

Barriers and facilitators regarding influenza and pertussis maternal vaccination uptake: A multi-center survey of pregnant women in Italy

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Abstract

Objective

In 2017, the Italian Ministry of Health issued the new 2017-19 National Plan of Vaccine Prevention and pregnant women were targeted to be vaccinated against influenza and pertussis. Our study aim was to assess the barriers and facilitators regarding maternal immunization acceptance among pregnant women after the launch of this program.

Study design

We conducted a multi-center survey in three Italian cities between March and June 2018. Collected data were analyzed anonymously, and included information about current recommendations of maternal immunization, antenatal care characteristics and reasons for accepting or rejecting vaccination.

Results

A total of 743 pregnant women completed the survey. Half of the study population were aged 25–35 years and 88 % were Italian. Only 18 % pregnant women received advice to be vaccinated. In this group, the vaccine was recommended in most cases by an obstetrician-gynecologist (68 %) and during a routine antenatal visit (74 %). Self-reported influenza and pertussis vaccination coverage was 6.5 % (95 % confidence interval, 4.9 %–8.5 %) and 4.8 % (95 % confidence interval, 3.5 %–6.6 %), respectively. The main vaccination barriers identified were lack of vaccine recommendation by any health-care provider (81 %) and safety concerns (18 %). Respondents mentioned the willingness to protect their offspring (82 %) and themselves (66 %) and having received immunization advice by a maternal care provider (62 %), as the main vaccination facilitators.

Conclusions

Lack of immunization advice by health-care providers and safety concerns were the main vaccination barriers against influenza and pertussis, among surveyed pregnant women. Vaccine delivery in the antenatal care setting could lead to increase of vaccine acceptance among pregnant women.

Keywords

Influenza, Pertussis, Pregnant women, Obstetricians-gynecologists, Midwives, Vaccination

Introduction

Children are at greatest risk of morbidity and mortality from infections in the perinatal period than at any other time in life, and depend on maternal IgG antibodies for protection in early life [1]. Higher concentrations of antibodies at birth result in protection from infection, or in delayed onset and decreased severity of several infectious diseases in the newborn, such as tetanus, influenza and pertussis, among others [2]. Consequently, maternal immunization has been increasingly recognized globally as a unique approach to protect newborns and young infants during a period of increased vulnerability from several infectious diseases, until the infant is able to adequately respond to active immunization or infectious challenge [3]. In Italy, the last 2017–2019 edition of the National Immunization Prevention Plan constitutes a new paradigm to promote vaccination at all ages. One of the novelties of this plan has been the introduction of the pertussis vaccine for use in pregnancy. Therefore, both influenza and pertussis vaccines are currently recommended during pregnancy in Italy [4]. Even though maternal influenza immunization has been recommended for several years in Italy, available previous estimates have shown a very poor vaccine coverage [[5], [6], [7]]. Thus, we aimed to assess the barriers and facilitators regarding maternal immunization and also estimate both, influenza and pertussis vaccine uptake during pregnancy, after the changes introduced in the 2017–2019 National Immunization Prevention Plan in Italy.

Materials and methods

A cross sectional survey of pregnant women attending three antenatal care centers was conducted between March and June 2018. Pregnant women were recruited in two tertiary care public teaching hospitals in Milan and Rome, and in one primary care non-teaching hospital in Jesi. These tertiary care hospitals attend around 3000 and 4000 births annually, while the primary care hospital attends about 830 births per year.

Inclusion criteria for study participation were (i) age between 18 and 45 years and being at least 32 weeks pregnant; (ii) having a good command of Italian; and (iii) accepting to participate in the survey and giving their consent.

The study team developed an anonymously self-completed, structured survey. It was piloted-tested with a convenience sample of 22 pregnant women to ensure clarity, comprehensibility and ease of administration. All pregnant women who had a third-trimester prenatal care appointment and fulfilled the inclusion criteria of the study were consecutively selected as potential study participants. Then, they were approached and invited to participate by the investigators. After informed consent was given, study participants were asked to complete the paper questionnaire and return it to the investigator. The final questionnaire contained 39 questions and it was designed to collect socio-demographic characteristics and information on barriers and facilitators regarding maternal vaccine uptake among pregnant women (Supplemental material).

