV vaccine is greater among people with higher education and students of medical faculties (91.6%) than other people (63.6%). Citizens of big cities (58.2%) and holders of higher medical education (77%) are more likely to vaccinate their children in the future. The place of residence does not correlate with knowledge about the availability of the vaccine and its reimbursement.

Conclusions. Insufficient knowledge among patients about HPV vaccination and HPV infection is the main reason for not vaccinating. Health promotion is crucial for the success of the HPV vaccination program in Poland.

Key words: human papillomavirus viruses, neoplasms, vaccines, Poland.

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Background

Human Papillomavirus (HPV) is the most common sexually transmitted infection and a well-documented factor of genital warts and precancerous conditions leading to many neoplasms such as cervical, vulvar, vaginal, anal, penile, oral, and throat cancer [1, 2]. Viral infection is responsible for 82% of these cases [3]. HPV is thought to cause 5% of all cancers in men and 10% in women [4]. Every year in Poland, over 3,000 new cases of HPV-associated cancers and 2,000 deaths are noted [5]. Epidemiological data indicates that almost every sexually active adult will be infected with HPV at least once in their lifetime.

Cervical cancer is the fourth most common neoplasm among women in the world, killing 300,000 patients a year [3]. 99% of cervical cancer cases are associated with HPV [5]. In Poland, 88% of cases are caused by types 16 and 18 [6].

HPV vaccination seems to be the best and most effective way to prevent cervical cancer. There are three different types of HPV vaccines registered in the European Union: 2-valent comprising antigens of types 16 and 18, 4-valent which also

protects from infection with types 6 and 11, and 9-valent which additionally contains antigens of type 31, 33, 45, 52, and 58 [3].

The HPV vaccine is proven to be safe. According to Sypień et al.: over 100 million doses of the HPV vaccine have been administered in the last few years. There has been no information about any serious side effects. Studies of the vaccine have shown a positive safety profile [7]. Research on the safety of the vaccine was also carried out in Denmark, where the vaccination rate against HPV was lower than for other vaccinations, due to media propaganda against this vaccine, explaining that it was associated with dangerous diseases. Most studies have found no association between HPV vaccination and subsequent disease [8].

Since 2007, Australia has been the first country in the world to introduce a nationwide vaccination program against HPV, primarily only for girls, but since 2013, also for boys. In Europe, the first country to introduce such a vaccination program was the UK. As a result of these actions, a significant decrease of cervical neoplasia among those vaccinated has been noted. In the UK, the prevalence of HPV 16/18 in sexually active 16–18-year-old females who were offered vaccination at the age of 12–13 years was < 1% in the most recent years tested, compared to over 15% prior to the vaccination program in 2008 [9]. Nowadays, more than 100 countries in the world run common vaccination programs for HPV [10].

WHO data from 2022 shows that most European countries have HPV vaccination coverage above 50%, with many above 70% (Figure 1).

For many years, access to HPV vaccination in Poland was limited. Since November 2021, the 2-valent vaccine has been 50% reimbursed by the Polish government. From June 1, 2023, free, voluntary vaccination has been introduced in Poland for children of both genders aged 12–13 years old. At present, every country in the European Union conducts a common vaccination program for girls, and half of the countries, also for boys. The Polish National Cancer Strategy – Narodowa Strategia Onkologiczna (NSO) aims to achieve 60% HPV vaccination coverage of the teenage population by 2028 [10]. Knowledge among society and awareness among physicians is essential for the success of this endeavor.

Objectives

The aim of this study is to assess young and middle-aged patients' knowledge about the HPV virus and HPV vaccination, as well as to verify how many of individuals were vaccinated and to identify the factors that encourage or discourage the decision on vaccination.

