

UDC 615. 371 / . 372 :(614. 2. 07 +615. 15) : 347. 635 / . 636 :342. 7 | .001. 36
DOI: 10.15587/2519-4852.2023.282687

SOCIAL-PHARMACEUTICAL ASPECTS OF PARENTS' ATTITUDES TOWARDS CHILDREN'S VACCINATION

Iryna Chukhray, Oksana Levytska, Petro Oliinyk, Iryna Hadiak, Halyna Bilushchak

The aim. Study of the attitude of parents with medical and pharmaceutical and other educations to vaccination of their children from the point of view of social pharmacy.

Materials and methods. An anonymous online survey of 1,566 respondents (of whom 302 are parents with medical and pharmaceutical education) on the Google Form online service in the Viber mobile application and on the Facebook social network, which was conducted from September 16, 2021 to October 6, 2021.

Methods of analysis, synthesis and generalization were used.

Results. A high degree of commitment to vaccination among the respondents was established (almost 9 out of 10 parents). 26.1 % of respondents motivate the refusal by the inadequate quality of vaccines, 25.7 % consider vaccination to be inappropriate; 24.3 % do not administer preventive vaccinations to children due to their unsatisfactory state of health; 20.4 % – due to possible side reactions. 67.1 % of parents are interested in the composition of vaccines, 95.6 % know the symptoms and complications of the diseases for which vaccination is carried out, and 96.6 % – side effects after vaccination, although 74.5 % want to receive more information about possible complications. At the same time, there are slightly fewer supporters of vaccination among respondents with medical and pharmaceutical education than among respondents without such education, although this difference is not statistically significant. However, depending on the education, significant differences (more than 10 %) were observed among the respondents regarding interest in the composition of vaccines, adherence to vaccination against COVID-19 of their children older than 12 years and the opening of vaccination points in pharmacies.

Conclusions. It was found that to increase the level of awareness of medical and pharmaceutical professionals regarding vaccination, it is necessary to optimize educational professional programs and curricula for their training. It is shown that increasing the level of their knowledge will increase the commitment of parents with other education to children's vaccinations. The need to expand the professional role of pharmacists by involving them in vaccinations has been confirmed

Keywords: medical and pharmaceutical specialists, specialists of other specialties, parents, children, vaccination, educational professional program, curriculum, pharmacy

How to cite:

Chukhray, I., Levytska, O., Oliinyk, P., Hadiak, I., Bilushchak, H. (2023). Social-pharmaceutical aspects of parents' attitudes towards children's vaccination. ScienceRise: Pharmaceutical Science, 3 (43), 39–49. doi: <http://doi.org/10.15587/2519-4852.2023.282687>

© The Author(s) 2023

This is an open access article under the Creative Commons CC BY license hydrate

1. Introduction

Social pharmacy integrates all aspects of pharmaceutical science and practice and includes a set of measures aimed at increasing the medical, economic, and most importantly social efficiency of the health care system and pharmaceutical provision [1]. From the point of view of social pharmacy, it is important to investigate the level of acceptance of vaccination at the level of the individual and society, as well as the risks and benefits of vaccinations, their individual and social acceptability, in particular, mandatory vaccination of children.

Despite strong evidence of the importance of vaccinations in preventing disease, disability, and death in millions of children each year, the problem of vaccination coverage in this age group exists worldwide. Receiving negative content and inaccurate vaccine information from unreliable sources, known as the “infodemic”, has been recognized in recent years as a risk factor for vaccination hesitancy, especially in the context of the COVID-19 pandemic [2].

In Ukraine, children are vaccinated against 10 diseases (pertussis, diphtheria, tetanus, measles, mumps, rubella, tuberculosis, haemophilia type b (HIB infection), hepatitis B and polio) [3] according to the Preventive Vaccination Calendar [4]. In addition to mandatory vaccinations, other types of vaccinations (against flu, pneumococcal infection, etc.) are recommended for children.

The study of attitudes towards vaccination of children, as well as the reasons for hesitation regarding vaccination, is the subject of research by many scientists. The above-mentioned investigations are carried out in two directions: the first involves studying the attitude of parents, and the second - the attitude of health care workers to the specified problem.

The first direction. It is known that the formation of public policy in various countries related to vaccination of children depends on understanding the current state of decision-making by parents regarding vaccination. Despite the proven efficacy of vaccination, some

parents have concerns and misperceptions about childhood vaccinations, even in communities with a high level of vaccination [5–7]. Therefore, surveys were conducted in the USA in 2012 and 2014, the purpose of which was to establish changes in parents' decisions regarding immunization of children. It was revealed that in 2012, most interviewed parents (89.2 %) agreed to accept all recommended children's vaccines, the rest deliberately delayed (5.5 %) or refused one or more vaccines (5.4 %). In 2014, the rates of acceptance, postponement, and refusal of vaccination were 90.8 %, 5.6 %, and 3.6 %, respectively. That is, the share of parents who agreed to vaccination increased slightly, and those who refused vaccination decreased [8].

A systematic review of 116 studies devoted to the study of parents' attitudes and beliefs about childhood vaccination conducted in 2012–2018 in 34 countries of the world showed that many studies (114) used a survey method, and the other two - interviews. At the same time, heterogeneous types of questionnaires with a high variability of questions were used. Parental attitudes and beliefs about childhood vaccines were studied in 57 (49.1 %) studies in total [9].

A survey conducted in Austria showed that most parents had a generally positive attitude towards vaccinating their children. At the same time, a fourth of the respondents (25.1 %) refused at least one of the recommended vaccinations. In a multivariate analysis of trust in vaccinations, it was established that education (lower trust at higher levels of education), gender (higher trust in women), trust in the doctor (positive influence), and information about vaccine risks are important. This survey showed the important role of the physician in communicating balanced information about the benefits and risks associated with childhood vaccinations [10].

A study of parental attitudes towards influenza vaccination in South India found that the most common reason for parental refusal to get vaccinated was lack of a doctor's recommendation. This was indicated by the majority (53.6 %) of parents who did not agree to vaccination against influenza. Such a recommendation is a more important factor for them than belief in the effectiveness of vaccination [11].

A study of pregnant Australian women and their follow-up post-partum survey found that improving the knowledge of pregnant women about childhood vaccinations can positively influence their intention to vaccinate their children, particularly among women who have given birth for the first time [12].

A study conducted in Malaysia found that pregnant women expecting their first child were four times more hesitant to vaccinate compared to those who already had one or more children, and unemployed parents were also more hesitant to vaccinate [13].

A survey of 612 parents in Australia found that more than two-fifths (43.0 %) had concerns about vaccination. The main reasons for this were: the number of vaccines given in the first two years, vaccine ingredients, allergies, weakened immune systems and autism. Parents considered medical professionals to be the most accessi-

ble and reliable source of information about vaccination. In general, almost a quarter of parents (23.0 %) reported insufficient knowledge to make the right decision about vaccination. There was little evidence of an association between parental approval of the vaccine or socioeconomic status and vaccination status [14].

