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Routine vaccinations during pregnancy: women knowledge and attitude during COVID-19 pandemic era, an Italian survey

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ABSTRACT

Objective. Diphtheria-Tetanus-Pertussis (DTPv) and seasonal Flu (Fv) vaccines are routinely recommended during pregnancy, however, there is still a low compliance to this recommendation.

To better understand the underlying reasons for pregnant women poor adherence to this procedure, we evaluated, through a questionnaire-based survey, women knowledge, and attitude toward vaccinations during pregnancy.

Materials and Methods. This was a survey study performed at the Obstetrics and Gynecology Unit of "Pugliese-Ciaccio Hospital", a tertiary centre in Catanzaro (Southern Italy), from September 2020 to February 2021. All consecutive women admitted to the postpartum ward after delivery were invited to participate in the study.

Results. Sixty percent (360/600, 60%) women declared that vaccines are not safe during pregnancy. One third of our study population (190/600, 31.6%) stated that DTPv and anti Fv are those considered to be safe during pregnancy, but only 26% (156/600) declared to have received one of them. Among those who got information about this topic (224/600, 37.3%), only 15.8% (38/240) had received them from an obstetric health care professional whereas 46.4% (104/224) got them from Google.

Conclusions. DTPv and Fv are safe and useful tools during pregnancy, however, compliance with this recommendation, is low. A crucial role is played by a lack of appropriate counselling and support from consultant's obstetrician and/or midwives. COVID-19 pandemic has sensitized the entire population about the topic of prevention and vaccination, therefore, health care professionals should take advantage from that and put strong efforts in implementing counselling strategies and vaccine campaigns.

INTRODUCTION

Specific vaccinations are recommended during pregnancy, they aim to protect women and their offspring from preventable diseases [1].

While evidence supports safety and efficacy of this procedures, there is still a low compliance with recommendations due to women's concerns about their impact on foetal wellbeing [2].

Risks from vaccination during pregnancy could arise from the use of live attenuated virus ones, such as Measles, Mumps and Rubella vaccine (MMR vaccine), indeed, as a precaution, these last are contraindicated during gestation.

Human Papilloma virus (HPV) vaccination, although not made up of live attenuated virus [3], is not currently recommended during pregnancy, even though no evidence have been found to demonstrate a correlation between this vaccination and adverse pregnancy outcomes [4].

Nowadays there are two vaccines, which have a specific recommendation for routine use during pregnancy: Diphtheria-Tetanus-Pertussis (DTPv) and seasonal Flu (Fv) vaccines. According to the national health care system recommendation [5], all pregnant women should undergo seasonal Fv during winter, while the timing for DTPv is during the 3rd trimester of pregnancy (between 28 and 38 weeks of pregnancy).

A specific counselling regarding vaccinations during pregnancy is offered by the National Health Care system in the occasion of the routine foetal scans:

- First trimester Nuchal translucency scan (11-13 weeks of gestation).
- Second trimester anomaly scan (19-21 weeks of gestation).
- Third trimester growth scan (34-36 weeks of gestation).

However, as previously demonstrated, in South Italy, there is a high rate of private obstetric care, where counselling protocols are unknown [6]. In consideration to the actual COVID-19 pandemic [7], the discussion about vaccination during pregnancy has become a topic of great interest both for women and the health care professionals. To better understand the underlying reasons for the poor compliance of pregnant women to the recommended vaccination, we decided to evaluate, through a questionnaire-based survey, women knowledge, and attitude toward vaccinations during pregnancy.

MATERIALS AND METHODS

This was a survey study performed at the Obstetrics and Gynecology Unit of "Pugliese-Ciaccio Hospital," a tertiary centre in Catanzaro (Southern Italy), from September 2020 to February 2021. All consecutive women admitted to the postpartum ward after delivery were considered eligible and invited to participate in the study, those who accepted, after signing the informed consent, were enrolled. An anonymous questionnaire regarding knowledge and attitude toward vaccinations during pregnancy was administered to the enrolled population, a description is available on **Table 1**. After completing the questionnaire, all participants received an appropriate counselling regarding the topic of vaccination during pregnancy from an experienced maternal-foetal medicine doctor.

The study has been approved by the local Ethics Committee Regione Calabria sezione area Centro (protocol Nr. 23, date 16th January 2020).

Patient and public involvement

The questionnaire has been designed by the authors in agreement to national guidelines [1]. Additional information were collected: age (years old), parity (nulliparous or parous ≥ 1), nationality (Italian, European, and extra-European), level of education (low level of education: illiterate, compulsory school, and high level of education: high school or graduation), employment status (employed or unemployed) and type of obstetric care (public, private or combined: private and public).

