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ORIGINAL PAPER

Attitudes of new mothers toward childhood vaccinations in Rzeszow, Poland

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ABSTRACT

Introduction: The purpose of this research is to identify the key beliefs and understanding, sources of trust and information, and planned actions regarding childhood vaccinations of mothers to newborns in Rzeszow, Poland.

Material and methods: A survey aiming to identify the above factors was disseminated to mothers who had given birth in Rzeszow, Poland. In total, 143 surveys were analyzed, and a $\chi 2$ statistical analysis was used to test for significance between the variables.

Results: Demographic factors did not have a significant association with the beliefs, sources of trust and information, or actions of new mothers regarding childhood vaccinations in Rzeszow. The most common vaccine adverse beliefs (VAB) concerned the vaccine schedule and whether childhood vaccines should be mandatory. The number of adverse beliefs mothers were unsure about showed no statistically significant association with the planned action of choosing to vaccinate or not. The top source of information about vaccinations was the internet, while the most trusted source for vaccine information was pediatricians/family doctors. Factors that did have a statistically significant association included beliefs about vaccines and sources of information and trust.

Conclusions: Overall, the most common VAB and key sources of information and trust about vaccinations in our study population in Rzeszow are similar to previous studies done elsewhere. We also identified that some mothers who vaccinated their older children could be changing their minds amidst the growing movement of vaccine hesitancy. This highlights that it is a key time for physicians to increase education and stress the importance about childhood vaccines, and creating reputable internet sources backed by physicians could help stop the spread of vaccine hesitancy and misinformation.

KEY WORDS:

childhood vaccinations, attitudes toward vaccines, vaccine hesitancy.

INTRODUCTION

The topic of attitudes toward vaccines has gained more interest as it has become more common for people to question whether they should vaccinate their children according to the recommended schedule or even at all. Many countries have seen a decrease in vaccination rates in recent years, which highlights the need for more research on the topic [1]. Several studies have investigated the most common reasons for vaccine hesitancy along with common vaccine myths, but there is a gap in the research concerning how these topics influence a parent's decision to vaccinate their children or not.

VACCINE HESITANCY

Up until 2009, overall vaccination coverage was between 94 and 99% but then started to decline, and since

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this decline the goal of 97–98% coverage has not been achieved [2]. One study done on reasons for vaccine hesitancy showed that worry over adverse reactions caused by the vaccines was the biggest concern that mothers had, with 72.7% of respondents stating this as their primary concern [2]. Several studies have been done in countries all over the world and fear of side effects and concern over vaccine safety are the main reasons parents state for hesitancy over childhood vaccines [3, 4]. One study even looked at three years of WHO/UNICEF joint data reported from 2015–2017 to address reasons for vaccine hesitancy globally, and, as is consistent with individual studies from different countries, the primary reason for hesitancy was fear of side effects and safety concerns [5]. Overall, the number one reason reported for hesitancy was fear of side effects, followed by lack of knowledge, and contextual influences. Another main reason that mothers state for vaccine hesitancy is that they have an overall lack of information on childhood vaccines in general. Another study reported low levels of satisfaction with current knowledge of childhood vaccines, with 63.5% of mothers saying their obstetrician-gynecologist had not given them any information on childhood vaccines [6]. Several studies that inquired about a mother's knowledge about pediatric vaccines reported low levels of knowledge on childhood vaccines in general and regarding safety and efficacy [1]. A specific study done in Canada reported that 92% of study participants indicated that they were very interested in information about pediatric vaccinations [7]. It is the consensus that mothers are interested in obtaining more information about childhood vaccines, and many state they are unhappy with the amount of information given to them by their doctors.

