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Vaccination knowledge and acceptability among pregnant women in Italy

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ABSTRACT

The aims of this survey were to ascertain pregnant women's level of knowledge and acceptability on the vaccinations and to identify their associations with several characteristics. A cross-sectional study was performed from December 2017 through March 2018 in the geographic area of Naples, Italy. The study used two stages cluster sampling method for selection and recruitment of participants. Data were collected through face-to-face interviews with pregnant women present at the Obstetrics outpatient clinic of the selected hospitals. A total of 358 respondents agreed to be interviewed out of the 405 pregnant women selected. One-fourth knew at least one of the vaccinations recommended during pregnancy and only 2.8% correctly identified all of these. Women who had received information about the vaccinations during pregnancy from general practitioners or gynecologists or other sources and those with at least one child were more likely to know at least one of the recommended vaccinations, whereas women with middle school education were less knowledgeable. None of the women had received tetanus, diphtheria, and acellular pertussis vaccine and only 1.4% the seasonal influenza vaccination. Only 27.9% reported a positive willingness to receive all the recommended vaccinations during pregnancy. Pregnant women would be willing to get all recommended vaccinations if they had at least one child and if they needed additional information, whereas the willingness was significantly lower among women who had reported high school as the highest level of education, who were in the second trimester of pregnancy, and who felt that the recommended vaccines administered during pregnancy were less dangerous for them and for the unborn child. This study suggests important focus points to be taking into account for informing and for implementing education activities on the benefits regarding vaccinations in order to increase the level of knowledge and the uptake in pregnant women.

Introduction

It is well known that infections during pregnancy have been linked to an increased risk of serious illness in the mothers, adverse infant outcomes, longer hospitalization periods, and higher mortality rate.

Over the past decades, extensive and increasing attention has been paid to maternal immunization and observational studies have documented that the administration of vaccines during pregnancy is a safe and highly effective public health strategy not only for the woman but also for the developing fetus and young infant.[1–4] Thus, maternal recommended immunization programs have been established in several countries. In Italy, according to the World Health Organization,[5] the Ministry of Health currently state that women should routinely receive tetanus, diphtheria, and acellular pertussis (Tdap) vaccine between the 27th and the 36th week of every pregnancy, regardless of prior Tdap history, and influenza vaccine at any stage. However, despite compelling evidence supporting the vaccinations and the recommendations, the rates of coverage among pregnant women remain consistently very low.[6,7]

The success of a vaccination program may also depend on the knowledge and awareness of the usefulness of vaccines to those who are at risk, because a lack of information and fear of vaccination may result in a lower rate in this population. Therefore, it is extremely important for expectant mothers to have a knowledge of vaccines and their related preventable diseases, and to learn their attitudes, their experiences, and the concerns or barriers that may affect their decisions. Several studies have been conducted to determine vaccination knowledge and acceptability among this group,[8–13] but to the best of our knowledge little literature is currently available in Italy.[14–16] Therefore, since information regarding this public health issue is strongly needed, the aims of the present large survey conducted in Italy were to ascertain pregnant women's level of knowledge and acceptability of vaccinations and to identify their associations with several characteristics.

Results

Characteristics of pregnant women

A total of 358 pregnant women agreed to be interviewed out of the 405 approached to take part in the survey, yielding an overall participation rate of 88.4%. The main demographic and general characteristics of the study participants are presented in

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Table 1. Basic characteristics of the sample of pregnant women.

Characteristics	Total n = 358	
	n	%
Age (years)	31 ± 5.7 (18-44)*	
Regional origin		
Italy	310	86.6
Eastern Europe	22	6.1
Asia	18	5
Africa	8	2.3
Educational level		
None or primary school	30	8.4
Middle school	148	41.3
High school	129	36.1
College degree or higher	51	14.2
Marital status		
Married/Cohabitant	325	90.8
Other	33	9.2
Previous pregnancies		
No	151	42.2
Yes	207	57.8
Number of children		
0	163	45.5
1	129	36
>1	66	18.5
Employment status		
Unemployed	229	64
Employed	129	36
Herself or husband/cohabitant who is a healthcare professional		
No	346	96.7
Yes	12	3.3
Week of pregnancy	25.4 ± 10.9 (4-41)*	
Self-rated health status	7.5 ± 2 (1-10)*	

*Mean ± standard deviation (range).

Table 1. The average age of the women was 31 years, a large majority were Italians (86.6%) and married or living as married (90.8%), one third had a high school level of education, 42.2% were pregnant for the first time, and the average gestational age was 25.4 weeks.

