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Article

Assessment of Attitudes towards Respiratory Syncytial Virus Vaccination: Internet Survey Results on Awareness and Acceptance among Pregnant Women in Poland

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Abstract: Background/Objectives: Respiratory syncytial virus (RSV) is a major cause of severe lower respiratory tract infections in infants, particularly in vulnerable populations such as preterm newborns and those with underlying health conditions. The approval of the RSVpreF vaccine for pregnant individuals offers a new strategy to reduce the burden of RSV-associated illness in newborns. The aim of this study was to assess RSV vaccination coverage among pregnant women, identify factors contributing to vaccination hesitancy, and evaluate the knowledge of the benefits of vaccination among patients in Poland. **Methods:** The study was conducted on 668 respondents from Poland. The study utilized an original, anonymous questionnaire consisting of 23 questions, which was distributed via social media platforms from July 25 to August 1, 2024. Participants, including women who had recently given birth or were about to, were recruited through Facebook groups and Instagram. **Results:** We confirmed that responders with medical backgrounds had statistically greater knowledge about RSV than non-medical individuals. Additionally, individuals with medical backgrounds were more likely to receive the RSV vaccination during pregnancy, as were patients who obtained vaccination information directly from their physician. Furthermore, a key finding was that patients who had previously received vaccinations for other diseases, such as influenza and pertussis, were more likely to opt for RSV vaccination. **Conclusions:** Vaccination against RSV during pregnancy is a crucial method for safeguarding newborns from infection and its severe complications. Awareness of RSV and vaccination rates among pregnant women remains low, necessitating educational initiatives and public health campaigns to improve coverage.

Keywords: pregnancy; RSV; vaccination

1. Introduction

Respiratory syncytial virus (RSV) is a seasonal pathogen that imposes a significant burden on the global healthcare system. RSV in children can present a broad spectrum of clinical symptoms, ranging from mild upper respiratory tract infections to severe lower respiratory tract infections, such as pneumonia or bronchiolitis. These severe manifestations may necessitate hospitalization and can lead to serious complications, including respiratory failure. [1,2]

The group of patients particularly at risk for severe RSV infection includes newborns born prematurely and infants with underlying medical conditions such as chronic lung disease of prematurity (CLDP) or bronchopulmonary dysplasia (BPD), hemodynamically significant congenital heart disease (hsCHD), immunocompromised conditions or severe neuromuscular disease. [3]

For many years, there has been a lack of effective methods that provide safe and reliable protection in these exceptional circumstances. Despite the full commitment of the medical staff, success in the battle for the health and life of the small patient has not always been achieved.

In 2015, the incidence of RSV acute lower respiratory infection (ALRI) was estimated at 33.1 million cases, leading to 3.2 million hospitalizations and approximately 59,600 fatalities among children hospitalized under the age of five. It is noteworthy that infants under six months of age represented a significant proportion of this burden, with 27,300 reported cases. [4]

A significant advancement was made in August 2004 when the Food and Drug Administration (FDA) approved the RSVpreF vaccine. This was subsequently followed in the following month by recommendations from the Advisory Committee on Immunization Practices (ACIP) and the Centers for Disease Control and Prevention (CDC). They recommended the administration of the RSVpreF vaccine to pregnant individuals as a one-time dose during 32 to 36 completed weeks of gestation, aiming to mitigate the incidence of RSV-associated lower respiratory tract infections in infants. [5,6]

Vaccinations for pregnant women still evoke a lot of discussion and doubts among both patients and physicians in Poland. According to the Immunization Program for 2024, the recommended vaccinations include those for influenza and pertussis.[7] The aim of our study was to determine the vaccination coverage among pregnant women for RSV, identify the factors influencing doubts, and assess the knowledge regarding the benefits of vaccinations.

2. Materials and Methods

The study was based on an original questionnaire developed by the authors. The survey was disseminated through social media platforms from 25 July 2024 to 1 August 2024. The questionnaire comprised 23 questions and was designed to ensure that participation was both anonymous and voluntary. The target population included women who have recently given birth or are about to give birth. Participants were recruited through Facebook groups and the questionnaire was also promoted via Instagram Stories. Informed consent was obtained from all participants, who were informed of their right to withdraw from the study at any time.