To monitor the attitude of parents to vaccination in Israel in 2008 and 2016, 360 people were interviewed. The level of parental confidence in vaccination recommendations provided by pediatricians and nurses decreased significantly from 87.0 % in 2008 to 72.0 % in 2016. Both the 2008 and 2016 surveys are high and almost the same the share of respondents (78.0 % and 82.0 %, respectively) confirmed that the benefits of vaccination outweigh possible risks. 71.0 % of respondents during the 2008 survey supported the requirement to provide documentation of full vaccination before enrolling in kindergarten, while in 2016, 66.0 % of respondents supported this policy [15].

Another survey conducted in Israel in 2018 found that higher vaccination rates were driven by publications from the country's Ministry of Health and the belief that vaccinations prevent serious diseases. The potential pain in the child during the vaccination caused more concern than the safety of the vaccine. The factor that most influenced the decision of Israeli parents to vaccinate their children was the level of trust in sources of information about vaccination, particularly nurses [16].

Italian parents cited their forgetfulness (18.5 %), unavailability of the vaccine at the vaccination center (17.4 %), and concerns about side effects (14.6 %) as important reasons for postponing vaccination. At the same time, the main reasons for refusing vaccination were the lack of recommendations from paediatricians, which was indicated by 35.1 % of respondents, as well as their own objection to the administration of vaccines (29.9 %) [17].

The vast majority (98.0 %) of surveyed mothers in Greece indicated that they had vaccinated their child/children, and the most popular source of vaccination information was their child's paediatrician (89.0 %). In addition, about half of the mothers delayed vaccinating their child/children (51.5 %), the main reasons for which were: paediatrician's advice (26.0 %), increased cost of medical examination (16.0 %) or fear of side effects (16.0 %) [18].

Anti-vaccination information was found to be the reason for the hesitancy of interviewed parents in Sudan to vaccinate their children against measles. The results suggest that investing in vaccine awareness and addressing vaccine access can be an effective measure to improve measles vaccine acceptability and thus increase vaccination coverage [19].

A multivariate analysis of the opinions of 1,181 women in the UK found that income and ethnicity were the main drivers of age and regional differences in women's intentions to get vaccinated against COVID-19 when not pregnant, during pregnancy and for their children. Trust in vaccines and the health care system were the reasons given by women to accept the vaccine against COVID-19 [20].

The issue of parents' attitude to children's vaccination was also considered by domestic scientists.

A study conducted in 2012 by the co-author of the current article showed that almost three-fourths (71.5 %) of the interviewed parents were supporters of routine vaccination of children. In addition, parents' awareness of the specifics of immunization was studied [21].

The most recent national survey conducted in 2021 showed a positive attitude to vaccination (95.9 % of respondents), since, according to the vast majority of respondents (60.4 %), it is a good way to prevent common diseases, more than one fifth (26.8 %) – the norm of world medical practice, at least one tenth (11.6 %) – the result of trust in medicine and medical workers [22].

The second line of research is devoted to the study of knowledge, attitudes, and beliefs about mandatory childhood vaccination among health care workers. It was established that some of them have wrong ideas about vaccination, which leads to a decrease in the level of use of recommended vaccines [23], and, therefore, to a decrease in the effectiveness of vaccination programs [24].

Thus, two studies on the attitude of health workers to vaccinations of children and adults, conducted in Italy, showed that most health workers and doctors believed that mandatory vaccination should be maintained (74.4 % of respondents in the first and 85.7 % in second studies). At the same time, some medical professionals believed that mandatory vaccination should be cancelled immediately or gradually [25, 26].

A study conducted in France showed that only 42 % of French general practitioners and paediatricians support mandatory immunization, compared to 56.5 % of the general population [27].

Another survey conducted in Ukraine was devoted to studying the attitude of parents and doctors to the problems of overcoming vaccine-controlled infections (whooping cough and meningococcal infection). Half (50.0 %) of the interviewed doctors believed that the main reason for parents' refusal to vaccinate is negative public opinion formed by mass media. At the same time, the parent-respondents denied the significant influence of the mass media on their choice regarding immunoprophylaxis, because almost two-fifths of them (38.0 %) put doubts about safety as the basis for possible refusal to vaccinate their children, and a third (32.0 %) about the quality of vaccines. In general, almost all (96 %) parents gave consent for vaccination, while more than half (58.0 %) – at their own expense [28].

As we can see, the attitude towards vaccination among different social groups – parents and health care workers – is ambiguous and complex, but it is common knowledge that the recommendations of medical and pharmaceutical workers regarding the benefits of vaccination play a decisive role in the intentions of patients. Therefore, the unsolved problem determines the relevance of further research in this direction.

2. Research planning (methodology)

The research algorithm included the following stages:

1. Preparatory, which involved the preparation of a research plan, search, selection, and analysis of scientific publications devoted to the research topic.

2. Development of the research methodology, which included the development of a questionnaire to study the attitude of parents with medical/pharmaceutical and other educations to the problem of mandatory immunization of children and its validation, as well as justification of the size of a simple probability sample of respondents.

3. Conducting an Internet survey, collecting and studying the received information.

4. Statistical processing of the survey results, considering the consistency of the answers.

5. Analysis and interpretation of research results, drawing up a conclusion.

3. Materials and methods

To study the attitude of parents with medical/pharmaceutical and other educations to the vaccination of their children, an anonymous online survey was conducted on the Google Form online service in the Viber mobile application and in the Facebook social network, including in specialized groups: “Vaccination: questions and answers” [29] and “Vaccination against health! We are for freedom of choice! (Ukraine)” [30].

Statistical processing of the results of the questionnaire survey was carried out using Friedman's ANOVA method in the STATISTICA program, considering the Kendall concordance coefficient (W). The greater its value, the higher the degree of consistency of respondents' opinions. Differences were considered significant at $p > 0.05$. The dependence between the answers to the questions of the main part of the questionnaire was established using the Spearman correlation coefficient (ρ) with a significance level of $p < 0.05$. The closer the Spearman correlation coefficient module is to unity, the stronger the relationship between the studied quantities [31].

An anonymous questionnaire survey was conducted within the framework of the research work of the Department of Pharmacy Organization and Economics, the conclusion of which was provided by the ethics committee of Danylo Halytsky Lviv National Medical University Protocol No. 3 dated 03/14/2016.

The passport part of the questionnaire included questions about gender; availability of medical/pharmaceutical education; places of residence; the age of the child/children interviewed. The main part of the questionnaire consisted of 16 questions, most of which were closed type, with an alternative answer (yes, no). For individual questions of the questionnaire, respondents had the opportunity to indicate their answer in the “Other” column.

The survey period is September 16, 2021 – November 6, 2021. The information obtained during the survey was processed using methods of analysis, synthesis, and generalization.

In total, 1,568 respondents took part in the survey, and 1,566 (99.9 %) qualitatively completed questionnaires were included for further processing, of which 302 were questionnaires of parents with medical/pharmaceutical education. The research used a simplified formula for calculating a simple probability sample ($P=0.954$) for the general population of more than 5,000 people (the number

of Ukrainians is 41,588.4 thousand people [32]: $n=1/\Delta^2$, where n is the volume of the sample population, Δ – the share of the given sample error [33]. Its marginal error in the case of 1566 respondents is $\pm 2.5\%$, i.e. the obtained survey results show the studied validity within the limits of the increased degree of reliability (Δ =up to 3 %).

