

The attitude of Polish women planning pregnancy and/or having children towards vaccinations: a cross-sectional survey study

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ABSTRACT

Objectives: Infectious diseases in pregnant women can cause birth defects. Implementing appropriate prevention methods while planning pregnancy can help avoid some of them.

Material and methods: A cross-sectional survey study was performed. The questionnaire investigated attitudes towards vaccinations, as well as opinions on anti-vaccine movements and the so-called "chickenpox parties". The questionnaire was developed for the purpose of this study and the survey was conducted using the google form, which was posted on social media groups for women planning pregnancy, being pregnant or for mothers' groups from Poland.

Results: The study group consisted of 2402 women; their median age was 31 years (range 16–54 years). Most women were from cities > 100,000 inhabitants (49.7%, 1194/2402) and had higher education (71.9%, 1726/2402). A positive attitude towards vaccinations was more common among younger, nulliparous women from big cities ($p = 0.02$, $p = 0.04$ and $p = 0.01$, respectively). 2068/2402 (86.1%) of respondents were not vaccinated before pregnancy and 1931/2402 (80.4%) of women were not vaccinated during pregnancy. While most women (1545/2402, 64.3%) considered vaccination safe, and effective (1904/2402, 79.3%) against infectious diseases, many ($n = 296/2402$ 12.3%) have no opinion on the so-called chickenpox party.

Conclusions: Most surveyed women had a positive attitude towards vaccinations and consider vaccines a safe and effective method of protection against infectious diseases. Since a significant proportion of women were not vaccinated before or during pregnancy and about 12% of women are undecided, the physician's role is crucial in educating and persuading the patient to be vaccinated.

Key words: anti-vaccination movement; infections; newborn diseases; pregnancy; vaccines

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INTRODUCTION

Intrauterine or perinatally transmitted infections are a significant cause of fetal and neonatal mortality and an important contributor to morbidity in early and late childhood. The term TORCH complex is used to describe common mother-to-child infections, including toxoplasmosis, other: syphilis, hepatitis B and C viruses (HBV and HCV),

human immunodeficiency virus (HIV), human papillomavirus (HPV), parvovirus B19, varicella and zoster virus (VZV) and enteroviruses. The acronym also includes rubella (MMR), cytomegalovirus (CMV) and herpes simplex virus (HSV). The majority in this group are infections of viral etiology [1].

Preconception care should be given to every woman of childbearing age. The main goals of antenatal care include

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identifying potential risks to the mother, fetus and pregnancy, and providing information about potential risk factors, and intervention options [2–4].

A detailed medical interview is essential for risk assessment. It is important to gather accurate information about past and present chronic diseases, including diabetes and hypertension, as well as family history of genetic and congenital diseases. Information about gynecological diseases and previous obstetric history, data on the course of previous pregnancies, way of their termination, and data on children's health are also important [2, 5]. Regular medical visits and laboratory testing reduce the risk of complications during pregnancy and delivery [2, 5, 6].

On January 1, 2019, new recommendations were introduced in Poland, outlining the scope of diagnostic tests and medical consultations that should be performed throughout the course of pregnancy. The testing scheme for vertical infections is considered correctly implemented if the first testing towards toxoplasmosis, rubella, HIV, HCV, and syphilis are performed before the tenth week of gestation. If the first tests for toxoplasmosis are negative, reassessment is recommended between the twenty-first and twenty-sixth week of gestation. Moreover, testing for HBV and HIV is recommended between the thirty-third and thirty-seventh week of gestation [4]. Many interventions before and during pregnancy can reduce the incidence of birth defects, congenital diseases, fetal impairment or pregnancy complications. Some interventions need to be performed before conception. They include glycemic control, weight loss, folic acid supplementation [7–9]. Pregnant women should give up drinking and smoking. It is also important to discontinue the administration of teratogenic drugs, and if the patient needs treatment, these drugs should be replaced with medications that are safe for the fetus. It is also important to maintain healthy body weight, as obesity increases the risk of birth defects and may cause many complications for the mother [7, 8]. During pregnancy, women should pay attention to hygiene. Hand washing, avoiding eating uncooked meat and unpasteurized food reduce the risk of developing diseases such as toxoplasmosis, and listeriosis [7, 9].