Pregnant women's knowledge of vaccinations

A very low number of the respondents were aware of the vaccinations recommended during pregnancy since only 4.5% identified the diphtheria, 7% the tetanus, 7.3% the pertussis, and 21% the seasonal influenza vaccine. Overall, one-fourth (23.7%) knew at least one of those recommended and only 2.8% correctly identified all four vaccinations. In the adjusted multivariate logistic regression model including the variables with a $p < 0.25$ in the univariate analysis, a total of four variables were found to be associated with the knowledge of at least one of the recommended vaccinations during pregnancy. The results of the analysis showed that pregnant women who had received information about the vaccinations during pregnancy from general practitioners or gynecologists or any other source were respectively 8.5 (95% CI 3.61-19.98) and 15.3 (95% CI 3.84-60.97) times more likely to know at least one of the recommended vaccinations. In addition, respondents with at least one child were 2.5 (95% CI 1.23-4.9) times more likely to have this knowledge, whereas women with middle school level of education were less knowledgeable than those with a baccalaureate/

graduate degree (OR = 0.34; 95% CI = 0.14-0.8) (Model 1 in Table 2).

Pregnant women's attitudes toward vaccinations

There was a high perception among the respondents regarding the risk for them and for the unborn child to contract a vaccine-preventable infectious disease during pregnancy with a mean value of 7.7 and 8.4 out of a maximum score of 10, respectively. However, 23.7% of the interviewed women stated that they felt the recommended vaccines during pregnancy were very dangerous for them and for the unborn child, with an average value of the dangerousness' perception of 6.6 and 7.2 of a maximum score of 10, respectively. The multivariate logistic regression analysis showed that women with none or only primary school level of education (OR = 7.07; 95% CI = 1.93-25.86), with at least one child (OR = 1.98; 95% CI = 1.14-3.44), and those who did not know any of the recommended vaccinations during pregnancy (OR = 0.34; 95% CI = 0.15-0.76) were more likely to feel that the recommended vaccines during pregnancy were very dangerous for the women and for the unborn child (Model 2 in Table 2).

None of the 175 women between the 27th and the 36th week of pregnancy had received the Tdap vaccine and only 1.4% of the whole sample had received the seasonal influenza vaccination. Among those who have never been vaccinated or did not receive a booster dose, or with unknown history of immunization, their willingness to receive the vaccinations was respectively 29.8% for diphtheria, 30.1% for pertussis, 31.2% for tetanus, and 32.3% for influenza. Only 27.9% of the whole sample reported a positive willingness to receive all the recommended vaccinations during pregnancy, 28.4% of Italian and 25% of immigrant women fell into this category. A multivariate logistic regression determined the factors statistically significantly factors that influenced the positive beliefs of the pregnant woman about the willingness for getting all recommended vaccinations. Pregnant women would be willing to get all the recommended vaccinations if they had at least one child (OR = 1.87; 95% CI = 1.02-3.41) and if they needed additional information about vaccinations (OR = 1.8; 95% CI = 1.06-3.06), whereas the willingness was significantly lower among those who had reported high school as the highest level of education (OR = 0.45; 95% CI = 0.22-0.95), who were in the second trimester (OR = 0.51; 95% CI = 0.27-0.92), and who felt that the recommended vaccines administered during pregnancy were less dangerous for them and for the unborn child (OR = 0.36; 95% CI = 0.17-0.95) (Model 3 in Table 2).

Sources of information

Only 13.4% of women had received information about the importance of vaccination during pregnancy and when asking about their preferred sources used, general practitioners or gynecologists were the sources of advice indicated by the highest proportion of respondents (70.8%), while 43.8% preferred the Internet, and 18.8% relied on the mass media. Finally, more than half (57.5%) of the women indicated that they feel the need to receive additional information about vaccinations during pregnancy.

Table 2 . Multivariate logistic regression analyses indicating associations between independent variables and the different outcomes.