The results are presented as proportions and percentages of respondents to individual questions, excluding nonresponses from the denominators. Mean and standard deviation or median and interquartile range were estimated for continuous variables. Chi-square test or Fisher exact tests were performed to compare categorical variables, as appropriate. Estimates of the influenza and pertussis vaccine uptake were calculated with their respective 95 % confidence interval. Statistical significance of the effect of determinants on self-reported influenza and pertussis vaccine coverage was tested for each vaccine independently using univariate logistic regression. All statistical analyses and interval estimates for odds ratio (OR) were 2-tailed and performed using an alpha error = 0.05. Findings were reported as significant at $p < 0.05$. The statistical package R Core Team (R Foundation for Statistical Computing, Vienna, Austria, 2013) was used for analysis.

Results

During the study period, 743 pregnant women were recruited at the three study centers. Socio-demographic and clinical characteristics of survey respondents are shown in Table 1. The mean age of the study population was 33 ± 5.1 years old, 655 were Italian (88 %) and 81 (11 %) had any comorbidity that put themselves at risk for influenza complications.

Table 1. Socio-demographic and clinical characteristics of surveyed pregnant women in Italy.

Socio-demographic and clinical characteristics

N (%) of pregnant women

N = 743

Study center

Milano	299 (40)
Jesi	251 (34)
Roma	193 (26)

Age group (years)

<25	37 (5.0)
25–35	377 (51)
>35	329 (44)

Origin

Italian	655 (88)
Immigrant	88 (12)

Partner's origin

Italian	658 (89)
Immigrant	78 (10)
NA	7 (1.0)

Education level^a

High	417 (56)
Low-Middle	326 (44)

Partner's education level^a

High	280 (38)
Low- Middle	456 (61)
NA	7 (1.0)

Work status

Housewife	70 (9.0)
Unemployed	94 (13)
Employed	579 (78)

Marital status

Married	431 (58)
Cohabiting/Other	312 (42)

Partner's work status

Unemployed	19 (3.0)
Employed	717 (96)
Unknown	7 (1.0)

Monthly household income

High	192 (26)
Middle	497 (67)

Low	54 (7.0)
Comorbidity	
No	662 (89)
Yes	81 (11)
Body mass index	
<30	703 (95)
≥ 30	40 (5.0)
Current pregnancy	
Singleton	721 (97)
Twins	22 (3.0)
Parity	
Primiparous	431 (58)
Multiparous	312 (42)
Number of antenatal care visits	
1-5	107 (14)
6-10	409 (55)
> 10	227 (31)
Illness during current pregnancy	
No	537 (72)
Yes	206 (28)
Hospitalization during current pregnancy	
No	624 (84)
Yes	119 (16)

^a Lower education = no secondary school diploma; Middle education = completed secondary school with diploma; Higher education = continued education beyond secondary school.

^b High income = > 3000 euros; Middle income = 1000–3000 euros; Low income = < 1000 euros.

When surveyed pregnant women were questioned about who was the HCP responsible of their antenatal care, almost of all of them (97 %) stated that it was the obstetrician-gynecologist (ob-gyn), but 17 % were also attending a midwife practice. Additionally, 53 % of pregnant women stated that their antenatal care was carried out in the private outpatient setting, 43 % were attending the hospital, and only 14 % of pregnant women were cared at an outpatient family center.

Only 133 (18 %) pregnant women received an advice by a HCP to be vaccinated against influenza and pertussis. In this group, only 99/133 (74 %) considered that they had received complete information

regarding maternal immunization. Also, the ob-gyn was the main HCP who recommended maternal immunization (68 %), followed by midwives (14 %), GPs (9.8 %), and pediatricians (9.8 %). This vaccine recommendation was mainly received during a routine antenatal visit (74 %) or during an antenatal class (24 %).

The self-reported influenza vaccine uptake in our study sample was 6.5 % (n = 48, 95 % confidence interval (CI), 4.9 %–8.5 %) and the pertussis vaccine uptake was 4.8 % (n = 36, 95 % CI, 3.5 %–6.6 %). For influenza, 58 % of pregnant women received the vaccine in a vaccination center, 31 % in the GP’s office, 4.2 % in the hospital and 6.2 % in other setting. Regarding pertussis, up to 94 % were immunized in a vaccination center, 2.8 % in the hospital and 2.8 % in other setting.