Material and methods

An anonymous author's questionnaire was completed by patients in March–April 2023. The study was conducted on 351 people, of which 3 people were rejected due to ambiguous answers regarding education or age that did not fit into our target range. The study group consisted of 348 primary care patients aged 13–54 (Table 1). Initial questions concerned the link between HPV infection and the occurrence of cervical cancer and other related neoplasms. Respondents were asked to demonstrate their knowledge whether vaccination against HPV reduces the risk of developing the above-mentioned cancers. Patients had to answer questions regarding the criteria enabling them to approach vaccination. We asked participants whether they knew that men can also develop cancer related to HPV infection. Further questions for our patients concerned their vaccination status, reasons for not getting vaccinated, and whether they planned to get vaccinated for those who were not already vaccinated. There were questions about whether the HPV vaccine was necessary and whether respondents planned to vaccinate their children in the future. The last question pertained to the source of information about HPV and the HPV vaccine so far.

Statistical analysis was performed using Statistica ver 13.3 (Statsoft, Polska). The consistency of the distribution of features

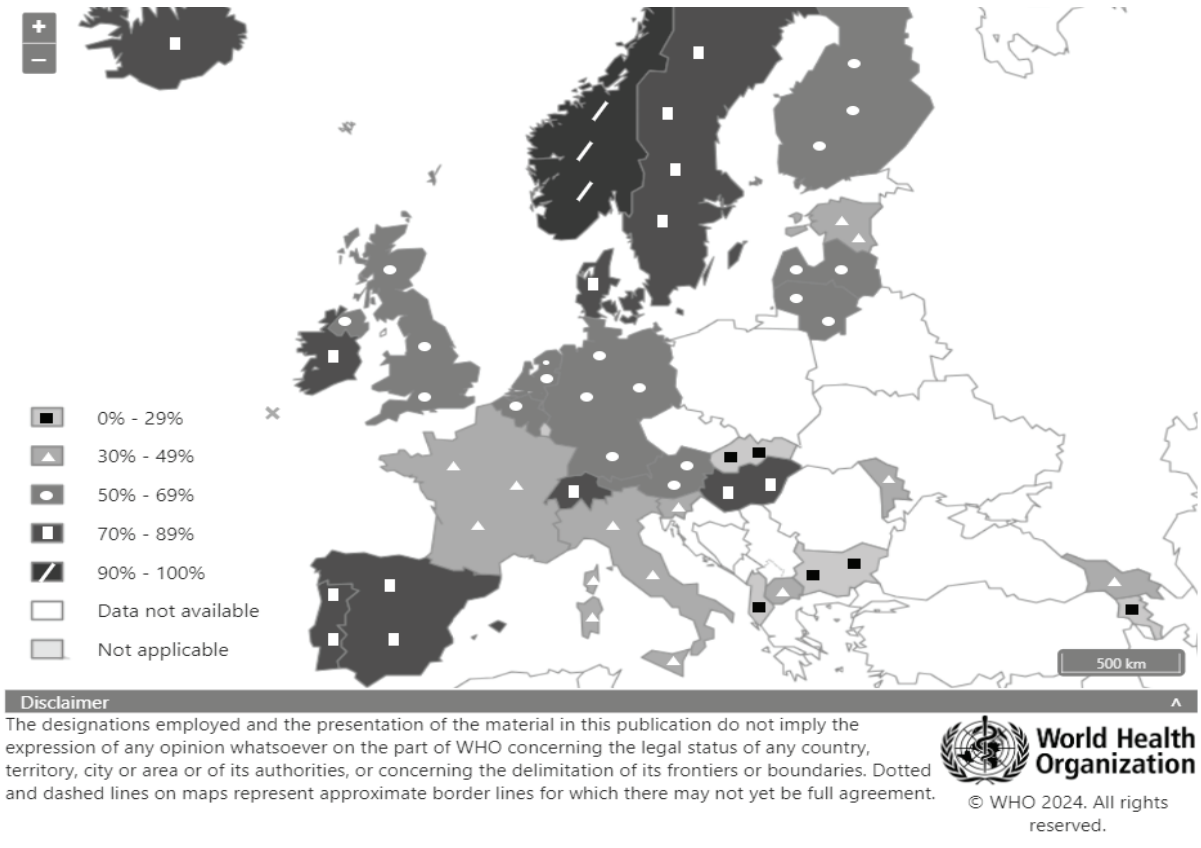

Figure 1. HPV vaccine full dose program coverage 2022 [11]

with normal distribution was assessed using the Shapiro-Wilk test. Descriptive statistics were calculated: mean with standard deviation, median, minimum and maximum values. Statistically significant differences were analyzed using the χ^2 test. A significance level of $p = 0.05$ was assumed.