The survey was conducted among representatives of all regions of Ukraine, except for the annexed Autonomous Republic of Crimea and the occupied territories of Donetsk and Luhansk regions, 12 respondents were from abroad. Most of them – more than a third of the respondents – are from the Western (35.1 %) and Northern (34.3 %) regions. Representatives of the Southern, Central, and Eastern regions account for 13.9 %, 12.2 %, and 3.7 %, respectively. Parents living abroad accounted for a small share of respondents (0.8 %) (Table 1).

Table 1
Value of the Kendall concordance coefficient by region ($p < 0.001$)

Region	Share of respondents	Kendall concordance coefficient, W	Average rank correlations, r	The value of the Pearson test (χ^2)
West	35.1 %	0.52	0.52	$\chi^2 (N=549, df=13) = 3695.529; p=0.00000$
North	34.3 %	0.55	0.54	$\chi^2 (N=537, df=13) = 3806.622; p=0.00000$
South	13.9 %	0.51	0.51	$\chi^2 (N=219, df=13) = 1460.641; p=0.00000$
Central	12.2 %	0.53	0.53	$\chi^2 (N=191, df=13) = 1320.623; p=0.00000$
East	3.7 %	0.56	0.55	$\chi^2 (N=58, df=13) = 424.9423; p=0.00000$
Abroad	0.8 %	0.56	0.52	$\chi^2 (N=12, df=13) = 86.91698; p=0.00000$

Kendall's concordance coefficient, depending on the respondents' region of residence, was within $W=0.51..0.56$, and the average rank correlations were within $r=0.51..0.55$, i.e., there is an average consistency of respondents' opinions [34]. At the same time, the value of the coefficient in all the analyzed cases is statistically significant, as evidenced by the Pearson agreement criterion given separately for each region (Table 1).

Kendall's coefficient of concordance and the average of rank correlations for the main questions of the questionnaire were 0.53 each, that is, the average consistency of the respondents' opinions is observed ($\chi^2 (N=1566, df=13)=10714.42; p=0.00000$).

Most respondents (96.1 %) are women. Among them, as well as among men, there was an average agreement of opinions regarding the mandatory questions of the questionnaire, as evidenced by the values of W and r . They were $W=0.53$ for women; $r=0.53$ ($\chi^2 (N=1505, df=13)=10,303.99; p=0.00000$), and for men – $W=0.55$; $r=0.54$ ($\chi^2 (N=61, df=13)=437.4340; p=0.00000$).

Slightly less than half (44.5 %) of the respondents have a child/children under the age of 3, more than a third (34.9 %) – more than 10 years old, less than a third (31.4 %) – from 4 to 6 years old, more than a quarter (26.5 %) – 7–10 years. Almost a fifth of the respondents (19.2 %) had a medical or pharmaceutical education. In this group of interviewees, as well as in the group of re-

spondents without such education, an average agreement of opinions was observed. The values of W , r and χ^2 were 0.54 in the first case; 0.53; ($N=301, df=13$)=2,093.931; $p=0.00000$, and in the second – 0.53; 0.53; ($N=1265, df=13$)=8655.722; $p=0.00000$.

4. Research results

According to the survey, it was established that most parents (89.7 %) vaccinate their children.

Kendall's coefficient of concordance and the average of rank correlations for mandatory questions of the questionnaire for those respondents who vaccinate children were 0.55 each, that is, there is an average consistency of the opinions of the respondents ($\chi^2 (N=1,405, df=13)=10,128.38; p=0.00000$). On the other hand, in the group of respondents who do not vaccinate children, there is a strong consensus of opinion ($W=0.77; r=0.77; \chi^2 (N=161, df=13)=1,609.792; p=0.00000$), only a small part of them (5 %) did not indicate the reasons for refusing vaccination. Among those who indicated the reasons, approximately equal shares motivate the refusal of immunization due to the inadequate quality of vaccines (26.1 %), consider vaccination inappropriate (25.7 %), do not carry out preventive vaccinations for children due to their unsatisfactory state of health (24.3 %). More than one-fifth of respondents do not consent to vaccination of their children due to possible side effects (20.4 %). Among other reasons, it was stated: lack of responsibility for the loss of the child's health due to

adverse reactions to vaccination; mistrust of the system of medical education of doctors in Ukraine and concealment of statistics. Parents with medical/pharmaceutical education are much more likely than other parents to refuse vaccination due to their child's unsatisfactory state of health (35.2 % vs. 21 %) and consider vaccination inappropriate (29.6 % vs. 23.8 %). At the same time, refusal of vaccination is much less often motivated by the possibility of complications (9.3 % versus 23.8 %) and inadequate quality of vaccines (20.3 % versus 27.9 %) (Fig. 1).

It was found that 96.7 % of respondents were asked for their parents' consent to vaccinate their children.

The Spearman correlation coefficient between the answer to the question about whether the respondents vaccinate their child and whether they were asked about consent is $\rho=0.17$, which indicates a weak connection between the answers.

It is shown that more than two-thirds of respondents (67.1 %) are interested in the composition of vaccines, at least 9 out of 10 parents know the symptoms and complications of the diseases for which vaccination is carried out (95.6 %), as well as side reactions that can occur from the use of vaccines (96.6 %). However, almost three fourths (74.5 %) of respondents want to receive more information about possible complications in children from vaccination.

When asked about the sources of obtaining information about the vaccination that will be administered to

the child, the respondents had the opportunity to provide several options for answers. Two-thirds of all respondents (65.8 %) obtain this information independently from medical literature, instructions for the medical use of vaccines, scientific research. Moreover, parents with other (66.7 %) than medical/pharmaceutical (61.9 %) education are more actively engaged in the independent search for such information. More than half of the respondents (53.4 %) indicated that they receive this information from their family doctor. And again, this information is more often received from a family doctor by parents with other (54.4 %) than medical/pharmaceutical (49.7 %) education. In the total sample, 10.9 % of respondents received information about vaccination from the nurse of the institution the child attends, and 3.4 % received it from friends or acquaintances. For 2.8 % of respondents, the source of such information is the Internet, specialized groups in social networks (groups “Science-based parents”, “Vaccination: questions and answers” on Facebook); specialized resources, including Wakarta’s electronic vaccination card, which builds an individual schedule of vaccinations; recommendations of influential specialists: British researcher in the field of

medicine Peter Abi and Fedor Lapiy – the chief paediatric immunologist of Kyiv. A small number of parents within the limits of statistical error (1.2 %) are not interested in information about vaccinations given to their children (Fig. 2).

However, according to most respondents (84.6 %), information about the composition of vaccines and side effects from their use should be provided, first, by a family doctor. Other sources of information were not trusted, as mass media were mentioned by 7.2 % of respondents, the nurse of the medical institution visited by the child – 3.8 %, the remaining sources (public organizations, manufacturers, WHO, Ministry of Health, authorized organizations) in total 4.4 %. No significant differences in parents’ priorities depending on the type of education regarding the above-described issue were found (Fig. 3).

The Spearman correlation coefficient between the answer to the question whether respondents vaccinate their child and who should provide information about vaccines (composition, possible reactions, and complications) has a value of $\rho=0.17$, which indicates a weak dependence between the answers.

