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ORIGINAL PAPER

A study of parental awareness regarding free influenza vaccinations

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ABSTRACT

Introduction: The influenza virus poses a significant epidemiological problem worldwide, characterized by high infectivity and the potential for severe complications, especially among children. According to the World Health Organization, this problem affects up to 30% of the pediatric population annually, which translates to a high number of cases and hospitalizations in Poland, presenting a serious challenge to the healthcare system.
Material and methods: Between 2024 and 2025, a survey study (n = 250) was conducted in Poland to assess parental awareness of free influenza vaccinations and to identify factors influencing the decision to immunize a child. The χ^2 test, Fisher's exact test, and the gamma correlation coefficient were used for statistical analysis, and the strength of association was determined using the odds ratio (OR). A significance threshold of $p < 0.05$ was adopted.
Results: An alarmingly low vaccination rate was observed (2.8% across both analyzed seasons combined), despite the availability of free vaccines. The strongest predictor was the parent's vaccination status – a vaccinated parent was almost 37 times more likely to vaccinate their child (OR = 36.992). A key barrier was the lack of information from a primary care physician, which affected 63.9% of parents who did not vaccinate their children. Receiving medical information increased the likelihood of child vaccination more than 10-fold (OR = 10.475). The critically low vaccination rate (2.6%) in the group of children with chronic illnesses is particularly concerning.
Conclusions: The study highlights the fundamental role of physician-parent communication and pro-vaccination attitudes. Systemic educational interventions are necessary, involving medical personnel in providing information about the benefits and safety of vaccinations, especially in at-risk groups.

KEY WORDS:
influenza, vaccinations, influenza A and B virus, chronic diseases, information.

INTRODUCTION

Influenza viruses are pathogens widespread throughout the world, affecting both adults and children. According to the World Health Organization (WHO), this problem affects up to 30% of the global pediatric population annually [1]. Due to the high infectivity of influenza A and B viruses, which are most commonly transmitted *via* droplet infection, influenza constitutes a serious epidemiological problem associated with severe complications. These complications are a cause of prolonged hospitalizations and chronic treatment for children who were completely healthy before the illness [2, 3]. Influenza vaccination is an important strategy for protecting children and adolescents and contributes to reducing the number of influenza cases in the adult population.

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Recommendations place particular emphasis on vaccinating children from clinical risk groups and those who have close contact with individuals at high risk of severe disease *(cocooning strategy)* [4].

In Poland, the peak of the influenza epidemic season typically occurs between December and March. According to statistics published in epidemiological reports on influenza by the National Institute of Public Health, (NIPH) from December 8, 2022, to March 31, 2023, the number of cases and suspected cases in the 0–14 age group was 1,507,887. In the period from January 1, 2024, to December 31, 2024, the Department of Epidemiology of Infectious Diseases and Surveillance of the NIPH reported that the number of confirmed influenza cases in the 0–14 age group was 1,933/100,000 inhabitants [5–8]. In Poland, according to the Announcement of the Minister of Health of August 30, 2023, on the list of reimbursed drugs, food for special medical purposes, and medical devices, influenza vaccines are available free of charge to children from 6 months of age to 18 years of age and to adults over 65 years of age [9]. It was expected that the introduction of reimbursement would contribute to a significant increase in influenza vaccination rates in the pediatric population. The ultimate goal was to achieve a population immunity threshold consistent with the guidelines of the WHO and the European Immunization Agenda 2030 [10]. Unfortunately, the percentage of vaccinated children up to the age of 18 remains dramatically low. In 2022, the group of children aged 0–14 numbered 5,816,044, of whom only 74,834 (approximately 1.3%) were vaccinated against influenza [11].

Given the newly introduced legal regulations concerning free influenza vaccinations in the pediatric population, this study undertook an assessment of the key determinants of parental decisions. The main objective was to examine the relationship between a child's vaccination and whether the parent received information about this possibility from a primary care physician (PCP), as well as to analyze the influence of other sociodemographic factors.