The study was approved by the Bioethical Committee of the Medical University of Lodz (decision number RNN/59/23/KE).

Table 1. Basic characteristics of the study group (*n* = 348)

Study group characteristics (*n* = 348)		
Place of residence	***n***	**%**
Large city (over 500,000 inhabitants)	163	48.84
Small town	117	33.62
Countryside	68	19.54

Results

Our survey showed that only 15% of the respondents (of all ages) were vaccinated – only 1 man among them and only 1 person > 30 years old (Figure 2).

The vaccine has been available (though non-reimbursed) in Poland since November 2006 and was mainly recommended for teenagers before becoming sexually active. Therefore, people > 30 years of age had much lower vaccination coverage than younger respondents.

As many as 73% of the respondents were unvaccinated, and the remaining 12% did not know whether they had been vaccinated. Education status had an impact on vaccination coverage – graduates of medical faculties (28%), people with non-medical higher education (9.8%), and people without any higher education (10.6%) (Figure 2).

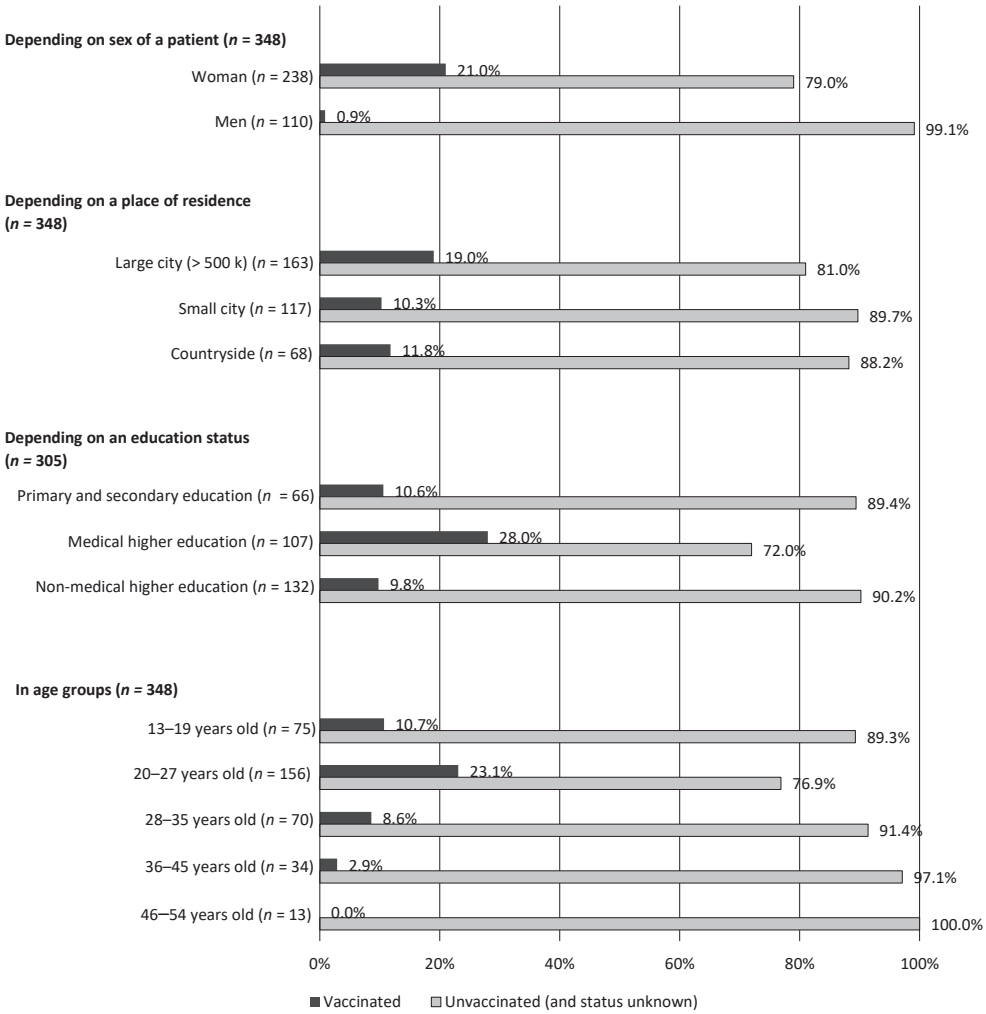

Figure 2. Vaccination status in the study group

Did you know that the HPV virus is also responsible for the development of cancers other than those of the cervix, i.e. throat, oral cavity, or anus?