Among surveyed pregnant women, 629 (85 %) knew that influenza vaccine confers protection against influenza disease during pregnancy. Only 418 (56 %) and 377 (51 %) pregnant women were aware that influenza and pertussis maternal vaccination, respectively, confers protection to the newborns during their first months of life. Additionally, pregnant women who believed that influenza and pertussis vaccines could cause these diseases to mother and infants were 244 (33 %) and 128 (17 %), respectively.

The main barriers and facilitators regarding maternal immunization are shown in Table 2. For unvaccinated women the main reason for not accepting maternal immunization was: “Vaccination was not recommended by any health-care provider (HCP)” (81 %). Regarding the facilitators among vaccinated women, the main reason for accepting vaccines was “I want to protect my baby” (82 %).

Table 2. Vaccination barriers and facilitators among surveyed pregnant women in Italy.

Vaccination barriers among unvaccinated pregnant women	N (%) of women
	N = 682
Vaccination was not recommended by any HCP	549 (81)
I do not believe vaccines are safe and effective	122 (18)
I do not believe vaccines are safe for my baby	116 (17)
I do not believe vaccination was necessary	26 (3.8)
Relatives/friends advised me against maternal vaccination	25 (3.7)
HCP advised me against vaccination during pregnancy	13 (1.9)
I had a vaccine adverse event in the past	7 (1.0)
Other barriers	54 (7.9)
Vaccination facilitators among vaccinated pregnant women^a	N (%) of women

	N = 61
I want to protect my baby	50 (82)
I want to protect myself	40 (66)
MCP recommended to be vaccinated	38 (62)
All pregnant women should get the vaccines	24 (39)
General practitioner recommended to be vaccinated	4 (6.6)
I usually get the recommended vaccines	3 (4.9)
Relatives/friends recommended it	2 (3.3)

HCP, health-care provider; MCP, maternal care provider.

^a Pregnant women who stated they have been vaccinated against influenza, pertussis or either both vaccines during their current pregnancy.

Of the 743 surveyed pregnant women, 684 (92 %) considered the ob-gyns followed by midwives (50 %) as the most trusted sources of information regarding maternal immunization, (Fig. 1). And, regarding the impact of HCP's advice on vaccine acceptance, 624 (84 %) and 512 (69 %) of respondents stated that a ob-gyn's and midwife's vaccine recommendation, respectively, was "influential" or "very influential" on vaccine acceptance.

Potential factors associated with influenza and pertussis vaccination uptake are shown in Table 3. Having a low-middle education level among pregnant women was associated with lower pertussis vaccine uptake (OR = 0.30; 95 % CI 0.10-0.60) compared to the high education level. Also, a low-middle partner's education level was associated with both influenza and pertussis lower coverage rates (OR = 0.50; 95 % CI, 0.30-0.90 and OR = 0.40; 95 % CI, 0.20-0.70, respectively).

Table 3. Factors associated to influenza and pertussis vaccination uptake among surveyed pregnant women in Italy (univariate analysis).

Sociodemographic, clinical and knowledge variables	Influenza Vaccine Uptake			Pertussis Vaccine Uptake		
	N (%)	OR	95 % CI	N (%)	OR	95 % CI
Survey center						
Milano	26 (8.7)	ref.		20 (6.7)	ref.	
Jesi	11 (4.4)	0.48	0.22-0.97*	4 (1.6)	0.23	0.070-0.61**