MATERIAL AND METHODS

The study was carried out using an original, on-site questionnaire, with results collected between February 2024 – May 2024 and November 2024 – February 2025. The study was conducted at the 1st Department of Pediatrics and Pediatric Gastroenterology and the 2nd Department of Pediatrics, Endocrinology, and Diabetology of the St. Jadwiga Queen Clinical Provincial Hospital No. 2 in Rzeszów. The survey included 250 respondents. The parents completing the questionnaire were accompanying their children during hospitalization for both acute conditions and scheduled diagnostic purposes. All respondents were related to the children (mothers and fathers).

STATISTICA Tibco 13.3 software (StatSoft Inc., Tulsa, OK, USA) and the R program (version 4.3.1.) were used for data analysis. Categorical variables were presented as numbers with percentages and compared using χ^2 test or Fisher's exact test, as appropriate. For binary variables, an odds ratio analysis (with a 95% confidence interval [CI]) was used to calculate the odds ratio (OR). A significance threshold of $p < 0.05$ was applied to all results.

RESULTS

In the 2023/24 season, 127 questionnaires were collected, and in the 2024/25 season, 123 questionnaires were collected. A total of 250 respondents were included in the study and were divided into two groups based on the child's vaccination status: those who had vaccinated their child ($n = 7$) and those who had not ($n = 243$). From the second group, for the analysis of non-vaccination reasons, 2 respondents were excluded due to incomplete data, leaving 241 questionnaires for further analysis.

CHARACTERISTICS OF THE STUDY GROUP

Demographic data of the respondents and their children, broken down by the 2023/24 and 2024/25 seasons, are presented in Table 1.

Statistical analysis showed a significant association only between the child's attendance at an educational institution and the study season ($\chi^2 = 7.024$; $p = 0.008$). Children were 1.62 times more likely to attend a nursery/preschool/school in the 2024/25 season than in the 2023/24 season.

INFLUENZA VACCINATION AND ASSOCIATED FACTORS

The influenza vaccination rate in the study group was low. In the 2023/24 season, 3 children were vaccinated (2.4%), and in the 2024/25 season, 4 children were vaccinated (3.3%), totaling 7 children (2.8%) across both seasons. Seven (2.8%) respondents stated that their child had received the influenza vaccine in previous seasons. No significant associations were observed between seasons, either for the child's vaccination in the season the study was conducted ($\chi^2 = 0.116$; $p = 0.7335$) or in the preceding season ($\chi^2 = 0.182$; $p = 0.6698$).

Among all respondents, only 12 (4.8%) were vaccinated against influenza. Among the vaccinated parents, 4 (33.3%) reported that their child was also vaccinated. A statistically significant association was observed between the parents' influenza vaccination status and the child's vaccination in both the current and preceding seasons. In each season, a vaccinated respondent was almost 37 times more likely to report that their child had been vaccinated against influenza. For vaccinated fathers, there was a 44-fold increase in the likelihood of their children being vac-

TABLE 1. Characteristics of the study group of respondents and their children

Feature	Category	Season 2023/24 ($n = 127$)		Season 2024/25 ($n = 123$)		Total ($N = 250$)	
		n	%	*n*	%	*n*	%
Respondent's gender	Female	102	80.3	99	80.5	201	80.4
	Male	25	19.7	24	19.5	49	19.6
Place of residence	Rural	76	59.8	61	49.6	137	54.8
	Urban	51	40.2	62	50.4	113	45.2
Respondent's education	Primary	3	2.4	3	2.4	6	2.4
	Secondary	46	36.5	42	34.1	88	35.2
	Vocational	10	7.9	10	8.1	20	8
	Higher	67	53.2	68	55.3	135	54
	No data	1	0.8	0	0	1	0.4
Healthcare worker status	Yes	7	5.5	13	10.6	20	8
	No	120	94.5	110	89.4	230	92
Child's age	6 months – 2 years	19	14.8	11	8.9	30	12
	3–6 years	27	21.1	31	25.2	58	23.2
	7–12 years	37	29.1	42	34.1	79	31.6
	13–18 years	44	34.4	39	31.7	83	33.2
Chronic illness in the child	Yes	44	34.6	41	33.3	85	34
	No	83	65.4	82	66.7	165	66