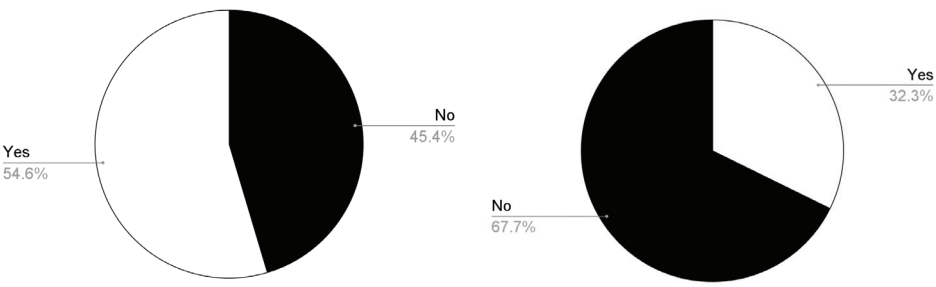

Figure 3. Knowledge about diseases caused by HPV among Polish patients

Awareness of HPV as a risk factor of cervical cancer was higher among women (62%) compared to men (45%). Another very important question the respondents were asked was whether they knew that HPV is also responsible for the development of cancers other than those of the cervix, i.e. throat and oral cavity or anus.

In our research, 73% of vaccinated people were aware that HPV also causes other neoplasms besides cervical cancer. This shows that the knowledge that HPV causes neoplasms other than cervical cancer is greater among vaccinated people than among unvaccinated respondents. Women were also more aware (59% women vs 43.6% men).

As many as 51% of the respondents did not realize that men are also at risk of developing HPV-related cancer. Of the 49% who reported knowledge of HPV-related cancers in men, there was no gender difference, but the place of residence played a role. 56% of inhabitants of large cities (> 500,000 inhabitants), 47% of inhabitants of small towns, and only 37% of people living in rural areas were aware of this fact. Place of residence was not relevant for the awareness of the relationship between HPV infection and the development of cervical cancer in women. Among the factors affecting the awareness of the relationship between HPV infection and cervical cancer, education was crucial. Respondents with medical education were the most aware (87.8%). The remaining were at a similar level – people without higher medical education (44%) and without any higher education (45.5%).

As a source of knowledge about HPV, the respondents indicated the following: medical professional, school, university, and the media.

One of the basic questions of our research was how many people knew about the existence of the HPV vaccine. We obtained a result of 74%. Almost 26% (*n* = 90) of the respondents in this study (21% women and 36.4% men) did not realize that there was the HPV vaccine. The place of residence had no influence on the respondents' knowledge about the vaccine. People with higher education presented more knowledge, but the clear discrepancy between people with medical (93%) and non-medical (69%) education should be noted. Women had greater knowledge about vaccination compared to men – 78% knew about the HPV vaccine.

Some questions concerned indications for HPV vaccination (who and at what age can be vaccinated). University graduates had more knowledge, but this applies only to people with medical education (80%). It was noticed that the level of knowledge concerning HPV vaccination among people with non-medical higher education (43%) was comparable to the level of knowledge of people without any higher education (42%). There is a noticeable difference in the awareness of people aged 20–26 concerning the question about the reimbursement of the vaccine in Poland. In this age group, 43 out of 137 people (31.4%) gave the correct answer that there is one reimbursed vaccine (as at the beginning of 2023). In the remaining age groups, out of 212 people, only 26 knew about the existence of the reimbursed vaccine (12.3%).