Roma	11 (5.7)	.63	0.29-1.3	2 (6.2)	0.92	0.43-1.9
Age group (years)						
<25	3 (8.1)	ref.		1 (2.7)	ref.	
25–35	28 (7.4)	0.91	0.30-3.9	20 (5.3)	2.0	0.40-37
>35	17 (5.2)	0.62	0.19-2.7	15 (4.6)	1.7	0.33-32
Origin						
Italian	44 (6.7)	ref.		34 (5.2)	ref.	
Immigrant	4 (4.5)	0.66	0.20-1.7	2 (2.3)	0.42	0.070-1.4
Partner's Origin						
Italian	44 (6.7)		ref.	32 (4.9)	ref.	
Immigrant	4 (4.5)		0.75 0.22-1.9	4 (5.1)	1.1	0.31-2.8
Education level						
High	30 (7.2)	ref.		29 (7.0)	ref.	
Low- Middle	18 (4.3)	0.75	0.41-1.4	7 (2.7)	0.29	0.12-0.64**
Partner's Education level						
High	25 (8.9)	ref.		22 (7.0)	ref.	
Low- Middle	23 (5.0)	0.54	0.30-0.98*	14 (2.1)	0.37	0.18-0.73**
Work status						
Employed	40 (6.9)	ref.		32 (5.5)	ref.	
Housewife	4 (5.7)	0.82	0.24-2.1	2 (2.9)	0.50	0.080-1.7
Unemployed	4 (4.3)	0.60	0.18-1.5	2 (2.1)	0.37	0.060-1.3
Partner's Work Status						
Employed	48 (6.7)	--	--	36 (5.0)	--	--
Unemployed	0 (0.0)	--	--	0 (0.0)	--	--
Marital status						
Married	26 (6.0)	ref.		22 (5.1)	ref.	
Cohabiting/Other	22 (7.1)	1.2	0.65-2.1	14 (4.6)	0.87	0.43-1.7
Monthly household income						
High	16 (8.3)	ref.		12 (6.2)	--	
Middle	2 (3.7)	0.42	0.66-1.6	24 (4.8)	--	--
Low	30 (6.0)	0.71	0.38-1.4	0 (0.0)	--	--
Current pregnancy						
Singleton	46 (6.4)	ref.		34 (4.7)	ref.	
Twins	2 (9.1)	1.5	0.23-5.2	2 (9.1)	2.0	0.31-7.3
Parity						
Primiparous	27 (6.3)	ref.		22 (5.1)	ref.	

Multiparous	21 (6.7)	1.1	0.59-1.9	14 (4.5)	0.87	0.43-1.7
Number of antenatal care visits						
1-5	4 (3.7)	ref.		3 (2.8)	ref.	
6-10	35 (8.6)	2.4	0.94-8.2	23 (5.6)	2.1	0.70-8.8
> 10	9 (4.0)	1.1	0.34-4.0	10 (4.4)	1.6	0.48-7.2
Comorbidity						
No	40 (6.0)	ref.		32 (4.8)	ref.	
Yes	8 (9.9)	1.7	0.72-3.6	4 (4.9)	1.0	0.30-2.7
Illness Current Pregnancy						
No	31 (5.8)	ref.		20 (3.7)	ref.	
Yes	17 (8.3)	1.5	0.78-2.7	16 (7.8)	2.2	1.1-4.3*
Hospitalization Current pregnancy						
No	43 (6.9)	ref.		32 (5.1)	ref.	
Yes	5 (4.2)	0.59	0.20-1.4	4 (3.4)	0.64	0.19-1.7
Body Mass Index						
<30	47 (6.7)	ref.		35 (5.0)	ref.	
≥ 30	1 (2.5)	0.36	0.020-1.7	1 (2.5)	0.49	0.030-2.4
Influenza vaccine previous season						
No	40 (5.6)	ref.		--	--	--
Yes	8 (32)	8.0	3.1-19***	--	--	--
Received Vaccine Recommendation from HCP during Current Pregnancy						
No	9 (1.5)	ref.		2 (1.3)	ref.	
Yes	39 (29)	28	14-63***	34 (26)	67	27-200***
Influenza vaccination confers protection against influenza disease during pregnancy (True)						
Incorrect answer	5 (4.4)	ref.		--	--	--
Correct answer	43 (6.8)	1.6	0.68-4.7	--	--	--
Influenza vaccine could cause influenza to mother and baby (False)						
Incorrect answer	5 (2.0)	ref.		--	--	--
Correct answer	43 (8.6)	4.5	1.9-13**	--	--	--
Influenza vaccine is effective protecting newborns during their first months of life (True)						
Incorrect answer	9 (2.2)	ref.		--	--	--
Correct answer	39 (12.0)	6.20	3.09-13.83***	--	--	--
Pertussis vaccine could cause pertussis disease to mothers and babies (False)						
Incorrect answer	--	--	--	0 (0.0)	--	--
Correct answer	--	--	--	36 (5.9)	--	--
Pertussis vaccine is effective protecting newborns during their first months of life (True)						

Incorrect answer	--	--	--	2 (1.1)	ref.
Correct answer	--	--	--	34 (8.7)	8.93 3.50-30.23***

ref. reference category; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Influenza coverage rates were significantly higher among pregnant women who had been vaccinated in the previous influenza season compared with non-previously vaccinated women (32 % vs. 8.0 %, $p < 0.001$). The most important factor associated to being vaccinated against influenza or pertussis during the current pregnancy was receiving a vaccine recommendation from a HCP (OR = 28; 95 % CI, 14–63 and OR = 67; 95 % CI, 27–201). Additionally, attending the hospital for the antenatal care was associated with higher influenza and pertussis vaccine uptakes (OR = 2.3, 95 % CI, 1.3–4.4 and OR = 2.2, 95 % CI, 1.1–4.4, respectively).

