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Original Article

Factors associated with adherence to the COVID-19 vaccine in pregnant women*

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Highlights: (1) Maternal vaccination plays a significant role in preventing and combating maternal morbidity. **(2)** Some factors may influence acceptance or hesitancy of the COVID-19 vaccine during pregnancy. **(3)** Safety regarding the effectiveness of vaccination against COVID-19 during pregnancy is a factor associated with adherence to COVID-19 vaccines. **(4)** Postpartum women without access to the internet/TV/radio have 2.56 times the risk of adhering to the COVID-19 vaccination schedule. **(5)** Health education helps to increase the level of knowledge and acceptance of the vaccine by pregnant women.

Objective: to identify factors associated with adherence to the COVID-19 vaccine during pregnancy. **Method**: cross-sectional and analytical study with 348 postpartum women in shared accommodation at the Municipal Maternities of Recife-PE. Data was collected through interviews during the months of June to September 2022. Pearson's Chi-Square or Fisher's Exact tests and the Poisson regression model were applied for statistical analysis. **Results**: 17.2% of pregnant women adhered to the complete vaccination schedule, and adherence was associated with access to the internet/TV/radio (p-value = 0.011), routine prenatal vaccination (p-value = 0.019), safety of the efficacy of the COVID-19 vaccine and partner support (p-value = 0.020). Postpartum women without access to the internet/TV/radio, and who feel confident about the effectiveness of the vaccine, had higher prevalence rates for adhering to COVID-19 vaccination, with PRs of 2.56 and 3.25, respectively. **Conclusion:** there was evidence of low adherence to the vaccination schedule against COVID-19 during the gestational period, considering the number of recommended doses and the interval between them. Therefore, professionals in their clinical practice must make pregnant women aware of the importance of immunization and compliance with the vaccination schedule.

Descriptors: Pregnant Women; Pandemics; SARS-CoV-2; Immunization Programs; COVID-19 Vaccines; Vaccination Coverage.

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Introduction

Coronavirus disease (COVID-19), caused by the etiological agent Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), is a respiratory infection that can cause problems in the respiratory tract, such as Severe Acute Respiratory Syndrome (SARS). It was first reported in the city of Wuhan, China, and declared a pandemic in March 2020[1-2]. Considering the accumulated data on deaths in Brazil, from February 26, 2020 to December 31, 2022 693,853 deaths were reported due to COVID-19, and the accumulated mortality rate was 327.7 *per* 100 thousand inhabitants. In the Northeast Region, mortality was 233.3 deaths/100 thousand inhabitants[3].

Pregnant women are considered a vulnerable population to SARS-CoV-2 infection, and are at a significantly higher risk of serious outcomes compared to non-pregnant women. COVID-19 infection in pregnancy can cause both maternal and fetal complications, including prematurity, increased need for surgical delivery, respiratory distress, fetal distress, coagulopathy accompanied by liver dysfunction, and maternal death. Therefore, pregnant women should be considered key populations in COVID-19 prevention strategies[4-7].

The vaccine is one of the most effective tools for protecting people against COVID-19 and, through Law No. 14,190 of July 29, 2021, pregnant women, postpartum women and breastfeeding women, with or without comorbidity, regardless of the age of the infants, were included as a priority group in the National Vaccination Operationalization Plan against COVID-19[8-9].

Maternal vaccination is capable of preventing and combating maternal and child mortality from various infectious diseases, including COVID-19. Vaccines generate robust humoral immunity in pregnant women, being vital to control the burden of the disease and reduce morbidity in this population. Furthermore, protective immunoglobulins can be delivered to the fetus through the uteroplacental circulation, providing protection against hospitalization related to COVID-19[10-12].

The vaccination schedule against COVID-19 for pregnant and postpartum women corresponds to two doses (dose 1 and dose 2) of Sinovac or Pfizer and a booster dose within six months after completing the primary vaccination schedule[13-14]. Pregnant and postpartum women aged 12 or over are recommended to receive a booster vaccination with the bivalent Pfizer COVID-19 vaccine (Booster) at any gestational age[15].