According to the recommendations of the Advisory Committee on Immunization Practices at Centers for Disease Control and Prevention and the American College of Obstetrics and Gynecology, a woman who is planning to become pregnant should be vaccinated against MMR and chickenpox at least four weeks before conception (as these vaccinations are contraindicated during pregnancy), unless she has had varicella or rubella or has been vaccinated against these diseases. From the second trimester of pregnancy, every woman should be vaccinated against influenza and hepatitis B (unless she has previous history of these diseases or has been vaccinated against them).

Vaccination against pertussis (DTP) with an acellular vaccine between 27 and 34 weeks (36 weeks in Poland) of pregnancy is also recommended in order to pass the antibodies to her child (irrespective of her previous history of infection or immunization) [10].

Objectives

The aim of the study was to evaluate the attitude of Polish women who have children or are planning a pregnancy towards vaccination, infectious diseases that may cause vertical infections, their medical knowledge and the main sources of medical information.

MATERIAL AND METHODS

A cross-sectional survey study was performed anonymously, which checked the attitudes of Polish women planning pregnancy, being pregnant or already having children towards various aspects related to vaccinations and vertical infections. Moreover, attitudes towards anti-vaccine movements and chickenpox parties were also analyzed. The survey analyzed the vaccination coverage among surveyed women. The analysis included whether women were vaccinated appropriately when planning pregnancy, and whether these vaccinations were recommended by doctors. In addition, it was verified, whether women were vaccinated during pregnancy against the diseases according to recommendations. The study also checked women's willingness to vaccinate their children, and if they consider vaccination to be safe and effective against infectious diseases.

The questionnaire was developed for the purpose of this study and the survey was conducted using the google form, which was posted on social media groups for women planning pregnancy, being pregnant or for mothers' groups from Poland. Women from these groups were only once exposed to the questionnaire. Groups were chosen based on the names "Mothers", "Future mothers", "Planning pregnancy" and a combination of these titles along with the names of specific areas of Poland, namely provinces and voivodeships. Every surveyed woman, when completing the questionnaire, had to agree to complete it and had given permission to analyze and publish data collected from her survey. The design of the work conforms to standards currently applied in the Medical University of Warsaw's Bioethics Committee. Approval number: AKBE/131/2021.

Normality of continuous variables was tested using Shapiro-Wilk's test. The U-Mann Whitney test was used to compare continuous variables and the χ^2 test was used to evaluate categorical variables. A p value of < 0.05 was considered significant. Logistic regression was used to calculate adjusted odds ratios and to determine variables independently associated with the attitude towards vaccinations. Statistical analysis was performed using programme Statistica version 13.3.

RESULTS

The collected data were grouped into 4 subgroups:

- study group characteristics,
- vaccination-related data,
- infectious diseases during pregnancy,
- attitude towards anti-vaccine movements and chickenpox parties.

Study group characteristics

The study group consisted of 2402 women planning pregnancy or having children. The median age was 31 years (range: 16–54 years). The largest group consisted of women living in cities > 100,000 inhabitants ($n = 1194/2402$, 49.7%), with higher education ($n = 1726/2402$, 71.9%), married ($n = 1841/2402$, 76.6%) and in a relationship ($n = 2329/2402$, 97%). Most of the surveyed women had been once pregnant ($n = 1009/2402$, 42%) and gave birth once ($n = 1211/2402$, 50.4%). When implementing the survey, 788/2402 (32.8%) of women were pregnant. The survey also checked if women have contact with school-age children (1491/2402, 62.1%) and the source of their knowledge about vaccines, which was mostly medical staff (1848/2402, 76.9%). Baseline characteristics of the study group are presented in Table 1.