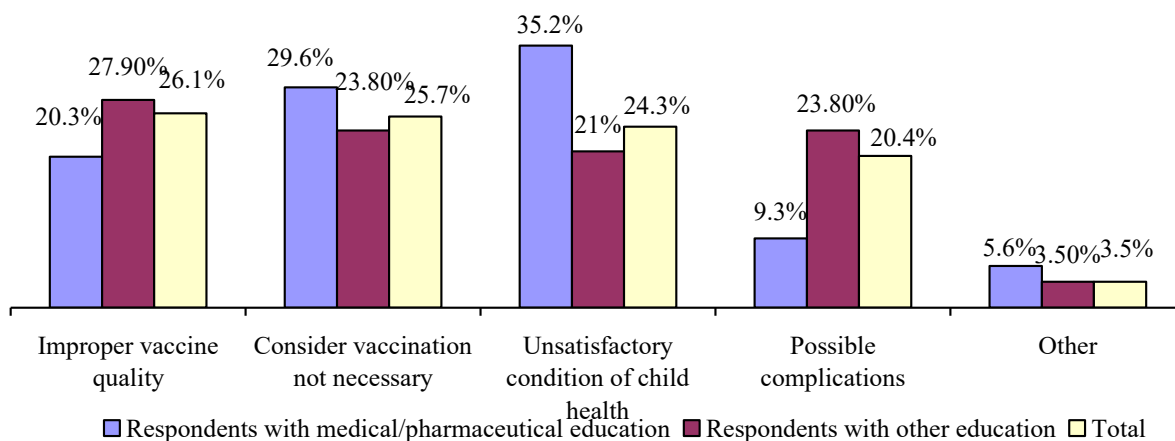


Fig. 1 Rating of the reasons of preventive vaccinations refusals

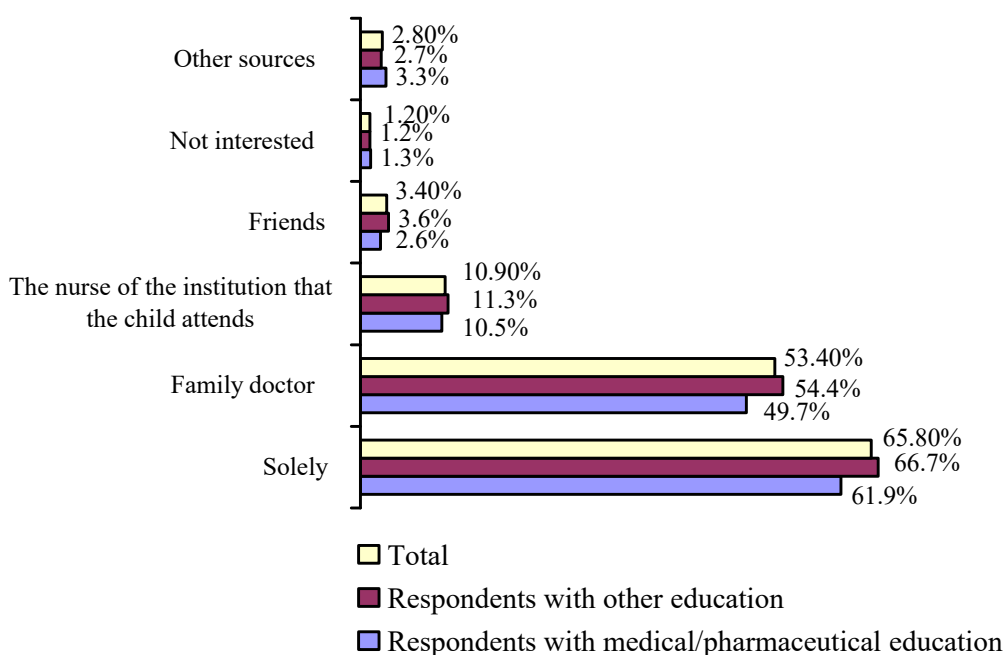


Fig. 2 Sources of obtaining information about the name and type of vaccination, which will be administered to the child

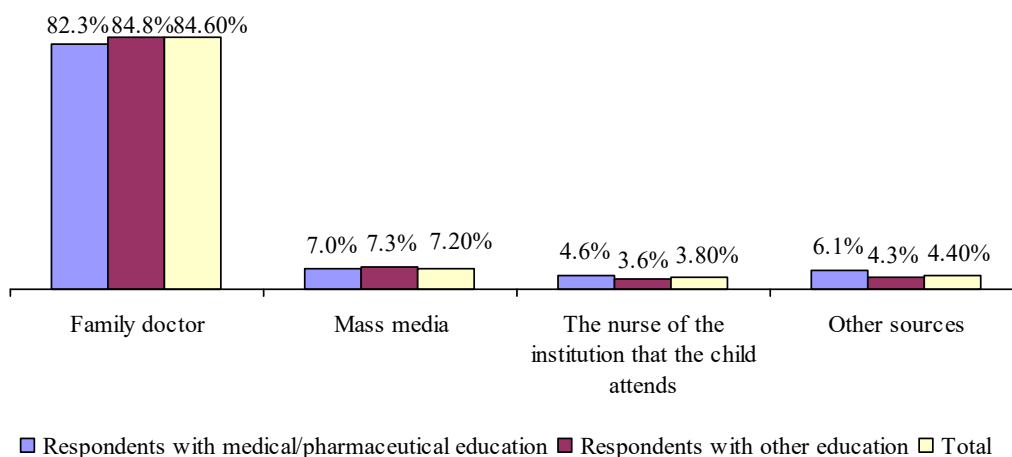


Fig. 3 Distribution of respondents' opinions regarding sources of information on the composition of vaccines and their side effects

For more than half of the respondents (59.7 %), the country producing the vaccine is important. In the first place in terms of trust, parents indicated manufacturers from the USA (59.7 %), in second – from the Netherlands (43.1 %), followed by – from Bulgaria (18.0 %), India (11.2 %) and Poland (10.2 %).

According to the opinion of almost two-thirds of the interviewed parents (61.4 %) believe that the manufacturer should be responsible for the complications that occurred after vaccination. Some respondents believe that no one is responsible for such complications (13.8 %) or that the family doctor is to blame (10.3 %).

Almost 2/3 of the interviewed parents (61.6 %) are convinced that children who do not have preventive vaccinations cannot attend preschool or school.

The Spearman correlation coefficient between the answer to the question about whether respondents vaccinate their child and whether a child who is not vaccinated can attend preschool/school is $\rho = -0.31$, which indicates an average agreement between responses.

About two-thirds of respondents (63.2 %) want their child older than 12 to be vaccinated against COVID-19, with only 5.5 % of children in this age group receiving such a vaccination. A little more than half of parents (54.1 %) want their child younger than 12 years old to also get vaccinated against COVID-19. It should be noted that in connection with the spread of the coronavirus infection in Ukraine, from 17.07.2021 it was allowed in certain cases to vaccinate children from the age of 12, and from 29.10.2021, all children of this age group could receive such a vaccination if they have all standard vaccinations [35].