Regarding knowledge, pregnant women who knew that influenza and pertussis maternal vaccination confers protection to newborns were more likely to be vaccinated (OR = 6.2; 95 % CI, 3.1–14 and OR = 8.9; 95 % CI, 3.5–30).

Discussion

To the best of our knowledge, this study is the first multi-center survey analyzing the barriers and facilitators regarding both influenza and pertussis maternal vaccination uptake among pregnant women in Italy. Our findings revealed a very low maternal vaccine uptake, with figures of 6.5 % for influenza and 4.8 % for pertussis. The lack of recommendation by any HCP was stated as the main vaccination barrier for declining vaccination among pregnant women, followed by the belief that vaccines are not safe or effective. The misconceptions regarding maternal immunization identified in our study are in line with findings of previous studies. D’Alessandro et al. reported that 24 % of pregnant women considered that recommended vaccines during pregnancy were very dangerous for them and their unborn child [8]. Similarly, in other European countries, the safety concerns or fear of side effects were the most important reasons for not being immunized identified among pregnant women [[9], [10], [11]].

The willingness to protect the offspring was the most significant facilitator of maternal vaccination. Furthermore, pregnant women who knew that influenza and pertussis vaccines were effective protecting newborns during their first months of life were 6 and 8 times more likely to be vaccinated compared to those women who were not aware of these vaccine benefits. The willingness to protect themselves and having received vaccination advice by a MCP were also important factors for accepting vaccines.

Our findings converged with several previous studies, which showed that a direct recommendation by a HCP is the most important factor associated with an increase likelihood of being vaccinated during pregnancy [5,7,9,10,[12], [13], [14], [15], [16]]. In fact, in our study, pregnant women who received a vaccine recommendation from a HCP during their current pregnancy were 28 times more likely to be vaccinated against influenza and 67 times more likely to be vaccinated against pertussis. Unfortunately, in our study only 18 % of pregnant women stated that they had received a vaccine recommendation during their current pregnancy. Among pregnant women who did receive a vaccine recommendation, most of them identified ob-gyns as the MCPs who advised them to be immunized during pregnancy. Additionally, most pregnant women agreed that ob-gyns followed by midwives were the most trusted sources of information regarding immunization during pregnancy and that these MCPs were “influential” or “very influential” on the women’s decision of being vaccinated. Therefore, our results show that MCPs, especially ob-gyns, are uniquely placed to increase maternal vaccine acceptance but they are not taking advantage of their pivotal role in improving vaccine acceptance during pregnancy, as confirmed by others [[17], [18], [19]]. Ob-gyns are likely not informed about the importance of vaccine counselling during antenatal care as they have not been traditionally considered vaccinators [20]. Despite the fact that MCPs are familiar with other preventive measures like PAP screening, in many countries like Italy they have not received specific training regarding maternal immunization. Both, the lack of maternal immunization knowledge as well as the lack of habit in administering vaccines represent significant barriers that need to be addressed in order to increase maternal vaccine coverage.

Even though maternal immunization is publicly funded in Italy, there are other organizational barriers that prevent pregnant women to receive the recommended vaccines during pregnancy. In our study, the hospital and/or private practice were indicated as the most common antenatal care settings. Also, the majority of pregnant women (85 %) reported to have undergone more than 6 antenatal care visits. These findings are in line with national data reporting up to 87 % of pregnant women with 4 or more antenatal care visits during pregnancy [21]. This high number of antenatal care visits in the hospital and/or private practice settings, where pregnant women are in close contact with their most trusted HCPs, ob-gyns and midwives, provides numerous opportunities to offer and administer immunization to pregnant women. Unfortunately, our results have also shown that only 4.2 % and 2.8 % of pregnant women received influenza and pertussis vaccines, respectively, in the hospital setting. Therefore, the lack of a dedicated maternal immunization program at the hospitals and/or private practices in Italy represents a significant barrier to achieve optimal maternal vaccination coverage. In other European countries with higher maternal immunization uptake, like United Kingdom, pertussis and influenza vaccines can be administered during the antenatal care visits within the public health system, making vaccine delivery more efficient [22].