Vaccination-related data

Most women had been previously vaccinated according to their vaccination schedule [against tuberculosis, hepatitis B, DTP, MMR, polio ($n = 1283/2402$, 53.4% for polio to 1728/2402, 71.9% for DTP)] almost a quarter of women did not remember what infectious diseases they were vaccinated against in the past ($n = 566/2402$, 23.6%) (Fig. 1). Most women had not been vaccinated while planning pregnancy ($n = 2069/2402$, 86.1%) (Fig. 2). This may be because physicians often do not recommend vaccinations before the pregnancy ($n = 1989/2402$, 82.2%). The study shows that only about 3% (67–91/2402, 2.8–3.8%) of physicians recommended vaccination against influenza or pertussis to pregnant women. Nonetheless 1712/2402 (71.27%) of women have a positive attitude towards vaccinations. It was more common among nulliparous, younger women living in more populous cities (Tab. 2). A total of 71.3% ($n = 1712/2402$) of women consider vaccinations necessary for their children's health. Also, 64.3% ($n = 1544/2402$) of respondents consider vaccinations safe for their children, while 79.3% ($n = 1905/2402$) consider them effective in preventing infectious diseases.

Infectious diseases during pregnancy

The study also checked women's knowledge of the risk associated with infectious diseases during pregnancy. Polish women were also asked about the most dangerous, in their opinion, pathogenic factors that may affect the development

of the fetus (Tab. 3). Seventy three percent ($n = 1752/2402$) of women have never heard the acronym TORCH. Most women know that fetal birth defects can be caused by infectious agents ($n = 1718/2402$, 74.1%), but almost a quarter were not aware of this fact ($n = 544/2402$, 22.6%). Among the five most dangerous in surveyed women's opinion infectious diseases for the fetus, were: toxoplasmosis ($n = 1594/2402$, 66.4%), rubella ($n = 1195/2402$, 49.8%), CMV ($n = 912/2402$, 38%), HIV ($n = 810/2402$, 33.7%) and measles ($n = 643/2402$, 26.8%). According to respondents, the five most dangerous fetal defects caused by infectious agents were: nervous system defects ($n = 1599/2402$, 66.6%), heart defects ($n = 1549/2402$, 64.5%), intrauterine death ($n = 1445/2402$, 60.2%), extremities hypoplasia ($n = 1009/2402$, 42%), and body mass deficiency ($n = 729/2402$, 30.3%).

Attitude towards anti-vaccine movements and chickenpox parties

Our study showed 57% ($n = 1350/2402$) of the surveyed women fully disagree with anti-vaccine movements, 22.9% ($n = 549/2402$) partially agree, and 11.8% ($n = 284/2402$) have no opinion and 6.2% ($n = 149/2402$) fully agree. In case of chickenpox party, as much as 83.1% ($n = 2013/2402$) of women consider this phenomenon dangerous for children's health, 12.3% ($n = 296/2402$) have no opinion on this matter, and 3.9% ($n = 93/2402$) consider it a good way for children to acquire immunity. Women living in cities > 100,000 inhabitants considered chickenpox party more often as a dangerous phenomenon for children's health (51.19%, $n = 989$ vs 43.62%, $n = 205$, $p = 0.04$).

DISCUSSION

Our study revealed that a positive attitude towards vaccinations was more common among nulliparous, younger women living in more populous cities (Tab. 3).

Interestingly, it seems that there is no real correlation between attitudes towards vaccination and socio-economic status or level of education. Much better predictors are high levels of underground thinking, low tolerance to perceived personal freedom, aversion to needles or blood, and religious issues. But most importantly, worried parents are the consumers of misinformation [11].

A German study conducted by Betsch C et al. [12] demonstrated that accessing vaccine-critical websites for five to ten minutes increases the perception of risk of vaccination and decreases the perception of risk resulting from omitting vaccinations as well as the willingness to vaccinate. This is worrying given that as many as 76.1% ($n = 1829/2402$) of surveyed women use the internet as a source of knowledge about vaccination.