Variable	OR	SE	95% CI	p value
Model 1. Knowledge of at least one vaccination among those recommended during pregnancy (sample size = 358)				
Log likelihood = −158.78 χ^2 = 74.87 (8 df), $p < 0.0001$				
Sources of information about vaccinations during pregnancy				
None	1*			
General practitioners or gynecologists	8.5	3.7	3.61-19.98	<0.0001
Others	15.32	10.79	3.84-60.97	<0.0001
Number of children				
0	1*			
≥1	2.46	0.86	1.23-4.9	0.01
Educational level				
College degree or higher	1*			
Middle school	0.34	0.15	0.14-0.8	0.014
High school	0.54	0.22	0.24-1.22	0.14
None or primary school	0.38	0.25	0.09-1.44	0.15
Italian nationality	2.8	1.53	0.95-8.19	0.06
Need of additional information about vaccinations during pregnancy	1.75	0.53	0.95-3.2	0.07
Model 2. Perception that the recommended vaccines administered during pregnancy are very dangerous for the woman and for the unborn child (sample size = 354)				
Log likelihood = -175.46 χ^2 = 34.65 (6 df), $p<0.0001$				
Educational level				
College degree or higher	1*			
None or primary school	7.07	4.67	1.93-25.86	0.003
Middle school	2.71	1.57	0.87-8.44	0.09
High school	2.01	1.16	0.64-6.27	0.23
Who did not know any of the recommended vaccinations during pregnancy	0.34	0.13	0.15-0.76	0.008
Number of children				
0	1*			
≥ 1	1.98	0.55	1.14-3.44	0.015
Younger age	0.96	0.02	0.91-1.01	0.098
Model 3. Positive willingness to receive all the recommended vaccinations during pregnancy (sample size = 348)				
Log likelihood = −189.85, χ^2 = 37.73 (10 df), $p<0.0001$				
Feel less dangerous the administration of the recommended vaccines during pregnancy for themselves and for the unborn child	0.36	0.13	0.17-0.75	0.006
Trimester of pregnancy				
Third	1*			
Second	0.51	0.15	0.27-0.92	0.026
First	0.71	0.25	0.35-1.44	0.34
Need of additional information about vaccinations during pregnancy	1.8	0.48	1.06-3.06	0.028
Educational level				
College degree or higher	1*			
High school	0.45	0.17	0.22-0.95	0.036
None or primary school	0.43	0.26	0.12-1.45	0.17
Middle school	0.7	0.26	0.34-1.45	0.34
Number of children				
0	1*			
≥1	1.87	0.57	1.02-3.41	0.043
Married	2.24	1.16	0.81-6.23	0.12
Perceive that it is dangerous for the unborn child if the woman contract the infectious disease during pregnancy	1.08	0.07	0.95-1.24	0.21

*Reference category.

Discussion

This study offered insight into pregnant women's knowledge and acceptability regarding recommended vaccinations and it identified the associated key variables and can inform efforts to expand vaccination programs.

Furthermore, this study found considerable gaps in the level of knowledge related to vaccination in this high-risk population since only one-fourth knew at least one of those recommended with values ranging from 4.5% for diphtheria to 21% for seasonal influenza and only 2.8% correctly identified all four vaccinations. These values were considerably lower compared to similar previous studies on women recruited in the immediate postpartum period or during pregnancy. Indeed, in the United States, 83% knew the vaccines recommended, specifically 77% influenza, 61.4% pertussis, and 22.5% tetanus.[10] In a survey conducted by some of us in the same geographic area, 23.9% identified the influenza,[16] and in Saudi Arabia 19% knew that all pregnant women should get flu vaccine.[13] The level of knowledge depends on a complex interaction of factors, but the results of the multivariate logistic regression revealed that the sources of information appear to have a significant role. It is concerning that only 13.4% had received information about vaccinations. It is very interesting to note that the vast majority of the women considered physicians an important source of information, since they were the most frequently consulted

source. These professionals are in the best position to answer questions and they have the responsibility of discussing and recommending vaccinations to pregnant women. This is supported by the results that receiving information from physicians or other sources was positively associated with a higher level of knowledge. Pregnant women without this knowledge were more likely to feel that the recommended vaccines administered during pregnancy were very dangerous for them and for the unborn child. On the basis of the widespread lack of knowledge, this study highlights that strategies are needed to promote vaccination to this group, especially by physicians because they might rely on them for guidance. Moreover, physicians also have the opportunity to reduce the costs of healthcare by educating the public to complete certain health and wellness activities.