The study protocol was presented to the Bioethics Committee at the Medical University of Wrocław, where it was assessed as not requiring opinion (No Kb_kanc 235/2024)

The analysis of the presented assumptions was evaluated as compliant with ethical principles in science, including the Declaration of Helsinki, and does not violate the rights of the surveyed individuals.

3. Results

A survey was conducted on a group of 668 women from 25 July to 01 August 2024. The average age of the respondents was 30 years, the youngest was 18 years old, and the oldest was 42 years old. A detailed overview of the study population is presented in Table 1.

Table 1. General characteristics of respondents, n (%).

Variable	Category	N (%)
Age (years)	18-26	38 (5.69)
	27-35	468 (70.06)
	Over 35	162 (24.25%)
Number of inhabitants (k)	Village	122 (18.26)
	City up to 50	95 (14.22)
	City between 50-500	164 (24.55)
	City over 500	287 (42.96)
Education	Secondary	71 (10.63)
	Vocational	2 (0.30)

Medical profession	Higher	595 (89.07)
	Yes	147 (22.01)
	No	521 (77.99)

One of the most important objectives of our study was to assess knowledge about RSV infection among women and awareness of its potential implications. Knowledge was evaluated using custom-designed questions, and respondents were divided into those working in medical professions and non-medical professionals. Statistically significant differences between medical and non-medical respondents were observed in only three questions: "What are the methods of treating RSV infection?"; "Do you know the RSV vaccinations in pregnancy?"; and "Do you know how RSV vaccines work?". Detailed data are presented in Table 2.

Table 2. Comparison of medical and non-medical knowledge of RSV, n (%) (Pearson's chi-square test of Independence.

Question	Correct answer	Are you in the medical profession?		FE/ χ^2	Statistics	
		Yes	No		df	p
What is RSV?	Yes	145 (98.64)	511 (98.08)	FE	-	0.921
	No	2 (1.36)	10 (1.92)			
What are the symptoms of RSV infection?	Yes	140 (95.24)	475 (91.17)	$\chi^2 = 2.07$	1	0.150
	No	7 (4.76)	46 (8.83)			
What age groups are most at risk of complications after RSV infection?	Yes	86 (58.50)	334 (64.11)	$\chi^2 = 1.31$	1	0.252
	No	61 (41.50)	187 (35.89)			
What are the ways to prevent RSV infection?	Yes	9 (6.12)	57 (10.94)	$\chi^2 = 2.47$	1	0.116
	No	138 (93.88)	464 (89.06)			
What are the methods of treating RSV infection?	Yes	109 (74.15)	251 (48.18)	$\chi^2 = 30.09$	1	<0.001
	No	38 (25.85)	270 (51.82)			
Do you know what causes RSV infection in newborns and infants?	Yes	127 (86.39)	394 (75.62)	$\chi^2 = 7.13$	1	0.008
	No	20 (13.61)	127 (24.38)			
Do you know the RSV vaccinations in pregnancy?	Yes	118 (80.27)	318 (61.04)	$\chi^2 = 18.71$	1	<0.001
	No	29 (19.73)	203 (38.96)			
Do you know how RSV vaccines work?	Yes	117 (79.59)	267 (51.25)	$\chi^2 = 37.69$	1	<0.001
	No	30 (20.41)	254 (48.75)			

FE - the value of the Fisher exact test statistic, χ^2 - the value of Pearson's chi-square independence test statistic, df – degree of freedom, p - level of statistical significance. Due to multiple comparisons, a Bonferroni correction was applied to $\alpha=0.05$ and $\alpha=0.006$ was used.

We also assessed the rate of vaccination among both women working as medical professionals and those without medical education. (Table 3) The medically educated group was statistically more likely to get vaccinated with the RSV vaccine during pregnancy compared to non-medical professionals.

Table 3. Comparison of RSV vaccination rates between medics and non-medics, n (%) (Pearson's chi-square test of independence).

Question	Answer	Are you in the medical profession?		<i>p</i>
		Yes	No	
Have you been vaccinated against RSV during pregnancy?	Yes	37 (25.17)	67 (12.86)	<i>FFH</i> <0.001
	No	110 (74.83)	448 (85.99)	
	Maybe	0 (0.00)	6 (1.15)	

FFH - the value of the test statistic of the Fisher-Freeman-Hamilton test, *p* - level of statistical significance. $\alpha=0.05$.