Anti-vaccine movement is a colloquial term for initiatives of people who negate the effectiveness and

Table 1. Baseline characteristics of the study group			
		n = 2402	%
Place of residence	Village	549	22.8
	City < 10 000	167	7
	City 10 000–100 000	492	20.5
	City > 100 000	1194	49.7
Education	Medium	530	22.01
	Vocational school	97	4
	Higher	1726	71.9
	Other	492	2
Marital status	Single	440	18.03
	Married	1841	76.6
	Divorced	69	2.09
	Widowed	52	2.02
Stable relationship	Yes	2329	97
	No	73	3
Number of pregnancies	0 pregnancies	98	4.1
	1 pregnancy	1009	42
	2 pregnancies	832	34.6
	3 pregnancies	299	12.4
	> 4 pregnancies	164	6.9
Number of births	0 births	243	10.1
	1 birth	1211	50.4
	2 births	754	31
	> 4 births	203	8.5
Current pregnancy status	Not pregnant	456	19
	Pregnant	1614	67.2
	Not pregnant, planning pregnancy	332	13.8
Sources of information about medical knowledge	Medical staff	1848	76.9
	Books	837	34.7
	Press	426	17.7
	Internet	1829	76.1
	Television	298	12.4
	Family	748	31.3
	Friends	756	31.5
	Lamaze class	318	13.2
	University class	5	0.2
	Science publications	3	0.1
	Leaflets	85	3.5

expediency of vaccinating. The history of anti-vaccination movements dates back to the nineteenth century, when Edward Jenner proved that vaccinia virus infection protects against smallpox virus infection and its complications. Already then many people disapproved his actions [13]. Nowadays, the anti-vaccine movement has increased significantly, following the publication of a paper by Andrew Wakefield in 1998 in which he argued that measles, mumps,

rubella (MMR) vaccination was associated with autism [14]. The greatest intensification of anti-vaccine movements in Europe took place after the publication of Wakefield's pseudo-research, the consequences of which we must face today. In the UK, the MMR vaccination rate dropped from 92% in 1996 to 84% in 2002. In 2003, the rate was as low as 61% in some parts of London, far below the rate needed to avoid an epidemic of measles [15]. Anti-vaccine movements