TABLE 2. Associations between child's influenza vaccination in the study season and selected factors

Studied factor	χ^2 test		Fisher's exact test		
	χ^2	*p*-value	OR	95% CI for OR	*p*-value
Residence	0.804	0.3699	2.096	[0.335 –22.419]	0.4619
Education	2.367	0.4999	N/A		
Presence of a chronic illness in the child	0.095	0.7584	0.772	[0.072–4.838]	1
Information from a PCP about free influenza vaccination	7.106	0.0077*	10.475	[1.241–487.943]	0.0123*
Being a healthcare worker	0.387	0.5341	1.958	[0.041–17.501]	0.4463
Child's attendance at nursery/preschool/school	0.847	0.3574	0.465	[0.073–5.054]	0.3112
Living with elderly or immunocompromised individuals	2.472	0.1159	3.193	[0.452–19.578]	0.1384
Average waiting time for a vaccination appointment at the clinic	4.99	0.2883	N/A		
Respondent's influenza vaccination status	43.179	< 0.001*	36.992	[5.343–296.335]	< 0.001*

N/A – not applicable, OR – odds ratio, PCP – primary care physician
** statistically significant*

cinated (OR = 44; 95% CI [2.71–714.62]; $p = 0.008$). In the case of vaccinated mothers, this likelihood increased 21-fold (OR = 21.11; 95% CI [2.95–150.65]; $p = 0.0024$). Two (16.7%) of the vaccinated individuals were healthcare workers, and 1 (50%) of them reported that their child was vaccinated against influenza in the current season.

Among the 250 respondents, 152 individuals (60.8%) demonstrated full awareness of the complications of influenza, 79 individuals (31.6%) had incomplete knowledge on the topic, and 19 individuals (7.6%) had no knowledge of any complications. However, no significant association was found between the child's influenza vaccination in the study season and the respondent's awareness of influenza complications. No statistically significant associations were found between the parent's level of education, place of residence, average waiting time for a visit at the PCP clinic, or the presence of chronic diseases in the child, and the child's influenza vaccination in the study season (Table 2).

Statistical analysis revealed significant associations within the group of respondents who did not vaccinate their child against influenza. Among them, a relationship was shown between selected reasons for not vaccinating the child and the provision of information about free vac-

cination by a PCP ($\chi^2 = 35.65$; $p = 0.017$), an explanation of the vaccine composition and mechanism of action ($\chi^2 = 32.41$; $p = 0.039$), and the child having had influenza ($\chi^2 = 33.46$; $p = 0.03$).

THE IMPACT OF INFORMATION FROM A PRIMARY CARE PHYSICIAN ON ATTITUDES TOWARDS INFLUENZA VACCINATION

Information provided by a PCP proved to be a significant factor influencing the vaccination of respondents' children against influenza. Parents who received information from a physician were nearly 10.5 times more likely to vaccinate their child than those who did not receive such information (OR = 10.475). Of the 241 parents who did not vaccinate their child against influenza, 154 (63.9%) were not informed by their physician about this possibility. On the other hand, 87 individuals (36.1%) decided against vaccination despite being informed about its availability by their physician. No significant association was observed regarding the provision of information about free vaccination by a PCP between the seasons ($\chi^2 = 0.517$; $p = 0.4723$).

To deepen this analysis, the attitudes of parents of unvaccinated children were assessed in relation to receiving information from a PCP. The statistical analysis did not show a significant impact of being informed by a PCP about the possibility of free influenza vaccination on a change in decision after receiving this information ($\chi^2 = 4.883$; $p = 0.299$), nor after the child had contracted influenza ($\chi^2 = 4.483$; $p = 0.344$). However, a significant influence on parents' decisions, in the context of information received from a physician, was found for an explanation of the vaccine composition ($\chi^2 = 10.362$; $p = 0.035$) and the reasons for not vaccinating the child ($\chi^2 = 18.018$; $p = 0.003$). Detailed data on the responses to these questions, broken down into groups of parents informed and not informed by a PCP who did not vaccinate their child, showed three statistically significant differences in attitudes. Informed parents were more convinced of the advisability of their decision, being less likely to consider changing it after additional explanations of the vaccine composition and action (28.7% vs. 13%; $p = 0.003$). They also significantly more often cited other reasons for not vaccinating their child than concerns about adverse events, lack of efficacy, lack of need, or lack of knowledge about availability (21.8% vs. 5.2%; $p = 0.001$). In contrast, the uninformed group significantly more often cited a lack of knowledge about the vaccine's availability as the reason (9.7% vs. 3.5%; $p = 0.045$).