With respect to vaccination coverage, it is not encouraging that only 1.4% of the participants reported having obtained one of the recommended vaccinations, and none had received all four vaccinations, although the Italian National Immunization Plan recommend vaccinations against tetanus, diphtheria, pertussis, and seasonal influenza to pregnant women.[17] These findings concur with the results from previous studies with levels of coverage for pertussis ranging from 1.7% in Italy[14] to 64% in Belgium,[18] whereas for influenza it is from 4% in Thailand[11] to 45% in Belgium.[18] Regarding the vaccination acceptability, it is also very concerning that the sampled women had generally a non-positive attitude and, not surprisingly, only 27.9% of those unvaccinated were likely to have all four recommended vaccinations with a frequency ranging from 29.8% for diphtheria to 32.3% for influenza. In the already mentioned Italian surveys, 21% pregnant women expressed their willingness to get vaccinated for pertussis[14] and for influenza.[16] Studies in other countries reported that the values of those who would get vaccine against influenza ranging from 34.5% in the United States[8] to 76.3% in China,[19] whereas against pertussis a value of 89% has been observed in Canada.[12] Vaccination acceptability in the present study was significantly influenced by the negative beliefs about the safety of the vaccinations, since this willingness was significantly lower among the pregnant women who felt that the recommended vaccines administered during pregnancy were very dangerous for them and for their unborn child. The fact that when answering questions about their attitude the large majority of respondents gave a negative answer is not surprising. After all, a vast majority of women might only have heard of vaccinations during pregnancy for the first time from the questionnaire in this study, which may well explain the fact that they were worried about the consequences and of accepting them. The finding that willingness to receive all vaccinations was significantly associated with the need for additional information supports this. This survey also converged with several previous studies in finding that different groups of the population expressed trust in the health care workers and that their recommendations have been shown to be strongly positively associated with knowledge, acceptability, and uptake of vaccinations.[16,18,20–27]

The hypothesis that the knowledge of at least one recommended vaccination during pregnancy, the risk-perception of the vaccines for the women and for the unborn child, and the willingness to receive all the recommended vaccinations during pregnancy were associated with socio-demographic factors was partly confirmed in the final multivariate logistic regression models. Understanding the key characteristics associated with the outcomes of interest could be used in tailored intervention programs. Educational level was one of the strongest predictors with women having a low level of education being more likely to have a poor knowledge, high risk-perception, and less willingness to be vaccinated. This could be explained by the fact that having a high education level might facilitate a pregnant woman's communication with physicians and greater accessibility to different sources and capacity to understand and interpret this information. The findings on the effect of education are in line with those reported in previous work.[16,23,28–31] Furthermore, another remarkable finding was related to the number of children. Women with lower number of children had a poor knowledge, higher risk-perception, and less willingness to be vaccinated. The contribution of this variable was in agreement with other studies[32–35] and might be explained by the fact that women who had at least one child may have understood the importance of vaccination and, although inappropriately perceived a risk, they were willing to vaccinate in the future. Finally, not surprisingly, Italian respondents had higher knowledge and this association, although not significant, is coherent with a previous finding in the same geographic area on seasonal influenza.[16] The observed finding may be explained by the concern that non-Italian pregnant women may have more difficulty to integrate in the new society and to access to health care facilities. A study in Southern Italy showed that adherence to cervical and breast cancer screening was much lower in immigrant women than in the native Italian population and one-third participated in prepartum course, although the access is free.[36]

There are a number of limitations to the findings of the present survey that should be interpreted and used with caution. First, the cross-sectional design precludes the ability to examine whether there is a temporal and causal inference between the different characteristics and the outcomes of interest. Second, the study sample was limited to a single large geographic area, raising concerns about the generalizability of the study findings to the Italy's population that should be treated with caution. Third, the results were based on self-reported information and we were unable to confirm the data with medical or immunization records. As in all studies using this methodology, there is a risk of participant over- or under-reporting the frequency and recall bias, although we consider that there is compelling reason to consider this as a small risk. Despite these limitations, a key strength of this study is that is the first to report the knowledge and acceptability regarding all recommended vaccinations in the pregnant population in Italy.

In summary, this study offers a unique view of the knowledge, attitudes, and practice related to vaccinations in pregnant women and suggests important focus points to be taken into account for informing and for implementing education activities on the benefits regarding vaccinations in order to increase the level of knowledge and the uptake in pregnant women.

Materials and methods

Study setting and sample

This was a cross-sectional observational study performed from December 2017 through March 2018 in the geographic area of Naples, Italy. The study used two stages cluster sampling method for selection and recruitment of participants. In the first stage, from the list of 29 public and teaching hospitals in the area, four public and one teaching hospitals have been randomly selected. In the second stage, a simple random sample of pregnant women visiting Obstetrics outpatient clinic was selected in each sampled cluster, until the required sample size was achieved. A total of 405 pregnant women were approached to participate in the survey. Sample size was calculated with the following assumptions: proportion of women with a positive attitude towards willingness to be vaccinated during the pregnancy of 25%, confidence interval of 95%, and error of 5%. The minimum sample size was calculated to be 289 participants, but considering a nonresponse rate of 10%, it was estimated that was needed to recruit 321 pregnant women.