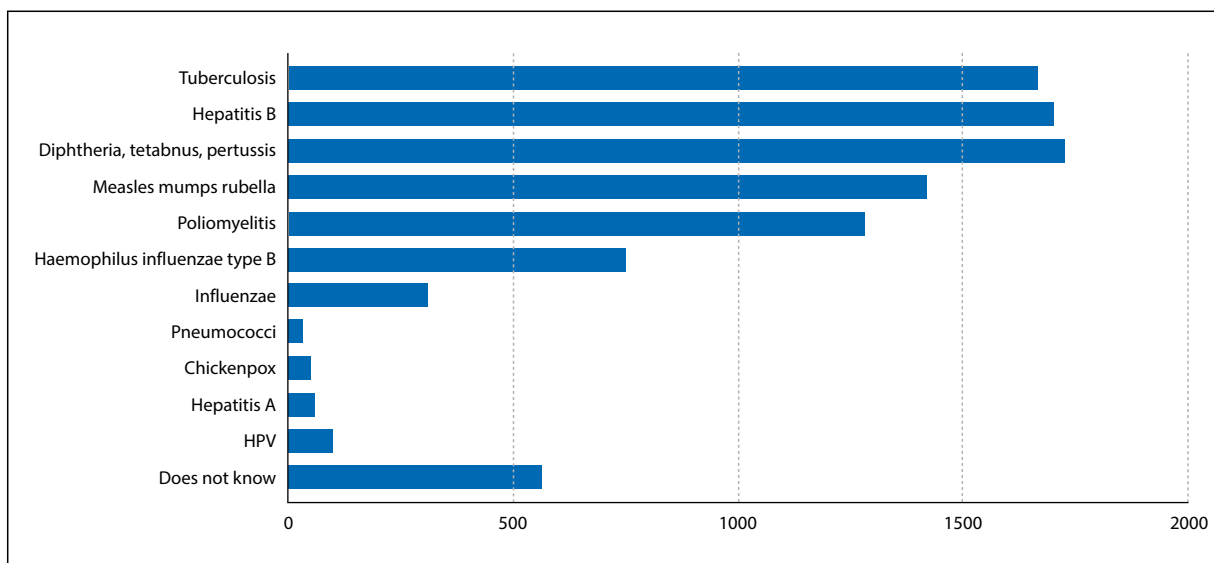


Figure 1. Data presents which pathogens the surveyed women had been vaccinated against according to their individual vaccination schedule; HPV — human papillomavirus

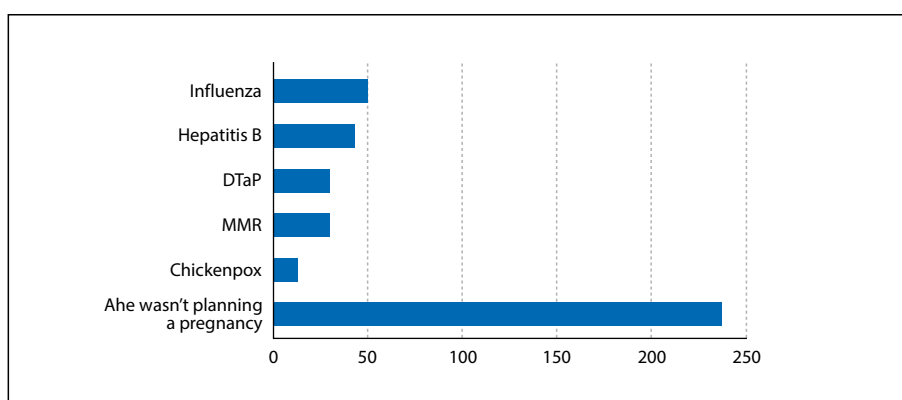


Figure 2. Data presents which pathogens the surveyed women had been vaccinated against due to planning her pregnancy; MMR — rubella; DTaP — Diphtheria, tetanus, pertussis

are also gaining more and more popularity in Poland. In our country, the number of people who avoid vaccination is constantly increasing. In 2010, as a result of the parents' refusal, 3437 children were not vaccinated with compulsory vaccines, whereas in 2018 about 40,000 parents had already evaded their vaccinations [14]. In a survey conducted by Furman et al. [16] 2.3% of parents declared that they have avoided mandatory childhood vaccination at least once, 8.5% of parents would stop vaccinating their children if the vaccination obligation was abolished. The aftermath of these activities can also be seen in Poland, the level of vaccination against measles, mumps and rubella fell below 95%, ensuring a safe level for society. Our study showed that 57% (n = 1350/2402) of the surveyed women fully disagree with anti-vaccine movements. It is difficult to reduce this tendency if women planning pregnancy in

Poland are not vaccinated according to recommendations (86.1%, n = 2069/2402). On the other hand, if a woman is planning her pregnancy and is under medical care, the physician should inform her about the recommended vaccinations. Analyzing the vaccination coverage of Polish women against influenza, data from the National Institute of Public Health — National Institute of Hygiene show that in 2018 only 2.5% of people have been vaccinated against influenza [14]. Our study showed that only 3% of doctors recommended pregnant women to vaccinate against influenza.

Recently popular among parents are the so-called "chickenpox party", these are deliberate organized meetings of healthy children with people infected with chickenpox virus. The purpose of the meeting is to infect healthy children so that their immune system develops natural

Attitude towards vaccinations	Positive	Negative	p-value
n	1712	690	
Median age	30.76 ± 5.5 years	31.34 ± 5.2 years	0.002
Parous	70.63 %	29.37%	0.0039
Nulliparous	76.95 %	23.05 %	
City > 100 000	51.34 %	45.65 %	0.013
City < 100 000	48.66 %	54.35 %	

immunity after illness [17]. An Italian Study revealed that 2.2% of the parents believed that varicella could cause serious health problems [18]. In our study 83.1% (n = 2013/2402) of women consider the phenomenon of chickenpox party as dangerous for their children's health. This attitude was more common in women living in cities > 100,000 inhabitants (51.19%, n = 989 vs 43.62%, n = 205, p = 0.04).