REASONS FOR NOT VACCINATING CHILDREN AND FACTORS THAT COULD INFLUENCE A CHANGE IN VACCINATION DECISION

A detailed analysis of the responses from respondents who did not vaccinate their child against influenza during the study season revealed significant and strong associations between parents' attitudes towards influenza vaccination. Very strong, positive correlations (χ^2 and γ test, $p < 0.001$) were found between parents' answers to questions regarding potential factors that might change their decision to vaccinate:

- information from a physician,
- an explanation of the vaccine composition and mechanism of action,
- and the child contracting influenza.

Therefore, parents answered these questions in a highly consistent manner, and their attitudes in these areas are strongly interrelated (Figure 1).

CLINICAL RISK GROUPS AND COHABITATION WITH INDIVIDUALS FROM RISK GROUPS, IN RELATION TO INFLUENZA VACCINATION

Among the 250 children included in the study, 85 (34%) were being treated for chronic diseases, and no statistically significant difference was found between the seasons in

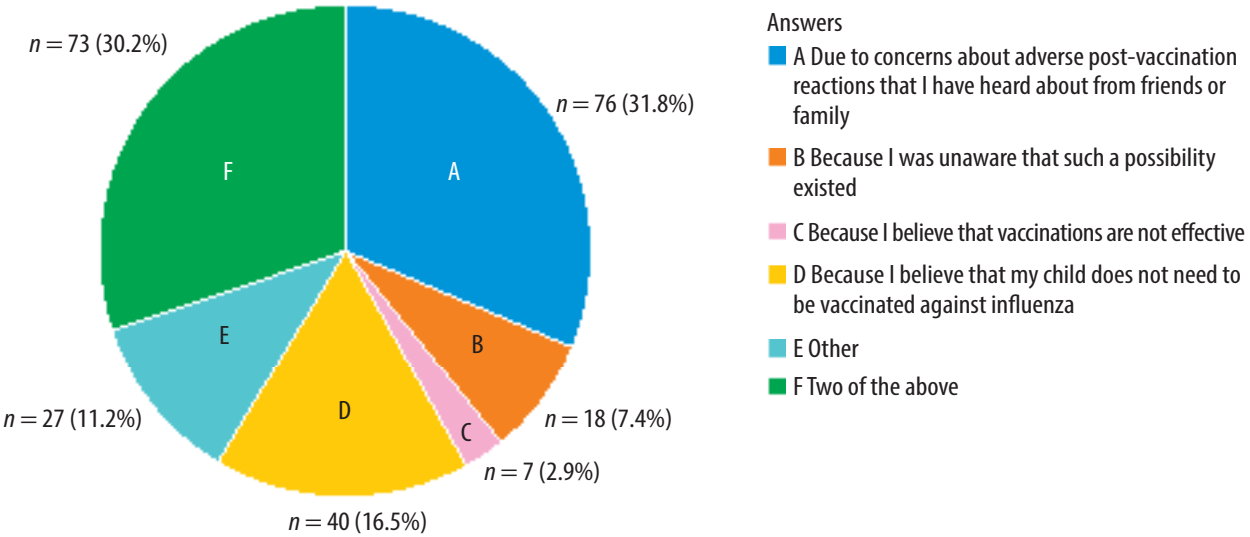

FIGURE 1. Percentage distribution of reasons for respondents' decision not to vaccinate their child against influenza ($n = 241$)