Statistical analysis

Continuous and categorical variables are expressed as mean \pm standard deviation and percentages, respectively. The non-parametric Mann-Whitney test was used for comparisons of continuous variables, and the 2-tailed Fisher exact test for comparisons of proportions. Statistical significance was fixed at an alpha level of 0.05. Statistical analyses were performed with SPSS 20.0 software (SPSS Inc, Chicago, IL, USA).

RESULTS

A total of nine hundred eighty-two, pregnant women were eligible, 382 refused to participate,

Table 1. Questionnaire questions.

1) Do you think it is safe to receive vaccines during pregnancy?
• Yes
• No
2) Did you receive any of the routinely recommended vaccination during this pregnancy?
• Yes
• No
3) In your opinion which vaccines can be considered to be safe during pregnancy?
• No one
• Diphtheria-Tetanus-Pertussis and anti-Flu
• Measles-mumps-rubella
4) Have you received information about vaccination during pregnancy?
• Yes
• No
5) If you have received any information regarding vaccines during pregnancy, which has been your source of information?
• Consultant Obstetrician and/or Midwife
• Google
• Family members or friends
6) Would you be interested in receiving information about efficacy and safety of vaccines during pregnancy?
• Yes
• No

therefore 600 were included in the study. Population characteristics are illustrated on **Table 2**.

Mean maternal age was 31 ± 4.24 years old. The majority of women were Italian 526/600 (87.6%) and have had at least one previous pregnancy 61% (366/600). Two hundred sixteen out of 600 (36%) women had a low level of education while 384/600 (64%) had a high level of education, the difference between the two groups was significant ($p < 0.001$). Two hundred seventy six out of 600 (46%) women were employed whereas 324/600 (54%) were unemployed, obstetric care has been combined (private for routine foetal scans and public for delivery) for 90 % of the interviewed women (540/600).

Answering to question 1 (*Do you think it is safe to receive vaccines during pregnancy?*) 240/600 (40%) women declared to know that vaccinations during pregnancy are safe. Among those that considered the procedure unsafe (360/600, 60%), the majority were mothers with a low level of education (low level of education 214/360, 59.4% versus high level of education 146/360, 40.5%, $p = 0.003$), nulliparous (nulliparous 234/360, 65% versus parous 126/360, 35%, $p < 0.0001$) and unemployed (unemployed 222/360, 61.6% versus employed 138/360, 38.3%, $p < 0.0001$).

Answering to question 2 (*Did you receive any of the routinely recommended vaccination during this pregnancy?*) 156/600 (26%) women declared to have received at least one of the recommended vaccinations during pregnancy. A significant difference

has been found in terms of level of education (high level of education 135/156, 86.5% versus low level of education 21/156 13.4% $p < 0.0001$), parity (parous 105/156, 67.3% versus nulliparous 51/156 32.6% $p < 0.0001$), but not for employment status (unemployed 76/156, 48.7% versus employed 80/156, 51.2%, $p = 0.6$).

Answering to Question 3 (*In your opinion which vaccines can be considered to be safe during pregnancy?*) 190/600 (31.6%) stated that Diphtheria-Tetanus-Pertussis and anti-Flu are safe, 50/600 (8.3%)

Table 2. Women characteristics (n = 600).

Characteristics	n (%)
Nationality	
Italian	526/600 (87.6%)
European	6/600 (1%)
Extra-European	68/600 (11.3%)
Parity	
Parity 0	234/600 (39%)
Parity ≥ 1	366/600 (61%)
Level of education	
Low: illiterate or compulsory school	216/600 (36%)
High: high school or graduation	384/600 (64%)
Occupation	
Unemployed	324/600 (54%)
Employed	276/600 (46%)
Type of obstetric care	
Public	60/600 (10%)
Private	0/600 (0%)
Combined (private and public)	540/600 (90%)

chose Measles-Mumps-Rubella vaccine and 60% (360/600) declared that no one can be considered to be safe during pregnancy.

Answering to Question 4 (*Have you received information about vaccination during pregnancy?*), the majority of our study population has declared not to have received any information about the topic (No information received: 376/600, 62.6% versus information received: 224/600, 37.3%).

Answering to Question 5 (*If you have received any information regarding vaccines during pregnancy, which has been your source of information?*) among those who had received any information (224/600), 46.4% (104/224) got them from Google, 36.6% (82/224) from a consultant obstetrician or a midwife and 16.9% (38/224) from family members or friends.

Answering to Question 6 (*Would you be interested at receiving information about the efficacy and safety of vaccines during pregnancy?*) almost the entire study population was interested in receiving information about (574/600, 95.6%). A description of the survey results is available on **Tables 3-5**.