Having an infection in the past or an active HPV infection is not a contraindication to vaccination – however, our study shows that as many as 54% of the respondents answered this question incorrectly, regardless of gender, age, or place of residence. The highest percentage of correct answers was obtained in the group of students and graduates of medical faculties (71%).

At the time of the survey, only 20% of the respondents were able to correctly indicate the number of the reimbursed HPV vaccines. The place of residence of the responding person did not matter. People with higher medical education showed more knowledge (45%) vs others (8.7%). We also examined the respondents' approach to vaccinate their children in future. Only 40% out of all the patients surveyed were willing to vaccinate their children against HPV, regardless of child's gender. The willingness to vaccinate a child was affected by different factors:

- respondents' age – patients aged 20–27 showed greater willingness than the others (Table 2);
- respondents' education – students and graduates of medical faculties (77%) were more willing than others (41%);
- respondents' place of residence – residents of large cities (> 500,000) were more willing to vaccinate their children than the residents of small towns and the countryside (Table 2).

Table 2. Relationship between age or place of residence and willingness to vaccinate children

Willingness to vaccinate children (*n* = 271)		
	n	**%**
In age groups		
13–19 years old (*n* = 52)	18	34.6
20–27 years old (*n* = 117)	74	63.2
28–35 years old (*n* = 58)	26	44.8
36–45 years old (*n* = 33)	17	51.5
46–54 years old (*n* = 11)	5	45.5
Depending on the place of residence		
large city (> 500 k) (*n* = 122)	71	58.2
small town (*n* = 94)	45	47.9
countryside (*n* = 55)	24	43.6

In our study group, 51.7% of the participants declared a willingness to vaccinate their children. There is much higher willingness among vaccinated people (83%) compared to unvaccinated people (50%). Only 6.3% of the respondents (17 out of 271) declared no will to vaccinate their children. It should be noticed that many respondents hesitated about that problem – 42% of the respondents (17% among vaccinated and 41% among unvaccinated).

The questionnaire of our survey also contained some questions about other methods of cancer prophylaxis. One of them concerned the regularity of cytology – a test that allows early diagnosis of cervical dysplasia, which can be caused by HPV infection. Only 45% of the surveyed women underwent this examination within the last 3 years, but it is worth noting that all women over 41 years of age underwent regular examinations. In the group of women who undergo regular examinations, 9.2% were women vaccinated against HPV. Interestingly, among the surveyed women, as many as 9% had never had cytology, despite the fact that they declare themselves to be sexually active. There were also 6 women (out of 238) (2.5%) who had never been to a gynecologist despite being sexually active. The largest percentage of cytology performed was among citizens of large cities (81%). The worst results of getting tested regularly concerned females aged 13–24 (34.5%).

85% of women participating in the study would like to prevent cervical cancer. As many as 94% of the vaccinated women were willing to do so, as well as 86% among unvaccinated women and only 64% of women who did not know whether they had been vaccinated.

The need for vaccination was noticed by 73% (*n* = 255) of the respondents – women (*n* = 186; 78.15%) more than men (*n* = 69; 62.7%), regardless of the vaccination status.

One of the questions in the survey was the reason why respondents decided that HPV vaccination is unnecessary or that they had no opinion on the subject – as many as 72% indicated a lack of knowledge.

Our research shows that almost 3/4 (72.9%) of the surveyed people were not vaccinated against HPV. A significant part of the respondents (women and men) was not aware that men can also get HPV-related cancers. Women had more knowledge about HPV infection, the association between the HPV infection and cancer, and more awareness about the HPV vaccine than men. Knowledge about HPV and the HPV vaccine was greater among people with higher education, regardless of whether

they were graduates of medical or non-medical faculties. Citizens of big cities and higher-educated individuals were much more likely to be willing to vaccinate their children in the future. However, the place of residence had no influence on the awareness of the existence of the vaccine and reimbursement.

Discussion

In a POLKA study conducted between April and December 2019 in Poland, 16% of secondary school students (aged 17–19) were vaccinated [12]. In our study, the results were similar – 17.2% of people aged 17–20 were vaccinated against HPV.