Almost two-thirds of respondents (64.7 %) have a positive attitude to the opening of vaccination points in pharmacies. It is worth noting that Ukraine plans to start vaccination in pharmacies, but this issue is still under consideration. In November 2021, a pilot project on vaccination against influenza in pharmacies was implemented [36].

Spearman's correlation coefficient between the answer to the question about whether the respondents vaccinate their child and whether they have a positive attitude to the opening of vaccination points in pharmacies is $\rho = 0.28$, which indicates a weak consistency of the opinions of the respondents.

At the same time, between the answers to the question whether respondents have a positive attitude to the opening of vaccination points in pharmacies and whether they want their child older than 12 years/younger than 12 years to be vaccinated against COVID-19, there is an average consistency of opinion, which is evidenced by values of the Spearman correlation coefficient are 0.39 and 0.31, respectively.

Next, we studied the ratio of answers between parents with medical and pharmaceutical education and parents with other types of education to questions with an alternative answer (yes, no) (Table 2).

In general, no great difference was found between the respondents' opinions depending on their education. However, among persons with a medical/pharmaceutical education, there are slightly fewer supporters of vaccination and they:

- more often (15.8 %) are interested in the composition of vaccines, which is quite natural from the point of view of professional self-determination, because the effect of vaccines is primarily related to the type of immunogen and adjuvant;

- less favourable (by 10.3 %) to vaccinating their children older than 12 against COVID-19, which can be explained by professional scepticism about vaccines;

- more controversial (by 11.6 %) are the opening of vaccination points in pharmacies. On the one hand, the reason for this is the regulatory requirements that only those medical workers (doctor, paramedic, junior specialist with medical education) who have undergone special annual training and possess the rules of organization and technique of vaccination, as well as the skills of providing vaccinations, can be involved in vaccination emergency care in case of development of post-vaccination reactions/complications [4]. On the other hand, the opening of vaccination points in pharmacies requires regulatory support for the training of pharmacists on immunization issues, additional staff of specialists, determination of ways to reimburse the cost of such a service, confidentiality of information, provision of premises for consultations and appropriate equipment, development of standard working procedures for immunization.

Table 2

The ratio of positive answers to questionnaire questions depending on the respondents' education

Questions	Share of positive answers to questions, %		
	Among respondents with a medical/pharmaceutical education	Among respondents without a medical/pharmaceutical education	Total
Do you vaccinate your child?	87.1	91.0	89.7
Are you interested in the composition of vaccines?	79.8	64.0	67.1
Do you know the symptoms and complications of the diseases for which vaccination is carried out?	98.0	95.0	95.6
Do you know about possible reactions and adverse effects that can arise from the use of vaccines?	97.4	96.4	96.6
Would you like to know more about possible reactions and adverse effects that may arise from the use of vaccines?	73.5	74.7	74.5
Does the country that produces vaccines matter to you?	59.8	59.6	59.6
In your opinion, can a child who is not vaccinated attend preschool/school?	35.1	39.2	38.4
Would you like your child (over 12 years old) to be vaccinated against COVID-19?	54.9	65.2	63.2
Would you like your child (younger than 12 years old) to be vaccinated against COVID-19?	52.0	54.6	54.1
Do you have a positive attitude to the opening of vaccination points in pharmacies?	55.3	66.9	64.7

5. Discussion of research results

Our study showed that the absolute majority (89.7 %) of the interviewed parents are supporters of vaccination. If we take into account that the highest adherence to vaccination was found among respondents in Australia [14] and Greece [18] (98.0 % each), high - in two previous studies conducted in Ukraine, 96.0 % [28] and 95.9 % [22], in Israel – 90.0 % (2008) and 89.0 % (2016) [15], in the USA – 89.2 % in 2012 and 90.8 % in 2014 [8], and the lowest in Austria – 82.7 % [10], so our results are closest to those obtained by American and Israeli researchers.

We found that the most important source of information about vaccination and the influencing factor on its choice for Ukrainian parents is the family doctor (84.6 %), which is confirmed by the results of other studies. For example, parents in Greece indicated paediatricians [18], in Israel – nurses of maternal and child health care clinics [15], in Australia – medical specialists in general [14]. At the same time, the lack of a doctor's recommendation for influenza vaccination in South India was the most common reason for parental refusal of vaccination [11].

Almost three-fourths (74.5 %) of those interviewed during our study indicated that they need more information about complications after vaccination. The need to improve information about vaccination was also established in the study of attitudes towards vaccination of children of pregnant Australian women [12] and Italian parents [17].

In our study, as in the analyzed domestic studies [22, 28], among the main reasons for refusing vaccination were doubts about the quality or effectiveness of vaccines (26.1 %, 26.0 % and 14.7 %, respectively), the risk of complications and adverse reactions after vaccination (20.4 %, 32.0 % and 28.4 %, respectively).

We did not find a fundamental difference between the opinions of medical/pharmaceutical specialists and

parents with non-medical education regarding vaccination of children. At the same time, professionals are responsible for forming a positive attitude of parents towards vaccination. Moreover, the data of a sociological study conducted in Ukraine in 2017 showed that the influence of medical workers on the formation of a responsible attitude of parents towards vaccinations has recently weakened. As the authors of this study point out, doctors and nurses often do not pay due attention to vaccination issues during outpatient appointments, choose a passive model of behaviour and offer parents to make decisions about vaccination of children themselves. Sometimes they verbally or non-verbally let parents know about their own doubts about the need to follow the vaccination schedule for children or express uncertainty about the quality of vaccines available in the medical institution [37]. That is, medical personnel do not always fully and qualitatively carry out appropriate explanatory work, and sometimes they themselves are a source of negative information about vaccination [38].

A significant role in the popularization of vaccination in the world is also played by pharmacists, who provide both the supply of vaccines and, in many cases, vaccination [39–41]. For example, in 2019, flu vaccination was offered in pharmacies in 40 % of European countries, and in 17 %, other available vaccinations were also available [42, 43]. In the world in 2020, pharmacy-based vaccination was carried out in 36 countries of the world, and in 26 of them vaccination can be prescribed and carried out directly by a pharmacist [44]. A study conducted in Canada in 2016 showed that the involvement of pharmacists in the immunization process led to an increase in the number of the vaccinated population [40].

As you can see, vaccination in pharmacies is a common service in the world. However, the relationship to vaccination of children in pharmacies is quite complex and ambiguous.

For example, in the USA in 2009, all 50 states participated in pharmacy vaccination programs, but only 28 states allowed pharmacists to administer various vaccinations to children [45]. However, vaccination policies for children vary quite a bit from state to state, with many having specific age restrictions for paediatric patients, allowing only certain vaccines (e.g., influenza vaccine), or being administered by a pharmacist only with a prescription, etc. [46].

Since the beginning of the pandemic, pharmacies in all states have been given the opportunity to administer vaccines against COVID-19 to children aged 3 years and older, although specific pharmacy chains can decide which age they are ready to vaccinate [47, 48]. And 17 states allow pharmacists to give vaccinations against COVID-19 to children of any age [49]. At the same time, the American Academy of Paediatrics is against vaccinating children and adolescents in pharmacies, because it believes that this is not a solution to the vaccination problem [50]. However, The Paediatric Pharmacy Advocacy Group (PPAG) believes that pharmacists are well positioned to play a key role in addressing the public health problems associated with low childhood vaccination rates. For this, regulatory, logistical and barriers of the attitude of doctors and parents to vaccination of children in pharmacies should be overcome [46].