DISCUSSION

Main findings

Our study population has demonstrated to have a poor level of knowledge and awareness regarding vaccinations during pregnancy. More than half of our study population (60%) declared that vaccines during pregnancy are not safe (these women were more frequently nulliparous, unemployed and with a low level of education). Even if one third (31.6%) of our study population was aware that Diphtheria-Tetanus-Pertussis and anti-Flu vaccines are among those considered to be safe during pregnancy only 26% women undergo to one of them (mostly women with a high level of education with previous pregnancies).

Interpretation and comparison with other literature

Diphtheria-tetanus-pertussis (DTPv) and seasonal Flu (Fv) vaccines aim to protect women and their offspring from preventable diseases. Seasonal flu rec-

Table 3. Survey results.

Dichotomic questions	Yes	No
1) Do you think it is safe to receive vaccines during pregnancy?	240/600 (40%)	360/600 (60%)
2) Did you receive any of the routinely recommended vaccination during this pregnancy (Flu and/or Diphtheria-Tetanus-Pertussis)?	156/600 (26%)	444/600 (74%)
4) Have you received information about vaccination during pregnancy?	224/600 (37.3%)	376/600 (62.6%)
6) Would you be interested in receiving information about efficacy and safety of vaccines during pregnancy?	574/600 (95.6%)	26/600 (4.3%)
Multiple choice questions		
3) In your opinion which vaccines can be considered to be safe during pregnancy?	No one	360/600 (60%)
	Diphtheria-Tetanus-Pertussis (DTPv) and anti-Flu (Afv)	190/600 (31.6%)
	Measles, Mumps and Rubella vaccine (MMRv)	50/600 (8.3%)
5) If you have received any information regarding vaccines during pregnancy, which has been your sources of information?	Consultant's obstetrician and/or midwife	82/224 (36.6%)
	Google	104/224 (46.4%)
	Family members or friends	38/224 (16.9%)

Table 4. Women characteristics among the ones who stated that vaccines are not safe during pregnancy.

	1) Is it safe to receive vaccines during pregnancy?		P-values
	Yes 240/600	No 360/600	
Vaccines safety during pregnancy with answer: No	High level of education 146/360 (40.5%)	Low level of Education 214/360 (59.4%)	0.0003*
Vaccines safety during pregnancy with answer: No	Parity: 0 234/360 (65%)	Parity: ≥ 1 126/360 (35%)	< 0.0001*
Vaccines safety during pregnancy with answer: No	Unemployed 222/360 (61.6%)	Employed 138/360 (38.3%)	< 0.0001*

Table 5. Women characteristics among the ones who stated to have received at least one of the routinely recommended vaccinations during this pregnancy (Flu and/or Diphtheria-Tetanus-Pertussis).

2) Did you receive any of the routinely recommended vaccination during this pregnancy (Flu and/or Diphtheria-Tetanus-Pertussis)			P-values
Yes: 156/600 (26%)			
No: 444/600 (74%)			
Vaccination received: Yes	High level of education 135/156 (86.5%)	Low level of Education 21/156 (13.4%)	< 0.0001*
Vaccination received: Yes	Parity: 0 51/156 (32.6%)	Parity: ≥1 105/156 (35%)	< 0.0001*
Vaccination received: Yes	Unemployed 76/156 (48.7%)	Employed 80/156 (51.2%)	0.6

*Significance.

ommendation for vaccination has been introduced by the Advisory Committee on Immunization Practices (ACIP, USA) during the 1960s [8] due to the already known risks of maternal repercussions during pregnancy. More recently, during 2009, the H1N1 pandemic Flu had a significant impact on pregnant women population, indeed, these last, experienced a six times higher risk of hospitalizations, intensive care unit admissions, and deaths compared to the general population with a mortality rate as high as around 22% [9]. Benefits from Fv are not only limited on maternal wellbeing, indeed, recent evidence demonstrates a favourable association between the latter procedure and foetal well-being with a reduced risk of low-birth weight, preterm birth, miscarriage and stillbirth [10, 11]. On the other side Diphtheria-Tetanus-Pertussis vaccination is aimed to prevent *Bordetella pertussis* respiratory infection in the newborn, thought maternal immunization. Below six months of age children are at increased risk of Pertussis related complications (otitis media, pneumonia, apnoea, encephalopathy, as well as pulmonary hypertension). Severe and potentially lethal complications are even most common in infants below two months of age [12]. The effectiveness of DTPv, administered during pregnancy on the prevention of newborn Pertussis infection, has been widely demonstrated, as an example, during 2011 in Great Britain, following the implementation of the DTP vaccines program with more than 70% of pregnant women being vaccinated and a subsequent 91% reduction in pertussis cases for infants below three months of age [13]. More recently a study from the United States of America demonstrated a vaccine effectiveness of 78% against Pertussis cases characterized by the presence of cough in the age group below two months and a 91% effectiveness against hospitalized cases [14].