Additionally, we examined how often patients were informed by physicians about the possibility of RSV vaccination, and whether patients who received this information from their physicians were statistically more likely to choose vaccination compared to those who did not receive such information. (Table 4)

Table 4. Comparison of RSV vaccination rates in pregnant patients informed about RSV vaccination during pregnancy by their physician and those not informed about RSV vaccination by their physician, n (%) (Pearson's chi-square test of independence).

Question	Answer	Were you informed by your physician about the possibility of RSV vaccination?*		<i>p</i>
		Yes	No	
Have you been vaccinated against RSV during pregnancy?	Yes	64 (25.30)	40 (9.64)	<i>FFH</i> <0.001
	No	188 (74.31)	370 (89.16)	
	Maybe	1 (0.40)	5 (1.20)	

* Where do you get your knowledge about vaccination against RSV (**multiple choice**)? **Yes** - patients who answered 'medical' or who answered 'physician among others; **No** - patients who did not answer 'medic'. *FFH* - the value of the test statistic of the Fisher-Freeman-Hamilton test, *p* - level of statistical significance. $\alpha=0.05$.

We also examined the association between receiving other recommended vaccinations during pregnancy, such as influenza and pertussis vaccines, and the uptake of RSV vaccination. Detailed data are presented in Table 5.

Table 5. Comparison of RSV vaccination rates during pregnancy in patients vaccinated for other infectious diseases in pregnancy and patients not vaccinated for other infectious diseases in pregnancy, n (%) (Pearson's chi-square test of independence).

Question	Answer	Were you vaccinated against other diseases during pregnancy?		<i>p</i>
		Yes	No	
Have you been vaccinated against RSV during pregnancy?	Yes	100 (23.26)	4 (1.68)	<i>FFH</i> <0.001
	No	326 (75.81)	232 (97.48)	
	Maybe	4 (0.93)	2 (0.84)	

FFH - the value of the test statistic of the Fisher-Freeman-Hamilton test, *p* - level of statistical significance. $\alpha=0.05$.

Qualitative variables were expressed as the number of observations (n, %). The assumption of abundance of observations ($n < 5$ in $\leq 20\%$ of cells) was checked for the chi-square test. If the assumption was met, Pearson's chi-square independence test was used. If the assumption was not met the Fisher's exact test for 2 x 2 tables (Statistica, version 13.3.721.1) or the Fisher-Freeman-Halton test was used (R Studio, version 4.3.1). Due to multiple comparisons, a Bonferroni correction was applied to $\alpha=0.05$.

4. Discussion

Respiratory syncytial virus (RSV) is the leading cause of acute lower respiratory tract infections and a major contributor to infant mortality, particularly in children under 6 months of age in low- and middle-income countries.[8,9] In a prospective study conducted by Wildenbeest et al., it was demonstrated that approximately 50% of hospitalizations in children under 1 year of age were caused by RSV infection. Additionally, it is estimated that in low-income countries, over 80% of deaths attributed to RSV occur outside of hospital settings.[8]

Vaccination during pregnancy to confer immunity to the newborn has been known and practised for over 100 years. Historical references can be traced back to the 1870s, specifically regarding smallpox vaccination. Maternal IgG antibodies produced in response to natural infection or active immunization during pregnancy cross the placenta and enter the fetal bloodstream, providing newborns with protection for several months after birth. [10,11] In light of the above, there is often a sense of sadness among authors regarding the low vaccination rates and the doubts that frequently accompany patients.

In recent years, vaccinations during pregnancy have become standard practice and have been integrated into numerous national immunization programs. Recommendations for specific vaccinations may vary between countries due to cultural, infectious, and social factors. For instance, pertussis vaccination is implemented in many low- and middle-income countries, whereas in high-income and some middle-income countries, influenza vaccination has also been included in the recommended schedule. [12]

Maternal vaccination facilitates the transplacental transfer of elevated levels of maternal antibodies, providing infants with immediate protection at birth and throughout the early months of life. [13–15] This approach is employed to safeguard infants against tetanus, pertussis, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and influenza.[16,17] Such a strategy is particularly critical in low- and middle-income countries, where the burden of RSV-associated lower respiratory tract infections is the greatest.[8]