SOURCES OF INFORMATION

Many studies have investigated general attitudes toward vaccinations, and several of them inquire about what sources mothers turn to in order to find information about childhood vaccines. One study reported that 77.3% of respondents listed their family doctor or pediatrician as the primary source for information on vaccines, but the internet was the second most popular source for vaccine information, with 52% of participants stating they had used the internet as a source [2]. This same study also reported that 7.3% of mothers stated that they did not trust the information they received from their doctor [2]. One study that divided mothers into three groups (those who accept all vaccines on time, those who will delay or decline some vaccines, and those who are undecided about what they will do) included a similar survey question that asked mothers what their most important sources are for information about childhood vaccines, and all three groups listed the internet as their top source for information [6]. An additional study reported that 50% of participants agreed with the statement that the internet is a reliable place to obtain information about childhood vaccinations [7]. This same study also reported that 86% of participants admitted to using apps on their smartphone to obtain information [7]. Out of 8 studies that investigated what people use as their main source of information about vaccines, 4 identified the media, 3 identified the internet, and only 1 identified healthcare professionals as the most often used source for information on vaccines.

VACCINATION TRENDS IN POLAND

There have been studies done in Poland relating to attitudes toward COVID-19 vaccinations, but there has yet to be a study done on how the attitudes of new mothers toward childhood vaccinations affect their choice to vaccinate their children with the recommended childhood vaccines. In Poland, the Chief Sanitary Inspector annually announces the Protective Vaccination Program, acting pursuant to Art. 17 par. 11 of the Act of 5 December 2008 on the prevention and combating of infections and infectious diseases in humans (Journal of Laws of 2019, item 1239 and 1495). It provides the general rules for the implementation of the compulsory preventive vaccination program, the compulsory vaccination calendar for children and adolescents, as well as the recommended vaccinations [8].

In the last 5 years, the number of withdrawals from compulsory vaccinations in Poland has increased significantly, from 16.6 thousand withdrawals in 2015 to 48.6 thousand withdrawals in 2019, according to the statistical data of the National Institute of Public Health – National Institute of Hygiene relating to vaccinations of children and adolescents up to 19 years of age who are vaccinated according to the mandatory Program of Protective Vaccinations. This is a disturbing phenomenon that may affect the health of the entire population in the future (PZH 2020) [9]. Regular monitoring of parents' attitudes towards and opinions about the vaccination program will allow the adjustment of educational programs to current needs.

MATERIAL AND METHODS

Survey distribution: A survey with 31 questions focusing on patient demographics, beliefs about vaccinations, intended actions regarding choice to vaccinate, assessment of understanding and satisfaction with information about vaccinations, and sources of trust and information about vaccinations was handed out to mothers who had given birth in Rzeszow, Poland. Response to the survey was voluntary and anonymous. In total, 160 surveys were distributed.

Data Collection: 146 completed surveys were returned, and the anonymous responses were transferred to an Excel spreadsheet. Out of the 146 completed surveys, 3 were excluded from the analysis due to conflicting answers. The final analysis included 143 survey responses.

Analysis: The main categories of survey questions included demographics, beliefs and understanding about childhood vaccines, and sources of information and trust regarding childhood vaccinations. All these categories were compared against each other along with questions aimed at determining which actions parents planned to take regarding whether they would vaccinate their newborn or not. This is displayed in Figure 1. A χ^2 statistical analysis was used to test for significance between the variables.

RESULTS

Overall, 160 surveys were distributed to new mothers and 146 completed surveys were returned, with a 91.25% response rate. Three surveys were removed due to having conflicting answers to questions, so the final number of surveys included in the analysis was 143. The inclusion criteria to participate in the study included women after childbirth, age 18 or over, and voluntary consent to participate in the study. The exclusion criteria were age less than 18 and lack of voluntary consent to participate in the study.

DEMOGRAPHICS

The average age of the respondents was 30 years with 44.8% stating that this was their first child. When asked about place of residence 54.5% stated that they were from a rural area. When asked about the highest level of education 58.7% stated that they had completed a certificate training program. Most patients answered that they were married, and when asked about their economic situation 100% of respondents stated that they were in 'good' or 'very good' economic standing. Full descriptive statistics can be found in Table 1.

Analysis involving demographics did not show a significant association between city or rural geographic location, highest level of education, marital status or whether people stated that they would vaccinate their child with all recommended vaccines according to the recommended schedule. These demographic factors also had no significant relationship to the sources of information people used for vaccines, which sources people trust the most, or whether people held common vaccine adverse beliefs (VAB) such as vaccines being unsafe, containing toxic chemicals, and causing autism. These data are presented in Table 2.