What about in Ukraine? In our study, it was established that the level of parents' trust in medical and pharmaceutical workers in matters of vaccination is high. Therefore, to increase adherence to vaccination, it is first necessary to actively, qualitatively and fully carry out explanatory work and motivational counselling of parents regarding the benefits of vaccination; provide objective and reasoned information about vaccines, because public education about vaccination and the pandemic is crucial [51]. This can be achieved by increasing the level of self-awareness regarding immunoprophylaxis of both medical students and pharmaceutical students, as well as medical and pharmaceutical workers, obtained at graduate and post-graduate studies. For this purpose, it is necessary to revise and make corrections in the content of educational professional programs and training plans of specialists in institutions of higher medical/pharmaceutical education, possibly increasing the number of study hours devoted to the study of vaccination issues. And to implement and actively carry out vaccination in pharmacies, including children, it is necessary to start with the creation of an appropriate legal framework and appropriate thorough training of specialists.

Study limitations. Despite the obtained results, this study has some limitations. Although the size of the sample testifies to the representative nature of the study, its structure was not uniform across the regions of Ukraine. In addition, respondents from the annexed Autonomous Republic of Crimea and the occupied districts of Luhansk and Donetsk regions were not represented. Thus, the general results of the survey should not be extrapolated to specific regions of Ukraine. The participants of the survey were active users of social networks, in particular, specialized groups of supporters and oppo-

nents of vaccination. However, the opinion of those who do not use social networks is not represented. Although it is worth keeping in mind that our study was conducted during the COVID-19 pandemic, which required social distancing, so the use of online methods was optimal for data collection.

Prospects for further research. Our study showed a positive attitude of parents towards the opening of vaccination points in pharmacies. Given that such a service has long been and successfully provided in pharmacies in many countries around the world, further research may be aimed at studying the participation of pharmaceutical workers in immunization programs. In addition, it is important to study the essence of conflicting these regarding vaccination among medical and pharmaceutical workers.

6. Conclusions

1. From the point of view of social pharmacy, with the help of an Internet survey, the level of perception of parents with medical and pharmaceutical and other educations of mandatory childhood immunization was determined. At the same time, more than 90 % of respondents showed adequate awareness of immunization issues, symptoms, and complications of diseases for which vaccination is carried out, as well as adverse reactions that may arise from the use of vaccines. Two-thirds of respondents get information about vaccination independently from medical literature, instructions for the medical use of vaccines, scientific research, etc., and more than half – from a family doctor. At the same time, almost three fourths of respondents want to receive more information about possible complications in children from vaccination. Medical and pharmaceutical specialists, unlike respondents with other education, are more often interested in the composition of vaccines, are less in favour of vaccinating their children older than 12 against COVID-19 and are more conflicted about opening vaccination points in pharmacies.

2. Almost a quarter of the respondents consider vaccination to be inadvisable at all. At the same time, there are slightly fewer supporters of vaccination among respondents with medical and pharmaceutical education than among other interviewed specialists, although this difference is not statistically significant. The main reasons for refusing vaccination are the inadequate quality and possible side effects of vaccines, as well as the unsatisfactory state of health of their children. One of the ways of forming parental commitment to vaccination of children is to increase their level of knowledge through motivational counselling by medical and pharmaceutical specialists.

3. To increase the level of awareness of medical and pharmaceutical specialists in vaccination issues, it is necessary to optimize educational professional programs and curricula for their training at the graduate and post-graduate levels of education. At the same time, it is important to expand the professional role of pharmacists by involving them in carrying out vaccinations, as this corresponds to the directions of the development of social

pharmacy and increases the degree of coverage of the population by vaccination programs. The active implementation of this service in pharmacies, including for children, must begin with the creation of an appropriate legal framework and appropriate thorough training of pharmaceutical specialists.

Conflict of interests

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this article.

Funding

The study was performed without financial support.

Data availability

Data will be made available on reasonable request.

Acknowledgments

We thank the Armed Forces of Ukraine for the opportunity to engage in scientific activities.

We express our deep gratitude to Professor Bohdan Hromovik for the consultations provided to the authors during the research and registration of its results.