TABLE 3. Classification of chronic diseases in the study group of children

Chronic disease category	Season 2023/24 ($n = 44$)		Season 2024/25 ($n = 41$)		Total ($N = 85$)	
	n	%	n	%	n	%
Endocrine and metabolic diseases	10	22.7	14	34.1	24	28.2
Respiratory diseases	13	29.5	3	7.3	16	18.8
Genetic diseases and congenital defects	2	4.5	6	14.6	8	9.4
Allergic diseases	3	6.8	2	4.9	5	5.9
Dermatological diseases	0	0	2	4.9	2	2.4
Circulatory system diseases	3	6.8	4	9.8	7	8.2
Neurological and neurodevelopmental diseases	4	9.1	3	7.3	7	8.2
Gastroenterological diseases	4	7.3	1	2.4	5	5.9
Rheumatic diseases	1	2.3	1	2.4	2	2.4
Psychiatric disorders	0	0	1	2.4	1	1.2
Multimorbidity	2	4.5	4	9.8	6	7.1
Not specified	2	4.5	–	–	2	2.4

this regard ($\chi^2 = 0.048$; $p = 0.894$). Despite the lack of a statistically significant association between the presence of a chronic disease in the child and vaccination against influenza ($\chi^2 = 0.095$; $p = 0.7584$), it is worth noting that of all 85 respondents whose children had a chronic illness, only 2 (2.6%) decided to vaccinate their child (1 in each season), and 48 (56.5%) of these individuals were not informed by their family physician about the possibility of free vaccination. Eleven (22.9%) of them stated that such information, along with an explanation of the vaccine composition, could influence a change in their decision.

The classification and distribution of chronic diseases within the pediatric cohort, stratified by study season, are presented in Table 3.

Fifty-one (60%) respondents whose child had a chronic disease demonstrated knowledge of influenza complications, 31 (36.5%) had incomplete knowledge of the complications, and 3 (3.5%) had no knowledge of any complications. However, no significant association was found between the presence of a chronic disease in the child and the respondent's knowledge of influenza complications ($\chi^2 = 3.78$; $p = 0.15045$).

Among the 250 respondents, 49 (19.6%) live with elderly or immunocompromised individuals. In this group, 46 children (93.9%) were not vaccinated against influenza. However, the statistical analysis did not show a significant association between influenza vaccination and cohabitation with elderly or immunocompromised individuals ($\chi^2 = 2.472$; $p = 0.1159$).

ATTENDANCE AT EDUCATIONAL AND CARE INSTITUTIONS

Among the 250 respondents' children, 210 (84%) attended a nursery, preschool, or school. Of these, 205 (97.6%) were not vaccinated against influenza. This relationship was not statistically significant ($\chi^2 = 0.847$; $p = 0.3574$).

DISCUSSION

This study revealed an exceptionally low influenza vaccination rate among the study group of hospitalized children in Poland, at just 2.8%. This rate is critical and deviates significantly from international results, where regional influenza vaccination coverage ranges from 6.6% in Pakistan to 96.4% in South Korean cities. Despite the introduction of free vaccinations, the low vaccination rate in Poland remains a serious public health problem [12, 13].

The key factor influencing respondents' decisions about child vaccination was information provided by PCPs. Parents who received information from a physician were nearly 10.5 times more likely to vaccinate their child than those who did not receive such information. As many as 63.9% of parents whose children were not vaccinated had not received such information. This observation is consistent with the literature, which consistently emphasizes the role of recommendations from healthcare professionals. For example, a study by Zhang *et al*. in a pediatric population in China showed that the lack of a vaccination recommendation from healthcare workers was the most common reason for not vaccinating children against influenza (21.1%), while Burgaya-Subirana *et al*. in Spain highlighted that a pediatrician's recommendation was the main reason for past child vaccinations (68.18%) [14, 15].