Compliance with the DTP vaccination reaches almost 70% among the British pregnant women population [15], not comparable to the Italian ones in which the rate is significantly lower, despite recommendations [16-19]. Even if epidemiological evidence demonstrates the crucial role that prevention has for the above-mentioned infections, during 2019 less than 10% Calabrian pregnant women underwent one of the recommended vaccinations during pregnancy. A sub optimal adherence to this procedure has been widely reported by other Italian regions and different world countries [15, 20, 21].

In the southern part of Italy, a poor adherence to vaccination campaigns represents a critical issue not only within the pregnant women population, but also for the general population [22, 23].

COVID-19 pandemic has highlighted the crucial role of vaccines [24]; the entire population has been sensitized to the importance of prevention, indeed, according to our survey study between 2020 and 2021 a significant increase in the compliance with recommendations regarding routine vaccinations during pregnancy has been documented. Even though the rate remains alarmingly low.

Pregnancy is one of the most sensitive time of women's life, foetal wellbeing becomes what counts the most, any suggested procedure arises doubts and concerns in the future mother, as a matter of fact, according to the available literature the major limitation for the compliance with recommendation is represented by the fear for potential foetal side effects [19, 25-27]. This data is in agreement with our results, more than half of our study population declared that vaccines during pregnancy are not safe. Maternal doubts and concerns can find a potential explanation with women's low level of knowledge

and awareness about vaccination during pregnancy, this last appears to associate with a lack of appropriate counselling from the obstetric health care professionals, indeed, the majority of our study population declared that the principal source of information has been Google, then family members or friends and only in the 15.8% of cases it has been a consultant obstetrician and/or a midwife.

Despite that, women interest for the topic was high, as a matter of fact almost the entire study population wanted to know more about it.

Interestingly similar findings have been reported also from many other European and extra European countries [25-27]. A Canadian survey found that recommendations for vaccination during pregnancy vary among healthcare members, with midwives being less likely than physicians to recommend them to their patients [28].

Antenatal care providers are known to be trusted sources of information during pregnancy, services that are proactive in vaccinating women during the antenatal visits hold promise for improving coverage [29-35]. The strong link between healthcare workers' perceptions of vaccination and vaccine uptake has been widely documented [33-35], therefore it is essential to first, educate all healthcare professionals on current guidelines, especially midwives, who have reported little undergraduate training on maternal vaccination [28]. Only letting women become aware of the advantages and safety of any procedure during pregnancy, particularly focusing on foetal wellbeing [18, 36-40], it will be possible to obtain the best results in terms of compliance.

Strengths and limitations

The strength of this study is that it is the first Italian analysis about trends in routine vaccinations during pregnancy through COVID-19 pandemic era including a large number of participants. A major limitation of the study is the partial representation of the Italian population, in fact data come from a single centre of a single Italian region, Calabria.

Future study will assess changes in compliance with recommendation at the end of COVID-19 pandemic.

CONCLUSIONS

Diphtheria-Tetanus-Pertussis and anti-Flu vaccines are safe and useful tools during pregnancy to pro-

tect women and their offspring from preventable diseases, however, compliance with this recommendation, even if slightly increased respect to previous years remains alarmingly low. The most alarming evidence emerged from our study is the lack of appropriate counselling protocols and support from consultant's obstetrician and/or midwives. COVID-19 pandemic has sensitized the entire population about the topic of prevention and vaccination, health care professionals should take advantage of that and put strong efforts in implementing counselling strategies and vaccinations campaigns. Further, population-based monitoring and reporting of coverage will be of crucial importance for the evaluation of public health campaigns and clinical initiatives.

COMPLIANCE WITH ETHICAL STANDARDS

Authors contribution

F.V.: Study designed, patients recruitment. P.Q., A.R.P.: Study design, data analysis, writing – original draft. S.M., D.L.: Patients recruitment. M.M., F.Z., D. F., M.L.R.: Writing – review & editing. R.V., C.V.: Supervision.

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Study registration

N/A.

Disclosure of interests

The authors declare that they have no conflict of interests.

Ethical approval

The study was conducted in accordance with the Declaration of Helsinki and approved by Ethics Committee of Pugliese-Ciaccio Hospital, Catanzaro, Italy (protocol code 23; January 16, 2020).

Informed consent

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

Data sharing

Data are available under reasonable request to the corresponding author.

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