BELIEFS AND UNDERSTANDING

There were 8 key survey questions that aimed to investigate which adverse beliefs new mothers held toward childhood vaccinations and they included statements regarding vaccines causing autism, vaccines causing diseases, vaccines being given too early, the vaccine schedule being too intensive, vaccines containing toxic chemicals, and whether they think vaccines are effective, safe, and should be mandatory. These data are presented in Figure 2. The most common VAB concerned the vaccine schedule and whether childhood vaccines should be manda-

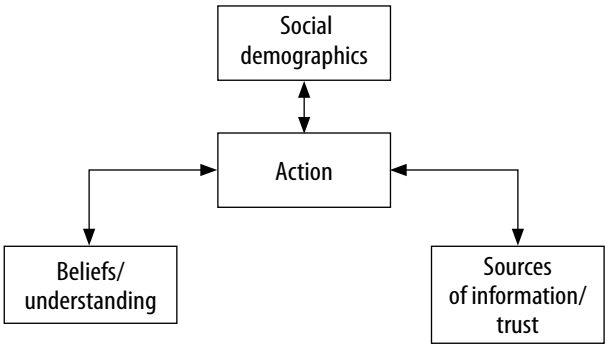

FIGURE 1. Our working model investigated the impact on planned action regarding immunization

We grouped questions in three groups – social/demographic, describing beliefs/understanding and investigating sources of information/trust.

TABLE 1. Full descriptive statistics gathered from survey data, average age 30

Parameters	Descriptive statistics, $N = 143$ (%)
Place of residence	
City	65 (45.5)
Rural	78 (54.5)
Level of education	
High school	5 (3.5)
Undergraduate degree	12 (8.4)
Graduate degree	40 (28)
Certificate training program	84 (58.7)
Other	2 (1.4)
Marital status	
Married	119 (83.2)
In a relationship	21 (14.7)
Domestic partnership	1 (0.7)
Single	2 (1.4)
Prefer not to answer	0 (0)
Economic situation	
Good	105 (73.4)
Very good	38 (26.6)
Bad	0 (0)
Very bad	0 (0)
Number of children apart from newborn	
This is my first child	64 (44.8)
1	49 (34.3)
2	25 (17.5)
3 or more	5 (3.4)

TABLE 2. Geographic location, highest education level, and marital status vs. sources of information and trust were all non-significant with a significance level of 0.05

Criteria vs. demographic	*p*-value
Sources of information vs. location	0.597
Trusted sources vs. location	0.137
Sources of information vs. education	0.679
Trusted sources vs. education	0.664
Sources of information vs. marital status	0.856
Trusted sources vs. marital status	0.436

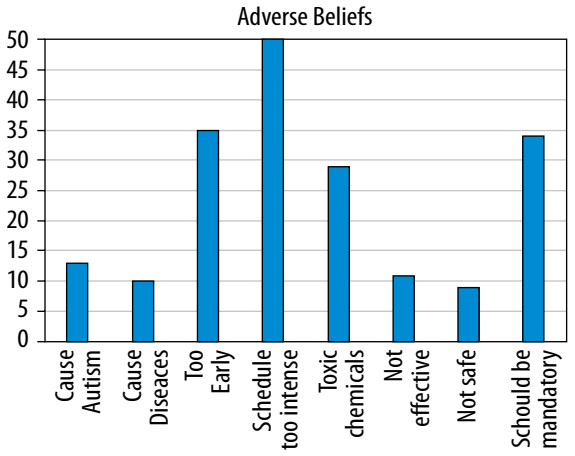

FIGURE 2. There were eight key questions aimed at identifying the most common adverse vaccine beliefs

tory. Out of the 143 respondents, 35% of them stated that they strongly agreed or agreed with the statement that the recommended immunization schedule is too intensive, and 24.5% of them strongly agreed or agreed with the statement that vaccines are given too early in a child's life. When asked to rate their level of agreement with the statement that childhood vaccines should be mandatory, 23.7% of respondents stated that they strongly disagreed or disagreed. The next most popular vaccine adverse belief was that vaccines contain toxic chemicals, with 20.3% of respondents answering that they strongly agreed or agreed with this statement. The remaining VAB were supported by smaller percentages of respondents, with 9% agreeing with the statement that vaccines cause autism, 7.7% disagreeing or strongly disagreeing with the statement that vaccines are effective in preventing the spread of infectious diseases, 7% of respondents strongly agreeing or agreeing with the statement that vaccines cause diseases, and finally 6.3% strongly disagreeing or disagreeing with the statement that vaccines are safe for children.