The results of a similar study examining people's knowledge about HPV conducted by Schwendener et al. on the population of Switzerland was published in 2022 [13]. It is worth adding that Switzerland is one of the best vaccinated societies in Europe – vaccination rates are 70–89%. 70% of the respondents had knowledge about the HPV vaccine, while in our study, 74% showed such knowledge. An interesting fact is that, comparing our research, people's awareness of the existence of the vaccine is comparable, and vaccination rates differ significantly – in our research, 15% of the respondents, including 1 man, were vaccinated, while in Switzerland, this was 20% of men and 65% of women [13]. In 2019, a study was conducted in Morocco by Yacouti et al. to check the awareness of the HPV vaccine among female students. They studied 1,086 participants aged 17–26 at six Moroccan universities. The rate of immunization coverage against HPV was less than 1%. Only 7.8% of the respondents were aware of the existence of the HPV vaccine. This may have to do with the fact that the HPV vaccine is not included in the national vaccination program. It is worth mentioning that in Morocco, the HPV vaccine has been available since 2008 [14].

We can also compare our results with research conducted in India by Rashid et al. in 2016. Among undergraduate students aged 16–26, 7.16% of women and 7.42% of men were vaccinated [15]. In our study, 30.9% of women and only 1.6% of men in this age group were vaccinated. Interestingly, the difference in vaccination coverage of both sexes is more visible in Poland.

Regarding people's knowledge about whether HPV can also cause other cancers than just cervical cancer, our results (Figure 3) were slightly more optimistic than the results of research by Jankowski et al. [16], which showed that 32.3% of adult Poles demonstrated such knowledge, while in our study, this was 54.6%.

In another Polish study by Pinkas et al. (2021) [17] on the relationship between HPV and head and neck cancers, only one third of the respondents were aware of the oncogenic potential of HPV as a risk factor for head and neck cancers.

In an American study conducted by Franca et al., approximately 70% of participants were aware that HPV causes cervical cancer, 53% were aware that HPV causes vaginal cancer, 40% were aware that HPV causes vulvar cancer, 39% were aware that HPV causes cancer of the oropharynx, 38% were aware that HPV causes penile cancer, and 34% were aware that HPV causes anal cancer [18].

According to our study, the most frequently indicated source of knowledge about HPV was medical professionals. For comparison, Schwendener et al. revealed [13] that the three most frequently mentioned sources of information were school health programs (53%), healthcare providers, and participants' social networks. The Internet and social media were minor sources of information about the HPV vaccine. Moreover, a study conducted in China by L. Zhou et al. revealed that people are least likely to have vaccine hesitation if they indicate a doctor as their source of knowledge about HPV compared to other sources (for example, family and friends, internet, radio/TV) [19]. In the Islamic religion, the reason for reluctance to vaccinate may be the lack of information about whether the vaccine is "halal" (permissible under Islam) [20].

When it comes to people's awareness of whether there is a vaccine against HPV – as we mentioned, in our study, 74% of the respondents were aware of it. According to other Polish studies, the results were as follows: 62.5% – Smolarczyk et al. [21], 63.6% – National Institute of Public Health [22]. In the study by Jankowski et al. (July 2023) – a month after the introduction of fully reimbursed vaccinations against the HPV virus – 51.3% of the respondents had heard about the free HPV vaccination program implemented as part of the National Anti-Cancer Strategy [16]. In our study group, 51.7% of the participants declared willingness to vaccinate their children, and many respondents hesitated about this issue. In past Polish studies by Pinkas et al. [17] in 2021, only 48.1% of respondents declared a positive attitude towards vaccination against HPV and declared that they would vaccinate their child against HPV (20.5% – "definitely yes"; 27.6% – "rather yes").

In another Polish study by Jankowski et al. in July 2023, 63.3% of the respondents declared their willingness to vaccinate their children ("definitely yes" or "rather yes") against HPV [16].