Limitations of the study

Since it was a questionnaire study, women completing the survey might have not understood some questions, since it was performed via social media, we could not explain it enough for some of them. On the other hand, most of surveyed women had higher education, which may suggest that they understood the questionnaire properly. However, one cannot be sure if the answers were honest. We decided to collect a high amount of correctly completed surveys in order to minimize the risk of getting dishonest answers and having unreliable results.

Most of the surveyed women live in big cities. It might be worth considering extending the study among rural areas in order to collect more representative data, especially when most women are obtaining their knowledge about vaccines mainly from medical staff, and medical care is more limited in the countryside.

CONCLUSIONS

To sum up, most of surveyed women want to be vaccinated and to vaccinate their children, they consider vaccines safe and effective against infectious diseases. A significant proportion of women planning to become pregnant or being pregnant is not vaccinated, the role of physician convincing the patient to be vaccinated is crucial in this matter. About 12% of women are the undecided fraction, and the educational role of physicians is essential to convince them of the importance of vaccination.

Ethics approval and consent to participate

The design of the work conforms to standards currently applied in Medical University of Warsaw's Bioethics Committee. Approval number: AKBE/131/2021.

Table 3. Presents which infectious diseases are Polish women the most afraid or would have been afraid of due to their pregnancy/planning pregnancy

A) Infectious diseases that Polish women are the most afraid of due to their pregnancy	
Infectious disease	n = 2402
Toxoplasmosis, n (%)	1594 (66.4)
Rubella, n (%)	1195 (49.8)
CMV, n (%)	912 (38.0)
HIV, n (%)	810 (33.7)
Measles, n (%)	643 (26.8)
Chickenpox, n (%)	603 (25.1)
Herpes, n (%)	575 (23.9)
Syphilis, n (%)	515 (21.4)
Pertussis, n (%)	484 (20.1)
Hepatitis B, n (%)	483 (20.1)
Tuberculosis, n (%)	450 (18.7)
Mumps, n (%)	395 (16.4)
Influenza, n (%)	392 (16.3)
Tetanus, n (%)	271 (11.3)
Polio, n (%)	247 (10.3)
Diphtheria, n (%)	157 (6.5)
I am not afraid, n (%)	126 (5.3)
B) Congenital defects caused by infectious agents according to Polish women	
Congenital defect associated with infectious agent	n = 2402
Defects of the nervous system, n (%)	1599 (66.6)
Congenital heart defects, n (%)	1549 (64.5)
Intrauterine death, n (%)	1445 (60.2)
Hydrocephalus, n (%)	1009 (42.0)
Hypoplasia of the limbs, n (%)	1009 (42.0)
Weight loss, n (%)	729 (30.3)
Deafness, n (%)	694 (28.9)
Does not know, n (%)	558 (23.2)
AIDS, n (%)	471 (19.6)
Congenital cataract, n (%)	237 (9.9)
There is no risk, n (%)	41 (1.7)

CMV — cytomegalovirus; HIV — human immunodeficiency virus

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Ethics and consent to participate

Written informed consent to participate was obtained from all participants.

Availability of data and material

The data sets used and/or analyzed during the current study can be made available by the corresponding author on reasonable request.

Authors' contributions

CB, MK, AG, JKB conceived and designed the analysis, collected the data, wrote the paper, PB conceived and designed the analysis, performed the analysis. ADR, ERW and MPS conceived and designed the analysis, contributed to critically refining the article. All authors have read and approved the final article.

Conflict of interest

The authors declare no conflict of interest.

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