While there was a higher percentage of respondents questioning the vaccine schedule, the ingredients of vaccines, and whether they should be mandatory, it was less likely that they fully agreed with some of the more common myths about vaccines causing autism, causing diseases instead of preventing them, and whether vaccines are effective or safe. Even though people did not fully endorse these beliefs, many respondents answered that they were unsure about these statements. When asked about these vaccine adverse beliefs, 46.9% of people said that they were unsure whether vaccines caused autism, 42.7% stated that they were unsure whether vaccines were safe for children, 42% were unsure whether vaccines contain toxic chemicals, 33.6% stated that they were unsure whether vaccines cause diseases instead of preventing them, and 25.2% stated that they were unsure whether vaccines were effective in preventing the spread of infectious diseases.

Overall, there appeared to be an association between some beliefs about vaccines and the sources of information people trust when looking for information about childhood vaccinations. The belief relating to vaccines causing autism and whether vaccines are safe for children had a statistically significant association with the sources of information people trust most for vaccine information, with p-values < 0.001. The belief about vaccines containing toxic chemicals was also statistically significantly related to the most trusted sources of vaccine information, with a p-value of 0.012. The most trusted sources of information about such vaccine-related information was pediatricians/family doctors. Upon further analysis, it was found that beliefs about vaccines appear to be associated with whether a mother plans to vaccinate her child. Some key beliefs about vaccines including that vaccines cause autism, vaccines contain toxic chemicals, and whether vaccines are safe for children and should be mandatory had a statistically significant association with the planned action of choosing not to vaccinate. For all four beliefs there was a p-value of < 0.001.

ACTIONS

Survey questions about actions included whether respondents would vaccinate their children or not. Overall, 80.4% of respondents stated that they strongly agree or agree with the statement that they planned to vaccinate their child with all recommended vaccines according to the recommended schedule, 14.7% stated that they were still unsure, and 4.9% chose to disagree or strongly disagree. When responding to the statement that they planned to vaccinate their child with all recommended vaccinations but according to a delayed schedule, 28.7% said that they strongly agree or agree, 41.3% said that they were unsure, and 30% disagreed or strongly disagreed. When asked to state their level of agreement with the statement that they would vaccinate their child with all recommended vaccines but not additional ones, 53.8% strongly agreed or agreed, 27.3% were unsure, and 18.9% chose to disagree or strongly disagree. When responding to the statement that they were not planning to vaccinate their child, only 2.1% of respondents strongly agreed

or agreed, 11.2% said that they were unsure, and 86.7% chose to disagree or strongly disagree. When those who stated that they did not plan to vaccinate their children with all recommended vaccines on time were asked if additional information about vaccines could change their mind, 49.3% of respondents stated either yes or maybe.

When asked about whether older children were vaccinated, 78 out of the 143 respondents answered the question, with 6 stating that they did not vaccinate their older children, and 72 stating that they did choose to vaccinate their older children. For those who stated that they chose to vaccinate their older child/children, we looked at whether their choice to vaccinate their new child differed from the decision they made for their other children. Out of the 72 respondents answering that they had chosen to vaccinate their other children, 10 were now stating that they either were unsure or disagreed with the statement that they were going to vaccinate their newborn with the recommended vaccinations in line with the recommended schedule. On statistical analysis there was a significant association with whether older children were vaccinated and whether the mother planned to vaccinate their newborn, with a p-value < 0.001.

SOURCES OF INFORMATION AND TRUST

Overall, 65% of respondents stated that the source they trust most for information on vaccines is the pediatrician or family doctor, followed by 18.2% identifying medical literature as the most trusted source. Only 9.1% of respondents stated that the internet and social media was their most trusted source for vaccine information, but 35% reported that the internet and social media was the number one source they used to obtain information about childhood vaccinations. When those who stated that they did not plan to vaccinate their children with all recommended vaccines on time were asked if additional information about vaccines could change their mind, 49% of respondents stated either yes or maybe. The number one source chosen that could change their mind was their pediatrician or family doctor, with 39.9% of respondents choosing this.