It was shown that the parent's vaccination status is one of the strongest predictors of the same decision regarding the child (OR = 36.992). This result is consistent with the study by Atkinson *et al*., where a vaccinated parent increased the likelihood of their child's vaccination (OR = 17.05), and the majority of respondents, as in the present

analysis, were female (74.7%) [16]. Importantly, a more than two-fold stronger influence was demonstrated for a vaccinated father (OR = 44) than a mother (OR = 21) on the child's immunization. This observation contradicts the findings of Kim *et al*., who found a dominant role for the mother in pro-health decisions (OR = 9.39 vs. OR = 1.84) [17]. Furthermore, the authors determined that the vaccination of both parents increased the chance of the child's vaccination by more than 19.7-fold (OR = 19.74). However, methodological differences must be considered, as in the Kim *et al*. study, the status of both parents was known, whereas our data were based on the declaration of only one parent [17].

We also observed an association between the reasons for the decision among those who chose not to vaccinate their child against influenza and the lack of information explaining the vaccine composition and mechanism of action. This seems to be an aspect that has been insufficiently emphasized in research to date.

Our study did not show a significant association between awareness of influenza complications and the decision to vaccinate a child, which is partially confirmed in the literature. Panchapakesan *et al*., in a survey of adults in Singapore, showed that knowledge about influenza is not a significant predictor of the willingness to be vaccinated [18]. These results suggest that awareness of health complications alone may be insufficient motivation to decide on vaccination, for both children and adults.

The study did not show a statistically significant relationship between child influenza vaccination rates and the analyzed sociodemographic factors, including place of residence or parental level of education. These findings, however, contrast with the results of Zhai *et al*., who showed an association with the place of residence, and Xu *et al*., who highlighted a negative correlation with education [19, 20]. The observed discrepancies suggest that the influence of individual factors may depend on the specifics of the study population and the socio-economic context, requiring further, in-depth research to fully understand the predictors of vaccination rates.

Despite the increased risk of complications from influenza, the alarmingly low vaccination rate (2.6%) among children with chronic diseases in our study group was coupled with a lack of information about free vaccinations for over half of the parents (56.5%). This is in stark contrast to rates described as low in other regions. For example, a report by Vazhappilly *et al*. noted that only 34% of Canadian children with diagnosed rheumatic diseases were vaccinated against influenza [21]. This highlights the urgent need to improve education and promotion of vaccinations in this group.

Although this study provides important information, it is subject to certain limitations. The generalizability of the findings to the entire parent population in Poland is limited by the relatively small sample size (n = 250) and its specific composition, namely the inclusion of parents of hospitalized children. Furthermore, data collected *via* self-report questionnaires may be subject to recall bias or social desirability bias, which is a recognized limitation in studies based on respondent declarations [22]. A significant predominance of female respondents (80.4%) also constitutes a limitation, as it may influence the strength of the observed correlations and the ability to generalize the conclusions while considering the attitudes and roles of fathers. Furthermore, it should be noted that the study did not assess the specific therapeutic regimens for chronic conditions or the influence of specialist physicians on vaccination decisions, which constitutes a limitation of our considerations.

CONCLUSIONS

The results of this study indicate the failure of the current public health strategy for influenza vaccination in Poland. Despite the introduction of full reimbursement, the vaccination rate in the studied population of hospitalized children remains at an alarmingly low rate of 2.8%, and in the key group of children with chronic illnesses, it is merely 2.6%. This demonstrates that the passive availability of vaccines alone does not translate into the desired epidemiological outcome. The study identifies fundamental barriers that are not economic in nature. The main one is the lack of an active recommendation from a PCP. At the same time, obtaining information from a PCP increased the likelihood of a child's vaccination against influenza 10.5-fold. The strongest single predictor for the decision to immunize a child is the parent's own attitude and example – a vaccinated parent was almost 37 times more likely to vaccinate their child. In light of this evidence, an effective strategy to improve vaccination rates must be reoriented from passive availability to active, two-pronged engagement. This consists of systemically strengthening the role of PCPs as active and effective educators in vaccination and intensifying public health campaigns aimed at adults, as their attitudes and behaviors are the key determinants of health protection levels in the pediatric population.

DISCLOSURES

1. Institutional review board statement: The study was conducted with the approval of the Bioethics Committee, under resolution number 2024/02/06, on February 7, 2024.
2. Assistance with the article: None.
3. Financial support and sponsorship: None.
4. Conflicts of interest: None.

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