Our results have several strengths. We provided not only vaccine coverage estimates but also the barriers and facilitators regarding both vaccines recommended during pregnancy. Pregnant women have been considered an influenza high-risk group for several years in Italy, whereas pertussis vaccine recommendation during pregnancy is novel. In the case of influenza, the low coverage found in our study is in line with the estimates reported in previous Italian studies with figures ranging from 0 % to 9.7 % (5.0–7.0). These estimates fall well behind the goal of 80 % coverage set by Healthy 2020 People [23], and they also indicate Italy as a country with one of the lowest maternal influenza vaccine coverage in the European region [[9], [10], [11],24]. Similarly, we found also a very low pertussis vaccine coverage as stated in previous Italian reports with uptakes ranging from 0 to 1.7 % [8,15]. Therefore, we believe that the implementation of maternal immunization as one of the objectives of the routine antenatal care is needed to narrow the gap between the official recommendation of the National Immunization Plan and the prevention strategies actually offered by the public health system.

Our study has also some limitations. First, we used a self-administered survey that could be open to selection and representation bias. According to information obtained from national reports, 20 % of pregnant women in Italy were immigrant, in contrast with the 10 % figure in our study [21]. This could be due to the fact that study questionnaires were administered only to women having a good command of Italian (selection bias). Also, about 56 % of survey respondents had high education level, a higher proportion compared to the 27 % of pregnant women with such education level in national reports [25]. It is possible that highly educated and autochthonous women could have better knowledge and attitudes regarding maternal immunization than the overall pregnant women population in Italy. In fact, according to our results, pregnant women with low-middle education level were less likely to be vaccinated against pertussis and women whose partners had low-middle education level were also less likely to be vaccinated against both influenza and pertussis. These findings are similar to a previous study conducted in Belgium, which has found that pregnant women and pregnant women whose partner had higher education level reported higher influenza vaccine uptake [9]. Although, the survey responses may not be representative of all pregnant women in Italy, we attempted to maximize the demographic diversity of our study population, recruiting women attending both primary and tertiary care hospitals located in 3 different Italian urban cities.

Another potential limitation was that we did not conduct a multivariate regression analysis due to the low vaccine coverage found in our study. Nonetheless, the detailed descriptive analysis and the univariate models performed in our study showed important trends regarding the barriers to accept maternal immunization among pregnant women in Italy. Finally, self-reported vaccine status could not be verified with official registries due to the anonymous characteristic of the survey and we could not be able to compare with national reports of vaccine uptakes, as these data are not available in Italy.

In conclusion, most pregnant women identified the lack of vaccination advice by a HCP as the main vaccination barrier. Further education of HCPs with particular emphasis on MCPs, framing vaccine information towards the infant's disease protection, and incorporating maternal immunization into routine antenatal care may improve vaccine acceptance among pregnant women in Italy.

Declaration of Competing Interest

LMV has received a consultation fee from GlaxoSmithKline in the past three years. All other authors have no disclosures.

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Appendix A. Supplementary data

Figures

Fig. 1

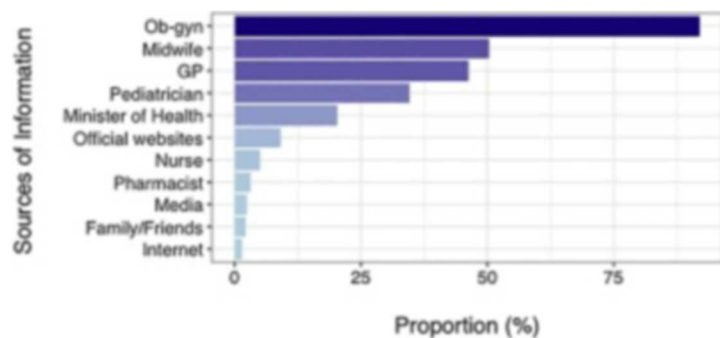


Fig. 1. Sources of information regarding vaccination during pregnancy considered to be reliable by surveyed pregnant women (N = 743)^a.

^aMultiple answers were allowed in this question.

Ob-gyn: obstetrician-gynecologist; GP: general practitioner.

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