Although COVID-19 vaccines are safe, effective and recommended by the Ministry of Health and other institutions, some factors may influence the acceptance of the COVID-19 vaccine during pregnancy and, consequently, generate low adherence to the vaccine during a health crisis, in addition to not reaching the goal established by the National Immunization Program of vaccinating at least 90% of each priority group[16-17].

Vaccine hesitancy is understood as the delay in accepting or refusing vaccines, despite the availability of vaccination services. This is a complex global problem that requires continuous monitoring, as it varies over time, location and vaccines. Furthermore, it can be influenced by the individual's cultural context, political and economic factors, personal perception or social context, and previous negative or positive experiences with vaccination and confidence that influence the decision from total acceptance to total refusal[18]. While vaccination adherence is considered the fact of starting vaccination and completing the proposed schedule with the recommended number of doses and the interval between them. Therefore, adherence would not be questioning whether the individual accepts or wishes to receive the vaccine, but rather whether they have actually been vaccinated according to current protocols and, preferably, with proof of vaccination[19].

The main reasons for vaccine refusal or delay by pregnant women cited in previous research are related to concerns about side effects for themselves and the safety of the vaccine during pregnancy; and fear of harm or long-term harmful effects to the fetus. Likewise, the lack of recommendations from health professionals and low knowledge of the importance of vaccines during pregnancy also affect the willingness of pregnant women to receive the COVID-19 vaccine[9,20-22]. It is appropriate for health professionals to implement health education actions with a view to contributing to increasing knowledge about the importance of vaccination in the pregnancy-puerperium period.

In view of the above, knowledge of the factors related to adherence to the COVID-19 vaccine during pregnancy will contribute to the health education process, and so that professionals have a scientific basis for advanced nursing practice based on knowledge of the reasons that favor adherence to vaccination against COVID-19. The study aims to identify factors associated with adherence to the COVID-19 vaccine during pregnancy.

Method

Type of study

This is an observational, cross-sectional and analytical study, based on the guidelines of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[23].

Study location, population and sample

The study was carried out in shared accommodation of three usual risk municipal maternity hospitals located in the city of Recife-PE that provide assistance to women in the pregnancy-puerperium period.

The population was made up of postpartum women who were able to complete the COVID-19 vaccination schedule during the gestational period, including adolescents. The sample was calculated using the sample calculation equation for proportion studies with a finite population. The N of 2,307 pregnant women was considered, which corresponded to the three months of registration, as well as the estimated monthly average of women in the gestational period in the city of Recife in 2021. Vaccination coverage of pregnant and postpartum women with a complete vaccination schedule of the COVID-19 vaccine living in Recife-PE was 61.55% by November 2021[24]. However, an estimated prevalence of 50% was considered for sample calculation purposes, adopting a confidence level of 95%, error of 5%, plus 10% to compensate for possible losses, resulting in 346 women.

The initial sample consisted of 365 postpartum women admitted to shared accommodation, and the convenience criterion was adopted to select the participants. The size of the sample collected was 5.5% larger than the calculated one, so as not to compromise the final sample with probable losses. During collection, 17 losses occurred due to lack of immunization data, which were excluded from this study, with the final sample consisting of 348 women.

Inclusion and exclusion criteria

Postpartum women who were able to complete the COVID-19 vaccination schedule during the gestational period were included. Those who had hearing and/or speech impairment, fetal death or stillbirth, medical diagnosis of postpartum depression, health problems or impairment that prevented them from participating in the research, and a postpartum woman who did not send any proof of vaccination after seven request attempts via WhatsApp application were excluded.

Study variables

The dependent variable was adherence to the COVID-19 vaccination schedule during the gestational period. Adherence to the COVID-19 vaccination schedule is considered to be the complete vaccination schedule for COVID-19 (dose 1 and dose 2) of the Sinovac or Pfizer vaccines, with the recommended interval between doses, and a booster dose within six months after completing the primary vaccination schedule[13-14].