One study evaluated RSV vaccination in pregnant women in Argentina. It was shown that vaccinating 342,110 pregnant women with vaccinated RSVpreF prevented 3915 RSV hospitalizations, 6399 RSV emergency department visits and 67 deaths having to do with RSV infection.¹

Following the guidance of the Centers for Disease Control and Prevention (CDC), which issues recommendations regarding vaccine safety, numerous vaccinations are recommended, with an emphasis on those that are safe during pregnancy and those that are not. The recommended vaccines, which are also endorsed in Poland by the National Institute of Public Health – National Research Institute in collaboration with the Polish Vaccinology Society, include vaccines for influenza, pertussis, COVID-19, and more recently, RSV. [18,19]

Considering that vaccinations are endorsed by leading medical organizations as safe and effective during pregnancy, it is concerning that a significant number of patients do not opt for this procedure.

In reference to a study conducted in 2019 by Wilcox, Christopher R. et al., the most common reason for declining vaccination was fear of side effects for their child. Consequently, the data we have gathered is particularly significant, as it confirms that a lack of knowledge regarding vaccinations among patients contributes to fear and anxiety surrounding them. Their team also demonstrated that healthcare providers often did not feel confident in delivering vaccination information. Fortunately, our study achieved statistically improved results, indicating that medical professionals possess current and better knowledge regarding vaccinations, particularly in the case of RSV.[20] Another factor influencing vaccination rates among pregnant women is ethnicity, the

¹ Rey-Ares L, Averin A, Zuccarino N, Vega CG, Kutrieb E, Quinn E, Atwood M, Weycker D, Law AW. Cost-Effectiveness of Bivalent Respiratory Syncytial Virus Prefusion F (RSVpreF) Vaccine During Pregnancy for Prevention of Respiratory Syncytial Virus Among Infants in Argentina. *Infect Dis Ther*. 2024 Oct 4. doi: 10.1007/s40121-024-01055-5. Epub ahead of print. PMID: 39365506.

ability to receive the vaccine from the recommending healthcare provider, and the number of births. According to a study by McAuslane et al., the vaccination rate for pertussis was significantly lower among women who gave more than three births (48.1%; 95% CI 37.0–59.4) compared to those with up to three. (63.0%; 95% CI 58.3–67.5).[21]

Francesca and her team reached interesting conclusions, demonstrating that 71.8% of healthcare workers advised women about influenza vaccination during pregnancy, and 68.8% recommended a vaccine against influenza during pregnancy. The study population included obstetricians-gynaecologists, midwives, and primary care physicians who provide medical care to pregnant individuals. This aligns with the trend observed in our study regarding RSV vaccination uptake. While a 25% vaccination rate against RSV among pregnant women working in healthcare may seem low, it is statistically higher than that among patients who are not healthcare professionals. The conclusions from Francesca's team, which showed that good knowledge and positive attitudes were the strongest factors positively associated with advising women about influenza vaccination during pregnancy, are consistent with our findings regarding RSV vaccination.[22]

As indicated by U. Nowacka et al., one of the most common reasons for rejecting COVID-19 vaccination was insufficient knowledge about the vaccine. Leveraging the experience gained from introducing SARS-CoV-2 vaccines to the market appears to be crucial. Women with higher levels of education (OR 2.26, $p < 0.0001$), those who received positive feedback about vaccination (OR 2.74, $p = 0.0172$), or were informed about the complications of COVID-19 during pregnancy (OR 2.6, $p < 0.0001$) were most likely to accept the vaccination. Therefore, according to the authors, a strong emphasis on proper education, training, and promotion of these protective measures is necessary. Our study findings confirm the thesis that patients who received information about vaccination from their healthcare providers were more likely to accept it compared to those who obtained knowledge from other sources or lacked it altogether. [23]

Limitations, The Survey Has Limitations Typical of Questionnaires Collected Via the Internet

5. Conclusions

RSV vaccination during pregnancy is one of the key strategies for protecting newborns from infection and severe disease. However, the level of awareness and the percentage of patients receiving the RSV vaccine remains objectively unsatisfactory in Poland. To improve vaccination rates, it is essential to implement educational programs and awareness campaigns targeted at both healthcare professionals and the general population.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data can be obtained individually after contacting mateusz.strozik@student.umw.edu.pl.

Conflicts of Interest: The authors declare no conflicts of interest.

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