The growing willingness to vaccinate children may be related to the introduction of vaccine reimbursement from June 2023 and increased public awareness of its existence. This requires further research. It was observed in Australia that inclusion of the HPV vaccine in the National Immunization Program led to higher acceptance and willingness to vaccinate [23]. Most of our respondents indicated a lack of knowledge as the reason not to vaccinate. In Turkey, where there is no reimbursement for HPV vaccination, the main reason people consider vaccination unnecessary is the cost [24]. In our study, some respondents also indicated the high price of vaccination as a reason for not getting vaccinated.

One of the most common reasons why children were not vaccinated against HPV in Italy was that the doctor had not recommended the vaccination recently, even though it is free of charge for boys and girls in certain age groups [25].

Interesting results regarding the willingness to vaccinate their children were obtained from studies conducted on parents in Ethiopia [26] and Argentina [27].

Ethiopia is one of the low-income countries in Africa. The cumulative incidence of parents' willingness to vaccinate their daughters against HPV in Ethiopia was 71.82%. HPV vaccination knowledge, attitude, educational status, and income were significantly associated with parental willingness. Income status was a positive and significant predictor of parents' willingness to vaccinate their daughters against HPV.

At the same time, in a study conducted among Argentine mothers, the acceptance of vaccination against HPV was very high (90% would agree to free vaccination). The surveyed women were largely interested in vaccinating their daughters even if they had to pay for the vaccine (60% would agree to be vaccinated in such a situation). However, the results showed that mothers with lower household income and mothers who were not employed were less willing to pay for HPV vaccination. These studies indicate the great importance of vaccination costs in the context of willingness to vaccinate one's children against HPV.

In the United States, a high association has been shown between personal/family experiences and willingness to vaccinate one's children. A delay in vaccination or a withdrawal from it was observed in parents who experienced anxiety or needle sensitivity. Additionally, the erroneous belief that the vaccine is intended only for girls also discourages parents because they are afraid of their daughters' sexual activity and promiscuity and therefore treat it as dangerous [28]. In the study by Rositch et al. [29], it was proven that lack of a doctor's recommendation was the most common reason for not getting vaccinated among unsure parents. The results of our research coincide with existing literature from other regions of the world on vaccination awareness. We see this in many examples, such as those included in the work [24, 25, 30].

In our work, we also encountered the response that no healthcare representative offered vaccination, and for them, this was the main reason for no vaccination.

The conclusion is the same: people know about the existence of the vaccine, but there are many reasons why they do not want to vaccinate themselves or their children. Any concerns, fears, insufficient knowledge, and lack of a clear medical opinion prevent people from getting vaccinated.

A Swedish study from 2021 showed that the parents in that study were willing to explain their decision about HPV vaccination to their daughters but not involve them in the decision itself. Their reasons were mainly grounded in the girls' young age and their presumed lack of the knowledge and capability necessary to judge the relevance of the vaccine to their own health [31]. This might be an important clue for Polish authorities to optimize the cost of education and increase vaccination coverage. It is possible that educating parents has a greater impact on increasing the vaccination rate than educating children. We agree with this conclusion because of our respondents' statement that their parents were against this vaccination (4.8%). This requires further research in the group of Polish parents.

In a literature review performed by scientists from the Netherlands and India, it was observed that health education interventions among young people of India proved to be effective in increasing uptake, awareness, and acceptance of the HPV vaccine [32]. The potential of social media to impact HPV vaccine awareness and knowledge was high but was not associated with increased vaccine uptake [33]. Therefore, the methods of education should be carefully thought out.

Limitations of the study

We must admit some limitations of our study. The main limitation of our study is the age range according to which we qualified patients to participate in our study (age 13–54). Another limitation of our work is the small study group (348 patients) compared to the entire Polish population. Of note, the data found by this study may not be nationally representative and therefore warrants cautious interpretation. The results of our work turned out to be very interesting, which opens the door for other researchers to expand our research to include a larger number of people and a wider age range. This will give us greater diversity and average results in relation to the entire Polish population.

Conclusions

The main reason for not undertaking the HPV vaccination among the surveyed patients (young and middle-aged) was insufficient knowledge. Health promotion in this field is crucial for the success of the vaccination program in Poland. Family physicians, as well as all other healthcare professionals, should be aware of the need for education of patients on HPV prophylaxis, its safety, and the need for its use for cancer prevention.

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