The independent variables included sociodemographic data (age, color/race; religion/belief, education, marital status, paid work, monthly family income, housing, internet/TV/radio access, people over 65 years old in the household and with comorbidities in the residence); maternal data (previous pregnancy, comorbidities, presence of health problems in the current pregnancy and symptoms of COVID-19 during pregnancy); prenatal care data (health unit where prenatal care was provided, number of prenatal consultations, gestational age at the start of prenatal care, professional who provided prenatal care and routine prenatal vaccination); access to information and personal experience related to the COVID-19 vaccine (confidence regarding the effectiveness of vaccination against COVID-19 during pregnancy, guidance on the vaccine to prevent COVID-19 during prenatal consultations, confidence in the guidance received at the prenatal care, reduced risk of hospital admission and complications, concern about the effects of the vaccine, fear of pregnancy complications after COVID-19 vaccination, partner support to take the vaccine, useful means of communication and social networks to clarify doubts about vaccination and the presence of people vaccinated against COVID-19 at home).

Data collection instrument

A validated instrument composed of multiple-choice questions was used to collect data, covering sociodemographic, maternal and prenatal care variables, adherence to the COVID-19 vaccine, access to information and personal experience related to the COVID-19 vaccine.

The collection instrument was validated through a methodological study that included the stages of construction, content validity and semantic analysis. In the construction process, an integrative review study[25] was carried out, which aimed to analyze national and international publications regarding the adherence of pregnant women in the context of pandemics.

Content validity was carried out with six expert judges on the study theme[26] selected through a search on the Lattes Platform of the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq*), using criteria based on the expert classification system of the Fehring model[27].

In the content validity stage, the judges assessed clarity and adequacy of the language for the target audience, degree of pertinence, relevance of presence

and degree of relevance of the item in the instrument, as well as suggestions, if they deemed necessary[28]. To analyze the degree of relevance for each item of the instrument, the Content Validity Index (CVI) was used, which measures the proportion of agreement between judges on certain aspects of an instrument and its items[29].

Semantic analysis was carried out with 10 postpartum women admitted to shared accommodation in one of the low-risk maternity hospitals, in Recife-PE, with the aim of verifying the understanding of the items in the data collection instrument by the population of interest[30]. To assess understanding, an agreement rate of at least 85% was used to maintain the item in the instrument[31]. At the end of this stage, the corrections and suggestions were analyzed to build the final version of the instrument. Those items that were in line with the purpose of the study remained, otherwise, those in which the understanding of the question was not clear were reformulated, with suggestions given by the women themselves.

Data collection and period

Recruitment of participants and data collection took place between June and September 2022, through individual interviews lasting an average of 10 minutes carried out in the shared accommodation environment close to the bed, after ensuring that the place was comfortable and free from external interference.

At the time of collection, documentation such as vaccination or prenatal card was requested to verify the vaccination record. Participants who did not have the aforementioned documents were asked to send a photo or certificate of vaccination against COVID-19 via WhatsApp application.

Data processing and analysis

The data were organized in the Epinfo® program version 3.5.4 with independent double typing and checking for errors and inconsistencies. For the analysis, the statistical software Statistical Package for the Social Sciences (SPSS) version 18.0 for Windows was used. Descriptive statistics with absolute and relative frequency distribution were used to characterize the sample. Subsequently, bivariate analysis was carried out to verify the association of variables with the outcome, using the Chi-square or Fisher's Exact tests in cases where the observed values were null or had expected values lower than five in 20% of the contingency table cells. All conclusions considered a significance level of 5%.

In the multivariate analysis, the Poisson regression model with robust variance was used to investigate the factors associated with adherence to the vaccination schedule. The variables that presented a p value < 0.20 in the bivariate analysis were selected and included in the model. For the factors to remain in the model, a significance level of 5% was considered. The adjusted prevalence ratio (PR) and the respective 95% confidence intervals for each variable were obtained by performing the Wald Test. Finally, the Receiver Operating Characteristic Curve (ROC curve) was generated to evaluate the power of the model in predicting adherence to the protocol by women. Associations with p values < 0.05 were considered significant.

Ethical aspects

This study was approved by the Research Ethics Committee of the *Universidade Federal de Pernambuco* under opinion number 5466201, and complied with the ethical precepts of Resolution 466/12 of the National Health Council of the Ministry of Health.

Women participating in the study were informed about the objective of the research, its relevance, the method for collecting data, the potential risks arising from their participation in the study, and the possibility of leaving the study at any time. Then, before data collection, all participants read and voluntarily signed two copies of the Free and Informed Consent Form (TCLE, for its acronym in Portuguese). In the case of minors under 18 years of age, the participant signed the Free and Informed Assent Term (TALE, for its acronym in Portuguese) together with their legal guardian, who signed the corresponding TCLE.