CONGRUENT VS. NON-CONGRUENT

Additional analysis aimed to look at how many completely VAB respondents had along with how many VAB they were unsure about. The 8 key VAB mentioned above are the same survey questions that were used in this analysis. Respondents were characterized as having 1, 2, 3, 4, or 5+ adverse beliefs along with being unsure about 1, 2, 3, 4, or 5+ adverse beliefs. There was a statistically significant relationship between the number of confirmed adverse beliefs and the planned action of choosing not to vaccinate their child, with a p-value of < 0.001. When looking at the number of adverse beliefs mothers were unsure about, there was no statistically significant association with the planned action of choosing to vaccinate, with a p-value of 0.356.

Each individual vaccine adverse belief was also analyzed for significance with what action the mothers planned to take in terms of vaccinating their child. Whether a respondent agreed, disagreed, or was unsure about the statements that vaccines are given too early, vaccines are effective, and vaccines should be mandatory did not have a significant association with how they answered the question about planning to vaccinate their newborn. In contrast, whether a respondent agreed, disagreed, or was unsure about the statements that vaccines cause autism, vaccines cause diseases, the vaccine schedule is too intensive, vaccines contain toxic chemicals, and whether vaccines are safe for children all had a significant association with the planned action regarding vaccination for their newborn, with p-values < 0.05.

DISCUSSION

Many previous studies have tried to determine which VAB are most common, what the main reasons for vaccine hesitancy are, and which sources people use most to get their information about vaccines. Some of the most common vaccine myths are that vaccines are linked to autism, vaccines contain unsafe toxic chemicals, and that the vaccine schedule is too aggressive. The common VAB found in our study are consistent with previous studies, but what is interesting, and has not yet been shown in other studies, is that a person can be unsure about whether many of these beliefs are true, but their uncertainty does not necessarily impact their decision to vaccinate their child. It is thought that people with no objection to vaccines or adverse beliefs will vaccinate and those who have objections and adverse beliefs will not vaccinate their children, but it may not be as black and white as this. There was no statistically significant association between the amount of adverse vaccine beliefs a person was unsure about and whether they chose to vaccinate their child or not. Figure 3 highlights the differences in how many people stated that they were unsure about a belief vs. how many stated that they strongly agreed or agreed with the belief or statement.

With the large numbers of unsure beliefs combined with the associations found between beliefs and sources of trust and information, education about these adverse beliefs could be key. But it seems that the most important audience to target consists of those with firm VAB as those are the people whose beliefs correlate more with the action of choosing to vaccinate. Initially it seems that targeting those who are unsure would be more important, but from what our data show, the majority of people unsure about different adverse vaccine beliefs typically still choose to vaccinate their child. This is highlighted in Table 3. As pediatricians and family physicians were selected as the most trusted sources of information about child-

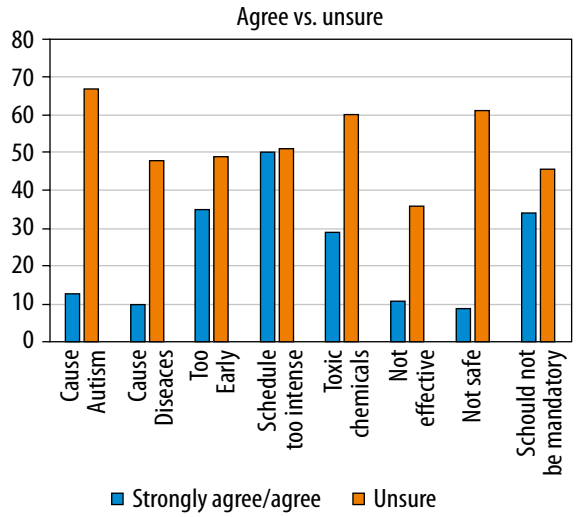

FIGURE 3. Graph showing side-by-side comparison of how many respondents answered strongly agree/agree to each of eight key vaccine adverse beliefs vs. how many answered unsure to the same eight beliefs

Blue is strongly agree/agree and orange is unsure.

hood vaccinations along with the internet being selected as the most common source for information, it could be argued that increased online presence from physicians, whether it be in the form of websites, social media pages, or apps, could be helpful in educating patients and parents on the importance of childhood vaccines.