Procedure

Before starting the study, a letter was delivered to the Health Director of the selected hospital asking for permission to carry out the survey, explaining the purpose and the non-compulsory nature of the study, and clarifying that anonymity and confidentiality of patients' data were guaranteed. Following the approval of the hospitals, researchers approached the pregnant women present at the outpatient clinics while waiting for their clinic appointment and were invited to participate in the study. Before the interview, those who expressed interest were informed about the aims of the study, the process of the interview, that they could withdraw from the study at any time without prejudice, and that the research team would keep all information strictly confidential. Data were collected through face-to-face interviews with pregnant women in a private room in the hospital and lasted about twenty minutes. Three investigators trained in data collection, with graduate level education in medicine, conducted the interviews. Participation was voluntary, and participants did not receive any form of payment or incentives for taking part in this study. Verbal informed consent, reflecting the anonymous nature of the study, was obtained from all participants before the start of the study and performing the interview was taken as documentation and evidence of a woman's consent to participate.

Survey instrument

The survey instrument, which was developed by the research team based on a previously published questionnaire,[16] consisted of four parts. The first part of the questionnaire asked about patients' personal (year of birth, nationality, marital status, educational level, employment status, number of children, husband's/partner's employment status) and pregnancy characteristics (number of pregnancies, parity, week of pregnancy, self-reported health status). The second part asked patients' general knowledge of the availability as well as the recommended vaccination for pregnant women. The third part examined patients' attitudes and perceptions about diseases severity for them and for the unborn child and safety of recommended vaccines during pregnancy. Moreover, they were asked whether or not they had received the recommended vaccinations during pregnancy. The fourth part asked whether they received information about vaccinations in pregnancy and whether they needed to receive additional information. The survey included open-ended and categorical responses, 10-points Likert scale with higher values corresponding to a stronger attitude, and selection from a list. Before starting the survey, the questionnaire was piloted for comprehensibility of questions and answers and for flow in 20 pregnant women in the same area and was revised accordingly.

The study protocol, along with the consent process, was approved by the Ethics Committee of the Teaching Hospital of the University of Campania "Luigi Vanvitelli".

Statistical analysis

The software Stata version 10.1 was used for statistical analyses.[37] The first level of analysis comprised the descriptive statistics of the principal characteristics of the sample. The second level of analysis has been completed in two stages. Firstly, a bivariate analysis was carried out to explore the association between each independent variable and the different outcomes of interest using chi-square test for the categorical variables and Student's t-test for the continuous variables. All independent variables found to be associated at p value less than 0.25 during the bivariate analyses were entered in the multivariable logistic regression for modeling. Secondly, multivariate logistic regression models were constructed to identify factors significantly and independently associated with the following binary outcome variables: knowledge of at least one recommended vaccination during pregnancy (Model 1), perception that the recommended vaccines administered during pregnancy are very dangerous for the woman and for the unborn child (Model 2), and positive willingness to receive all the recommended vaccinations during pregnancy (Model 3). The outcomes have been dichotomized into: in Model 1, respondents who correctly identified at least one recommended vaccination during pregnancy versus the others; in Model 2, respondents who answered "10" to both questions assessing the perception that the recommended vaccines administered during pregnancy were very dangerous for the woman and for the unborn child versus the others; in Model 3, the unvaccinated respondents with a positive willingness to receive all the recommended vaccinations during pregnancy versus the others. The following characteristics of each respondent were included in all models: age (continuous, in years), nationality (Italian = 0; other = 1), herself or husband/cohabitant who is a healthcare professional (no = 0; yes = 1), marital status (single/separated/divorced/widowed = 0; married/cohabitant = 1), highest level of education (four categories: none or primary school = 1; middle school = 2; high school = 3; college degree or higher = 4), number of children (none = 0; one or more = 1), suffering of at least one chronic disease (no = 0; yes = 1), self-rated health status (continuous), week of gestation (<13 = 1; 13–24 = 2; >24 = 3), sources of information about vaccinations during pregnancy (none = 1; general practitioner or gynecologist = 2; others = 3), and need

of additional information about vaccinations during pregnancy (no = 0; yes = 1). Other included variables were knowledge of at least one recommended vaccination during pregnancy (no = 0; yes = 1) and perceive that it is dangerous for the unborn child if the woman contract the infectious disease during pregnancy (continuous) in Models 2 and 3 and feel that the recommended vaccines administered during pregnancy were very dangerous for them and for the unborn child (no = 0; yes = 1) in Model 3. A stepwise procedure was used to obtain the final models according with p values for the variable inclusion and exclusion respectively of >0.2 and <0.4. Odds ratios (ORs) together with their 95% confidence intervals (CIs) were reported as measures of association between predictors and outcomes of interest. All reported values are two-sided, and a value of $p \leq 0.05$ was used as a threshold for statistical significance for all analyses.

Disclosure of potential conflicts of interest

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