Results

Of 348 postpartum women, 47.3% (n= 164) were between 19 and 25 years old; 84.2% (n= 293) self-reported brown/black skin color; 95.1% (n= 328) had a religion/belief; 62.6% (n= 218) had completed or incomplete high school; 55.6% (n= 193) were married or in a stable relationship; 71.8% (n= 250) did not have paid work; 61.2% (n= 210) received up to 1 minimum wage at the value in force at the time of collection; 49.9% (n= 173) had their own home; 95.4% (n= 331) with internet/TV/radio access; 33.1% (n= 115) with a history of a previous pregnancy; 94.5% (n= 326) did not have confirmed symptoms of COVID-19 during pregnancy; 80.7% (n= 280) had six or more prenatal consultations; 61.7% (n= 214) started prenatal care with a gestational age of up to 12 weeks; 48.1% (n= 167) received care exclusively from nurses; 83.0% (n= 283) had the routine vaccines in the current vaccination schedule for pregnant women.

When we sought to associate sociodemographic and health care variables with adherence to the vaccination schedule, there was statistical significance in the variables of internet/TV/radio access (p-value = 0.011) and routine prenatal vaccination (p-value = 0.019).

In Table 1, it can be seen that the majority of postpartum women took the vaccine to prevent COVID-19, however, only 17.2% adhered to vaccination during the gestational period, according to the national protocol in force in the country.

Table 1 - COVID-19 vaccine adherence profile of postpartum women admitted to shared accommodation in usual risk maternity hospitals (n= 348). Recife, PE, Brazil, 2022

Variables	n	%	p-value*
Application of the COVID-19 vaccine			
Yes	331	95.1	<0.001
No	17	4.9	
Start of the vaccination schedule			
Before pregnancy	281	80.7	
During pregnancy	50	14.4	<0.001
Not applicable	17	4.9	
Type of vaccine administered during pregnancy			
Pfizer	209	60.1	
Sinovac	40	11.5	
Pfizer and Sinovac	13	3.7	<0.001
Others	10	2.9	
Not applicable	76	21.8	
Number of doses recorded on the vaccination card†			
1st dose	29	8.8	
2nd dose	145	43.8	-
3rd dose (booster)	152	45.9	
4th dose (2nd booster)	5	1.5	
Postpartum women with a primary regimen able to receive the booster dose†			
Yes	115	80.4	<0.001
No	28	19.6	
Difficulty scheduling the vaccine†			
Yes	13	3.8	<0.001
No	333	96.2	
Difficulty accessing the vaccine†			
Yes	22	6.4	<0.001
No	324	93.6	
Adherence to the COVID-19 vaccination schedule			
Yes	61	17.5	<0.001
No	287	82.5	
Reason for non-adhesion			
Insufficient number of doses	174	60.7	
Interval higher than recommended	96	33.4	-
Did not take any doses	17	5.9	

*p-value of the Chi-square test for proportion comparison; †Number of observations is smaller than the sample size, as some participants did not respond to the evaluated item

Table 2 reveals the association of the variables of access to information and personal experience related to the COVID-19 vaccine with adherence to the vaccination schedule, with significance for: safety in relation to the effectiveness of vaccination against COVID-19 during pregnancy and provision of partner support to take the vaccine, with p values < 0.001 and 0.020, respectively.

Table 2 - Adherence to the vaccination schedule against COVID-19 during the gestational period according to the profile of access to information and personal experience related to the COVID-19 vaccine of women hospitalized in shared accommodation in usual risk maternity hospitals (n= 348). Recife, PE, Brazil, 2022