Another key interesting finding is that demographics do not seem to be a significant factor that influences beliefs, sources of trust and information pertaining to childhood vaccines or actions regarding childhood vaccines. Factors such as education status, marital status, economic status, and urban vs. rural place of residence had no significant connection to the beliefs, understanding, actions, or sources of information and trust as regards childhood vaccinations. In general, geographic demographics in Poland are divided by rural and urban, and there are not many other geographic locations that would make up key demographics. This is in contrast to the United States, which includes urban and rural but also includes suburban, inner city, etc. Comparing areas with different levels of diversity will be important in future.

As the anti-vaccine movement continues to gain strength and vaccine hesitancy seems to be at an all-time high, the question also arises whether parents are changing their minds about whether to vaccinate their newborn children, even if in the past they had their older children vaccinated. Our analysis seems to suggest that parents may be changing their minds about vaccinations for their children, as a percentage of mothers who stated that they had their older children vaccinated are no longer sure or have already made the decision not to vaccinate their newborn with the recommended childhood vaccines. This is another reason to stress the importance of education from trusted sources of information such as pediatricians and family physicians.

Potential limitations to the study include the fact that the study maybe was not powered enough to detect all potential significance between a belief system and not vaccinating. It may have been that the number of people choosing not to vaccinate was so small that we could not detect significance with the other variables. From a demographic standpoint, Rzeszow is technically one of the poorest districts in Poland, yet all people who answered the survey stated that they were in either good or very good economic standing. This could show that the sample population may not be completely representative of the general public, because people of all levels of socioeconomic status are not represented. Another limitation could be that the overall sample size could have been larger as there were 146 completed surveys returned and only 143 could be used for analysis. Some of the survey questions could have been better structured. Some questions may not have been fully understood by respondents or were open to interpretation, such as questions about wanting to vaccinate according to a delayed vaccine schedule or wanting to vaccinate with all recommended vaccines but not additional ones. It was not made clear what additional vaccines were outside of the recommended ones or what a delayed vaccine schedule involves.

CONCLUSIONS

Overall, when considering which VAB were most common in this study population, the most common adverse beliefs revolved around the vaccine schedule, with people believing the vaccine schedule was too intense and too many vaccines were given too early. Other common adverse beliefs were that vaccines contain toxic chemicals

TABLE 3. Shows number of unsure adverse beliefs across top with decision to vaccinate on schedule vs. delayed vs. not at all vs undecided on the side

	Unsure adverse beliefs vs. decision to vaccinate						Total
	0	1	2	3	4	5+	
All on schedule	22	15	17	9	5	19	87
All delayed	2	1	2	2	2	2	11
None	1	1	0	0	0	1	3
Unsure	0	1	2	1	2	8	14

and that vaccines should not be mandatory. These beliefs are similar to those identified in studies done elsewhere. Besides having completely vaccine adverse opinions, it was very common for people to answer that they were unsure about several common vaccine adverse beliefs, but what was interesting is that being unsure about so many things about vaccines did not seem to deter mothers from stating that they still planned to vaccinate their child. Considering sources of trust and information, it was found that physicians are a main source of trust about information regarding childhood vaccines while many people still get their information from the internet. Another interesting conclusion is that with the growing anti-vaccine movement, some mothers seem to be questioning whether to vaccinate their newborn with all recommended vaccines even though they had chosen to fully vaccinate their other children. These data show that it is a key time for physicians to increase education and stress the importance about childhood vaccines, and creating reputable internet sources backed by physicians could help stop the spread of vaccine hesitancy and misinformation.

The eventual goal for future research pertaining to the subject is to do the same study with new mothers at a hospital in Milwaukee for comparison. Milwaukee may be a more representative population of people of varying levels of socioeconomic status. On an even broader scale, the goal would be to do the same survey in many different cities around the world to compare differences in how adverse beliefs affect the decision to vaccinate one's child between different areas around the world.

DISCLOSURE

The authors declare no conflict of interest.

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