References

- Kotvitska, A. A., Kubarieva, I. V., Surikova, I. O. (2017). Determination of the content and formation of the concept of social pharmacy in the world and in Ukraine. *Social'na Farmaciâ v Ohoroni Zdorov'â*, 3 (4), 3–9. doi: <https://doi.org/10.24959/sphhcj.17.101>
- Rocha, Y. M., de Moura, G. A., Desidério, G. A., de Oliveira, C. H., Lourenço, F. D., de Figueiredo Nicolete, L. D. (2021). The impact of fake news on social media and its influence on health during the COVID-19 pandemic: a systematic review. *Journal of Public Health*, 9. doi: <https://doi.org/10.1007/s10389-021-01658-z>
- Pro zakhyst naseleння vid infektsiinykh khvorob (2000). *Zakon Ukrainy No. 1645-III. 06.04.2000*. Available at: <https://zakon.rada.gov.ua/laws/show/1645-14#Text>
- Pro poriadok provedennia profilaktychnykh shcheplen v Ukraini ta kontrol yakosti y obihu medychnykh imunobiolohichnykh preparativ (2011). *Nakaz MOZ Ukrainy No. 595. 16.09.2011*. Available at: <https://zakon.rada.gov.ua/laws/show/z1159-11#Text>
- Allan, N., Harden, J. (2014). Parental decision-making in uptake of the MMR vaccination: a systematic review of qualitative literature. *Journal of Public Health*, 37 (4), 678–687. doi: <https://doi.org/10.1093/pubmed/dfu075>
- Benin, A. L., Wisler-Scher, D. J., Colson, E., Shapiro, E. D., Holmboe, E. S. (2006). Qualitative Analysis of Mothers' Decision-Making About Vaccines for Infants: the Importance of Trust. *Pediatrics*, 117 (5), 1532–1541. doi: <https://doi.org/10.1542/peds.2005-1728>
- Gualano, M., Olivero, E., Voglino, G., Corezzi, M., Rossello, P., Vicentini, C., Bert, F., Siliquini, R. (2019). Knowledge, attitudes and beliefs towards compulsory vaccination: a systematic review. *Human Vaccines & Immunotherapeutics*, 15 (4), 918–931. doi: <https://doi.org/10.1080/21645515.2018.1564437>
- Frew, P. M., Fisher, A. K., Basket, M. M., Chung, Y., Schamel, J., Weiner, J. L. (2016). Changes in childhood immunization decisions in the United States: Results from 2012 & 2014 National Parental Surveys. *Vaccine*, 34 (46), 5689–5696. doi: <https://doi.org/10.1016/j.vaccine.2016.08.001>
- Dyda, A., King, C., Dey, A., Leask, J., Dunn, A. G. (2020). A systematic review of studies that measure parental vaccine attitudes and beliefs in childhood vaccination. *BMC Public Health*, 20 (1). doi: <https://doi.org/10.1186/s12889-020-09327-8>
- Kundi, M., Obermeier, P., Helfert, S., Oubari, H., Fitzinger, S., Yun, J., Brix, M., Rath, B. (2015). The Impact of the Parent-Physician Relationship on Parental Vaccine Safety Perceptions. *Current Drug Safety*, 10 (1), 16–22. doi: <https://doi.org/10.2174/157488631001150407104320>
- Ramprasad, C., Zachariah, R., Steinhoff, M., Simon, A. (2016). Parental attitudes towards influenza vaccination for children in South India. *World Journal of Pediatrics*, 13 (1), 84–90. doi: <https://doi.org/10.1007/s12519-016-0053-7>
- Danchin, M. H., Costa-Pinto, J., Attwell, K., Willaby, H., Wiley, K., Hoq, M., Leask, J., Perrett, K. P., O'Keefe, J., Giles, M. L., Marshall, H. (2018). Vaccine decision-making begins in pregnancy: Correlation between vaccine concerns, intentions and maternal vaccination with subsequent childhood vaccine uptake. *Vaccine*, 36 (44), 6473–6479. doi: <https://doi.org/10.1016/j.vaccine.2017.08.003>
- Mohd Azizi, F. S., Kew, Y., Moy, F. M. (2017). Vaccine hesitancy among parents in a multi-ethnic country, Malaysia. *Vaccine*, 35 (22), 2955–2961. doi: <https://doi.org/10.1016/j.vaccine.2017.04.010>
- Costa-Pinto, J. C., Willaby, H. W., Leask, J., Hoq, M., Schuster, T., Ghazarian, A. et al. (2017). Parental Immunisation Needs and Attitudes Survey in paediatric hospital clinics and community maternal and child health centres in Melbourne, Australia. *Journal of Paediatrics and Child Health*, 54 (5), 522–529. doi: <https://doi.org/10.1111/jpc.13790>
- Grossman, Z., Hadjipanayis, A., Degani, A., Somekh, E. (2019). Tracking Changes in Vaccine Attitudes and Decisions: Results from 2008 and 2016 Parental Surveys. *Pediatric Infectious Disease Journal*, 38 (4), e75–e76. doi: <https://doi.org/10.1097/inf.0000000000002147>
- Elran, B., Yaari, S., Glazer, Y., Honovich, M., Grotto, I., Anis, E. (2018). Parents' perceptions of childhood immunization in Israel: Information and concerns. *Vaccine*, 36 (52), 8062–8068. doi: <https://doi.org/10.1016/j.vaccine.2018.10.078>
- Napolitano, F., D'Alessandro, A., Angelillo, I.F. (2018). Investigating Italian parents' vaccine hesitancy: A cross-sectional survey. *Human Vaccines & Immunotherapeutics*, 14 (7), 1558–1565. doi: <https://doi.org/10.1080/21645515.2018.1463943>
- Giannakou, K., Kyprianidou, M., Hadjikou, A., Fakonti, G., Photiou, G., Tzira, E., Heraclides, A. (2021). Knowledge of mothers regarding children's vaccinations in Greece: an online cross-sectional study. *BMC Public Health*, 21 (1). doi: <https://doi.org/10.1186/s12889-021-12179-5>
- Sabahelzain, M. M., Moukhyer, M., Bosma, H., van den Borne, B. (2021). Determinants of Measles Vaccine Hesitancy among Sudanese Parents in Khartoum State, Sudan: A Cross-Sectional Study. *Vaccines*, 10 (1), 6. doi: <https://doi.org/10.3390/vaccines10010006>

20. Skirrow, H., Barnett, S., Bell, S., Riaposova, L., Mounier-Jack, S., Kampmann, B., Holder, B. (2022). Women's views on accepting COVID-19 vaccination during and after pregnancy, and for their babies: a multi-methods study in the UK. *BMC Pregnancy and Childbirth*, 22 (1). doi: <https://doi.org/10.1186/s12884-021-04321-3>
21. Chukhray, I. L., Antonchak, Z. P., Grushkovska, D. T. (2012). Study of parents' attitude to the problem of compulsory immunization of children. *Український медичний альманах*, 15 (5), 207–208.
22. Dorykevych, K. I., Kremin, Yu. I. (2021). Study of the attitude of Ukrainian citizens to vaccination: the results of an online survey. *Annaly Mechnikovskoho Instytutu*, 1, 51–56. doi: <https://doi.org/10.5281/zenodo.6350180>
23. Lytras, T., Kopsachilis, F., Mouratidou, E., Papamichail, D., Bonovas, S. (2015). Interventions to increase seasonal influenza vaccine coverage in healthcare workers: A systematic review and meta-regression analysis. *Human Vaccines & Immunotherapeutics*, 12 (3), 671–681. doi: <https://doi.org/10.1080/21645515.2015.1106656>
24. Report of the SAGE working group on vaccine hesitancy (2014). The Strategic Advisory Group of Experts (SAGE). World Health Organization.
25. Tafuri, S. S., Martinelli, D. D., Caputi, G. G., Arbore, A. A., Germinario, C. C., Prato, R. R. (2009). Italian healthcare workers' views on mandatory vaccination. *BMC Health Services Research*, 9 (1). doi: <https://doi.org/10.1186/1472-6963-9-100>
26. Martinelli, D., Tafuri, S., Fortunato, F., Cozza, V., Germinario, C. A., Prato, R. (2014). Are we ready to abrogate compulsory vaccinations for children? *Human Vaccines & Immunotherapeutics*, 11 (1), 146–149. doi: <https://doi.org/10.4161/hv.34417>
27. Nicolay, N., Lévy-Bruhl, D., Gautier, A., Jestin, C., Jauffret-Roustide, M. (2008). Mandatory immunization: The point of view of the French general population and practitioners. *Vaccine*, 26 (43), 5484–5493. doi: <https://doi.org/10.1016/j.vaccine.2008.07.058>
28. Fedyak, I. O., Bilyk, I. P., Mateyko, G. B. (2018). Focus on vaccination: the view of doctors and analysis of its pharmaceutical support on children's bacterial infections. *Pharmaceutical Review*, 1, 139–151. doi: <https://doi.org/10.11603/2312-0967.2018.1.8698>
29. Vaksynatsiia: pytannia ta vidpovidi (Pryvyvky – vaksyny – shcheplennia). Available at: <https://www.facebook.com/groups/bzvorgua/permalink/1577574825771355/4>
30. «Vaksynatsiia protyv zdorovia! Mi za svobodu vibora! (Ukrayna)». Available at: <https://www.facebook.com/groups/811537635696912/>
31. Yashkina, O. I. (2013). Statistical tools of expert opinion consistency in marketing research. *Ekonomichniy visnyk Natsionalnogo tekhnichnogo universytetu Ukrainy «Kyivskiy politekhnichnyi instytut»*, 10, 442–449. Available at: http://nbuv.gov.ua/UJRN/evntukpi_2013_10_74
32. Derzhavna sluzhba statystyky Ukrainy. Available at: <http://ukrstat.gov.ua/>
33. Hromovyk, B. P., Korolyov, M. V. (2020). The results of the study of pharmacists' opinion regarding the organization of their work in pharmacies during the coronavirus COVID-19 pandemic. *Farmatsevtichnyi Zhurnal*, 3, 39–44. doi: <https://doi.org/10.32352/0367-3057.3.20.04>
34. Moskalenko, V. F. (Ed.) (2009). *Biostatystyka*. Kyiv: Knyha plius, 184.
35. Pro vvedennia v diiu Rishennia operatyvnoho shtabu Ministerstva okhorony zdorovia Ukrainy z reahuvannia na sytuatsii z poshyrennia infektsiinykh khvorob, yakym mozna zapobihyti shliakhom vaksynatsii vid 01 zhovtnia 2021 roku (2021). *Nakaz MOZ Ukrainy No. 2234*. 13.10.2021. Available at: <https://cutt.ly/WGvznpX>
36. V Ukraini rozpochynaietsia pilotnyi proiekt iz vaksynatsii proty hrypu v aptekakh. Available at: <https://moz.gov.ua/article/news/v-ukraini-rozpochynaetsja-pilotnij-proekt-iz-vakcinacii-proti-gripu-v-aptakah>
37. Demchenko, I., Kozhan, N., Holtsas, L., Fenchak, A. (2017). Faktory vplyvu na prykhylnist batkiv shchodo vaksynatsii: rezultaty doslidzhennia. *ATs «Sotsiokonsal'tynh»*, 16.
38. Drutsul-Melnyk, N. V., Ivanova, L. A., Koloskova, O. K., Haras, M. N. (2022). Do pytannia imunoprofilaktyky infektsiinykh khvorob u ditei v period pandemii SOVID-19. *Visnyk medychnykh i biolohichnykh doslidzhen*, 2, 24–29. doi: <https://doi.org/10.11603/bmbr.2706-6290.2022.2.13045>
39. Rhodes, L. A., Williams, D. M., Marciniak, M. W., Weber, D. J. (2017). Community pharmacists as vaccine providers. *International Journal of Health Governance*, 22 (3), 167–182. doi: <https://doi.org/10.1108/ijhg-05-2017-0020>
40. Isenor, J. E., Edwards, N. T., Alia, T. A., Slayter, K. L., MacDougall, D. M., McNeil, S. A., Bowles, S. K. (2016). Impact of pharmacists as immunizers on vaccination rates: A systematic review and meta-analysis. *Vaccine*, 34 (47), 5708–5723. doi: <https://doi.org/10.1016/j.vaccine.2016.08.085>
41. Le, L. M., Veettil, S. K., Donaldson, D., Kategeaw, W., Hutubessy, R., Lambach, P., Chaiyakunapruk, N. (2022). The impact of pharmacist involvement on immunization uptake and other outcomes: An updated systematic review and meta-analysis. *Journal of the American Pharmacists Association*, 62 (5), 1499–1513.e16. doi: <https://doi.org/10.1016/j.japh.2022.06.008>
42. Poliakov, D. (2020). Shcheplennia v aptetsi: yevropeiski modeli ta dosvid. *Apteka.ua online*, 29 (1250). Available at: <https://www.apteka.ua/article/553207>
43. The legal and regulatory framework for community pharmacies in the WHO European Region (2019). Copenhagen: WHO. Available at: <https://apps.who.int/iris/bitstream/handle/10665/326394/9789289054249-eng.pdf?sequence=1&isAllowed=y>
44. Pinto, G. S., Hung, M., Wong, A. (2020). An overview of pharmacy's impact on immunization coverage. A global survey 2020. *International Pharmaceutical Federation (FIP)*. The Hague: International Pharmaceutical Federation, 66. Available at: <https://www.fip.org/file/4751>
45. Isler, A. (2022). Can Kids Under 5 Get the COVID Vaccine at a Pharmacy? Available at: <https://www.verywellhealth.com/young-children-covid-vaccine-pharmacy-or-pediatrician-5496841>