Variables of access to information and personal experience	Adherence to the vaccination schedule		p-value
	YES	NO	
Safety regarding the effectiveness of vaccination against COVID-19 during pregnancy			
Yes	54(22.2%)	189(77.8%)	**<0.001***
No	7(6.7%)	98(93.3%)	
Guidance on the vaccine to prevent COVID-19 during prenatal consultations			
Yes	46(18.9%)	197(81.1%)	0.296*
No	15(14.3%)	90(85.7%)	
Confidence in the guidance received during prenatal care			
Yes	19(19.0%)	81(81.0%)	1.000†
No	4(18.2%)	18(81.8%)	
Vaccination reduces the risk of hospital admission/complications‡			
Yes	55(19.4%)	229(80.6%)	0.063*
No	6(9.5%)	57(90.5%)	
Concern about the occurrence of a reaction or adverse effects from the vaccine‡			
Yes	30(16.1%)	156(83.9%)	0.430*
No	31(19.4%)	129(80.6%)	
Fear of pregnancy complications after the COVID-19 vaccine			
Yes	15(12.9%)	101(87.1%)	0.093*
No	46(20.3%)	181(79.7%)	
Partner support to take the vaccine‡			
Yes	48(21.0%)	181(79.0%)	**0.020***
No	11(10.5%)	94(89.5%)	
Useful media and social networks to clarify doubts about vaccination			
Yes	49(17.9%)	225(82.1%)	0.738*
No	12(16.2%)	62(83.8%)	
Presence of people vaccinated against COVID-19 at home			
Yes, all	49(18.4%)	218(81.6%)	0.929†
Yes, most	9(15.5%)	49(84.5%)	
Yes, few	2(12.5%)	14(87.5%)	
No	1(14.3%)	6(85.7%)	

*p-value of the Chi-square test for independence; †p-value of Fisher's Exact test; ‡Number of observations is smaller than the sample size, as some participants did not respond to the evaluated item

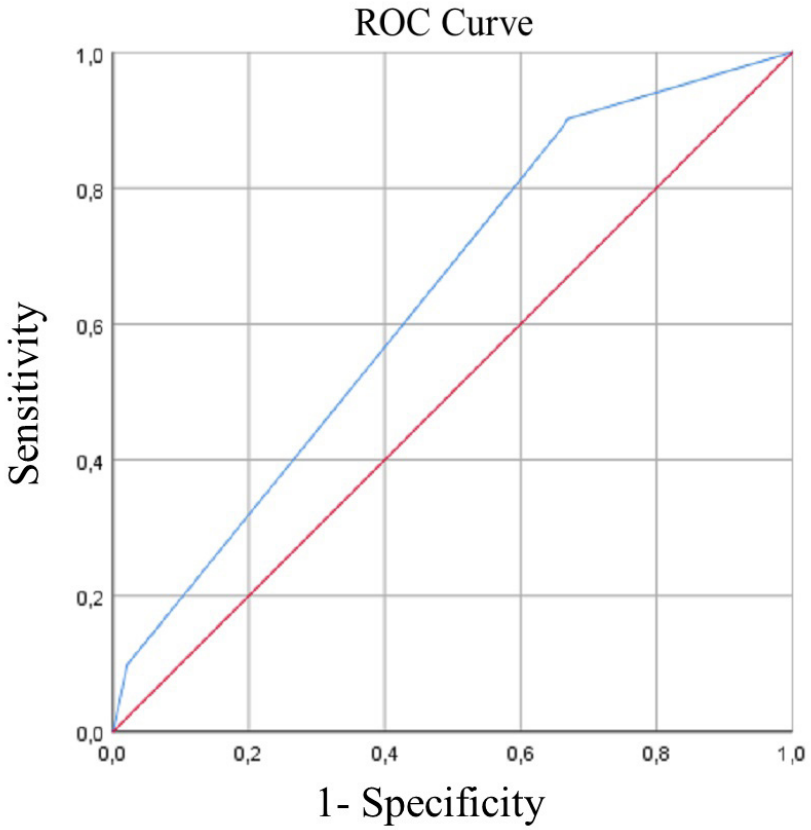
Table 3 presents the adjusted prevalence ratios for adherence to the COVID-19 vaccination schedule during the gestational period. It is verified that the group of postpartum women without access to the internet/TV/radio presents a prevalence ratio (PR) equal to 2.56 for adherence to vaccination. Furthermore, the safety in relation to the effectiveness of vaccination against COVID-19 during pregnancy has RP = 3.25 for adherence to vaccination.

Figure 1 shows the Receiver Operating Characteristic Curve (ROC curve) for adjusting the proposed model, and presents an area of 0.639, indicating good predictive power of the model for the study outcome.

Table 3 - Adjustment of the Poisson multivariate model for adherence to the COVID-19 vaccination schedule during pregnancy. Recife, PE, Brazil, 2022

Variables	PR*	CI†(95%)	p-value‡
Access to the internet, TV, radio			
Yes	1.00		
No	2.56	1.41 – 4.66	0.002
Safety regarding the effectiveness of vaccination against COVID-19 during pregnancy			
Yes	3.25	1.54 – 6.86	0.002
No	1.00		

*PR = Prevalence ratio; †CI = Confidence interval; ‡p-value of the Wald test



Prepared using SPSS Statistic software

*Receiver Operating Characteristic Curve; †CI = Confidence interval

Figure 1 - ROC Curve* for estimating adherence to the COVID-19 vaccination schedule during pregnancy (Area = 0.639, p-value = 0.001, CI† (95%)=[0.567;0.711])

Discussion

The data showed that study participants presented low adherence to the COVID-19 vaccination schedule during the gestational period, considering that pregnant women must receive the complete COVID-19 vaccination schedule (first dose and second dose) of Sinovac or Pfizer with the recommended interval according to the vaccine manufacturer, and must receive a single booster dose within six months after completing the primary vaccination

schedule[13-14]. The low vaccination adherence shown is due to the insufficient number of doses, as well as the longer than recommended interval between doses.

The National Vaccination Operationalization Plan against COVID-19 highlights the importance of carrying out the complete scheme, respecting the recommended intervals to achieve the vaccine's potential, as the predicted immunological response against the SARS-CoV-2 virus takes into account the interval deadlines recommended by each laboratory[17].

Regarding the adherence profile, it was observed that the majority of postpartum women did not have the COVID-19 vaccine schedule of two doses and a booster dose, which is worrying, as research shows the emergence of new variants of the coronavirus and the importance of protecting the primary vaccine schedule. A retrospective cohort found a cumulative incidence of symptomatic infection by new variants of the coronavirus of 2.4% (95% CI, 2.3-2.5) in participants who received the vaccine booster, while participants who received only the vaccine two-dose primary regimen had an estimated symptomatic infection of 4.5% (95% CI, 4.3 - 4.6)[32].

As for women who adhered to the COVID-19 vaccination, they reported that the main reasons for receiving the vaccine were maternal/personal protection, followed by the benefits for the baby. Self-protection is identified as the main reason for accepting the vaccine, and pregnant women who agree with the benefit of vaccination for the fetus showed greater acceptance of the COVID-19 vaccine (78.7%) than those who did not agree (57.0%, $p < 0.01$)[22,33].

A study that evaluated the frequency and characteristics associated with vaccine hesitancy among pregnant and postpartum women found that having received or planned to receive the vaccine against diphtheria, tetanus and pertussis (DTaP) during pregnancy (OR 0.17; 95% CI 0.09– 0.27), and having received the seasonal flu vaccine in the current (OR 0.18; 95% CI 0.11–0.28) or previous year (OR 0.22; 95% CI 0.13–0. 36), were factors associated with lower chances of vaccine hesitancy against COVID-19[34].

In this study, the association of the variables of access to information and personal experience related to the COVID-19 vaccine with adherence to the vaccination schedule revealed significant statistical associations with safety in relation to the effectiveness of vaccination against COVID-19 during pregnancy and partner support to take the vaccine.

Another study corroborates this result, reaffirming that confidence in the effectiveness of the vaccine by pregnant women and the presence of a partner who encourages vaccination against COVID-19 are factors associated with acceptance of vaccination against COVID-19 during pregnancy[35]. The participation of the partner in the pregnancy-puerperium cycle since prenatal care contributes to shared decision-making between the couple and has positive effects on the pregnant woman's attitudes towards vaccination, as the partner who participates in prenatal consultations will have the opportunity to discuss the subject with the health professional and learn about the maternal and fetal benefits[36-37].

A relevant point in this study regarding adherence to the COVID-19 vaccine was the safety reported concerning the effectiveness of vaccination against COVID-19 during pregnancy and when there was no access to the internet/TV/radio. The Receiver Operating Characteristic Curve (ROC curve) revealed that the model provides good predictive power for the outcome, and it can be stated that these factors had a strong association with adherence.