46. Omecene, N. E., Patterson, J. A., Bucheit, J. D., Anderson, A. N., Rogers, D., Goode, J.-V. R., Caldas, L. M. (2019). Pharmacist-administered pediatric vaccination services in the United States: major barriers and potential solutions for the outpatient setting. *Pharmacy Practice*, 17 (2), 1581. doi: <https://doi.org/10.18549/pharmpract.2019.2.1581>
47. Hanretty, A., Rose L. (2020). New HHS Regulations Expand Pharmacists' Role in Childhood Immunizations. *Pharmacy times*. Available at: <https://www.pharmacytimes.com/view/new-hhs-regulations-expand-pharmacists-role-in-childhood-immunizations>
48. PREP Act immunity from liability for COVID-19 vaccinators (2019). Department of Health and Human Services. Available at: <https://www.phe.gov/emergency/events/COVID19/COVIDVaccinators/Pages/PREP-Act-Immunity-from-Liability-for-COVID-19-Vaccinators.aspx>
49. Pharmacist administered vaccines: based on NASPA analysis of state pharmacy practice laws (2022). American Pharmacists Association; National Alliance of State Pharmacy Associations. Available at: <https://naspa.us/wp-content/uploads/2022/06/Pharmacist-Immunization-Authority-June-2022.pdf>
50. American Academy of Pediatrics Opposes HHS Action on Childhood Vaccines; Calls It 'Incredibly Misguided'. (2020). American Academy of Pediatrics. Available at: <https://www.aap.org/en/news-room/news-releases/aap/2020/american-academy-of-pediatrics-opposes-hhs-action-on-childhood-vaccines-calls-it-incredibly-misguided/>
51. Zaprutko, T., Kremin, Y., Michalak, M., Bernatoniene, J., Zaprutko, L., Hudz, N. et al. (2022). Social Attitude to COVID-19 and Influenza Vaccinations after the Influenza Vaccination Season and between the Second and Third COVID-19 Wave in Poland, Lithuania, and Ukraine. *International Journal of Environmental Research and Public Health*, 19 (4), 2042. doi: <https://doi.org/10.3390/ijerph19042042>

Received date 10.01.2023

Accepted date 12.06.2023

Published date 30.06.2023

Iryna Chukhray*, PhD, Assistant, Department of Organization and Economics of Pharmacy, Danylo Halytsky Lviv National Medical University, Pekarska str., 69, Lviv, Ukraine, 79010

Oksana Levytska, Doctor of Pharmaceutical Sciences, Associate Professor, Department of Organization and Economics of Pharmacy, Danylo Halytsky Lviv National Medical University, Pekarska str., 69, Lviv, Ukraine, 79010

Petro Oliinyk, Doctor of Pharmaceutical Sciences, Professor, Department of Disaster Medicine and Military Medicine, Danylo Halytsky Lviv National Medical University, Pekarska str., 69, Lviv, Ukraine, 79010

Iryna Hadiak, PhD, Assistant, Department of Chemistry, Pharmaceutical Analysis and Postgraduate Education, Ivano-Frankivsk National Medical University, Halytska str., 2, Ivano-Frankivsk, Ukraine, 76018

Halyna Bilushchak, PhD, Associate Professor, Department of Computational Mathematics and Programming, Institute of Applied Mathematics and Fundamental Sciences, Lviv Polytechnic National University, Bandery str., 12, Lviv, Ukraine, 79013

**Corresponding author: Iryna Chukhray, e-mail: iryna_chukhray@ukr.net*