Confidence in vaccine safety is a significant predictor of vaccine acceptance[33]. An American study revealed that vaccine acceptance was 2-3 times more likely among pregnant women who reported believing in the safety of COVID-19 vaccines during pregnancy[21]. Women's knowledge of vaccine effectiveness can be a tool capable of providing greater vaccination coverage. Therefore, health professionals need to reinforce guidance on vaccine safety in prenatal consultations, and transmit reliable, enlightening information based on scientific evidence to empower women in decision-making for vaccination[38].

People with more access to mass media, including social media, are more exposed to misinformation about vaccination against COVID-19. This negatively interferes with complete adherence to the vaccine during the gestational period, as when pregnant women are subjected to misleading information, their fears regarding immunization increase, in addition to having concerns about the effects of vaccines on maternal and fetal health[39-40].

During the pandemic, the production of fake news about vaccines and the belief that vaccines were not sufficiently studied, given the rapid time of their development, as well as political-ideological factors, influenced social opinions about the need for immunization and women's decision to take available vaccines against COVID-19 during pregnancy[41-42].

The dissemination of false news on social media, known as fake news, attacks the credibility of vaccines. Phrases such as: "the vaccine is deadly", "these doses have already killed thousands of people", "the COVID-19 vaccine alters genetics", "the vaccine is not safe", among others, are widely shared on social media and via messaging apps. This dissemination of unfounded and appealing information, together with the anti-vaccine

movement, contributes to the reappearance of infectious diseases, such as measles and whooping cough, and has become a public health problem[43].

In view of this, vaccination literacy is important, especially the ability to communicate and critically analyze information, in order to differentiate reliable sources from misleading information, and thus minimize concerns about the possible long-term adverse effects of vaccines, and doubts about their efficacy and safety[44]. Furthermore, there is a need for quality educational programs to prevent the spread of fake news and improve pregnant women's knowledge and awareness about immunization against COVID-19[45].

Social media has become a powerful information communication and advertising tool, allowing published content to reach several different audiences. Therefore, public authorities and official media outlets of the Ministry of Health must take advantage of this and use media and social networks as an efficient means of communication in disseminating reliable information and effectively combating fake news[42,45].

Furthermore, health education through mass media is a key component in providing health recommendations and increasing health literacy among the general population, contributing to expanding the level of knowledge and adherence to vaccines by pregnant women[41].

Likewise, health professionals should emphasize to pregnant women the need to verify the information received before sharing it with others, and familiarize themselves with Ministry of Health and fact-checking websites[46].

Besides, information based on scientific evidence provided by health professionals about the safety and effectiveness of the COVID-19 vaccine significantly increases the level of confidence and awareness about the vaccine during pregnancy, in addition to helping women in their decision-making process to be vaccinated in a conscious and informed way[47].

Finally, knowing the factors that determine adherence to the vaccine, as well as understanding the reasons for the acceptance of vaccines by the pregnant public, is important for the development of health policies that promote vaccination, and for the development of communication strategies aimed at population to explain the importance of immunization and for health education to occur with correct and safe information[48].

Accordingly, the study has relevant implications for health, as it provides results that emphasize good practices in improving vaccination adherence among pregnant women, beyond pandemic situations.

The limitation of the study concerns the possibility of not generalizing the data at a national level, as it is a regional study. However, the results obtained show similarities with national and international publications in the situational context of adherence to vaccines against COVID-19 during pregnancy.

Conclusion

There was evidence of low adherence to the vaccination schedule against COVID-19 during the gestational period, considering the number of recommended doses and the interval between them. Therefore, professionals in their clinical practice must make pregnant women aware of the importance of immunization and compliance with the vaccination schedule.

Routine prenatal vaccination, access to the internet/TV/radio, safety regarding the effectiveness of the vaccine against COVID-19 and partner support are factors associated with adherence to the COVID-19 vaccination schedule during pregnancy.

It is noteworthy that nurses' participation in prenatal care based on good practices and scientific evidence can help pregnant women feel safe regarding vaccination and adhere to the vaccination schedule.

Health education practices are recommended as a strategy for increasing adherence to the COVID-19 vaccine during pregnancy, as they can increase knowledge and awareness among pregnant women about the benefits of vaccination.

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