

Research Article

# Evaluation of Vaccination Coverage Against COVID-19 Among Postpartum Women at the Gaspard Kamara Health Center in Senegal in 2020

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## Abstract

The COVID-19 pandemic has shaken the world and the rapid delivery of vaccines against the virus has raised many questions. Doubts have been raised about the effectiveness and safety of the vaccine in pregnant and breastfeeding women, hence the need to assess vaccination coverage of postpartum women at the Gaspard Kamara health center. We therefore carried out a cross-sectional analytical study from May 31 to June 28, 2022 on all women who gave birth at the Gaspard Kamara health center. Exhaustive recruitment was carried out and the data were analyzed using the SSP software version 2022. In total, 235 women participated in the study, with a mean age of  $28.22 \pm 5.96$  years and extremes 16 and 44 years old. More than half of the patients (68.94%) had given birth vaginally. Those with secondary education accounted for 72.34%. Less than a quarter of women (7.23%) tested positive for COVID19 and 96.60% of them received information on the fight against COVID19, with the media being their main source of information. Less than half (40.43%) knew the vaccines available in Senegal, Johnson & Johnson being the best known. The majority of women (82.55%) believe in the effectiveness of vaccination to eradicate the disease. Age (30 years), lack of information on the fight against COVID19, lack of knowledge of the risks of serious forms in FE, knowledge of the availability of the vaccine in Senegal and vaccination of the spouse were statistically associated with vaccination against COVID19 among women in this country. study. Conclusion: The results of this study show the need to strengthen awareness and communication on the effectiveness and safety of vaccines among pregnant women, particularly those under 30 years of age. Let women know that they can be vaccinated at any age and during any trimester of pregnancy and breastfeeding.

## Keywords

Prevention, COVID-19, Vaccination, Senegal

## 1. Presentation

On December 31, 2019, China reported a cluster of pneumonia cases of unknown origin in Wuhan, Hubei province [1]. Very quickly the disease presented itself as a public health emergency of international concern and on 03/11/2020 the The World

Health Organization (WHO) has declared it a pandemic.

The organism responsible for this pneumonia syndrome is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It belongs to the order Nirovirales, the family

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Coronaviridae, the subfamily Coronavirinae and the genus Betacoronavirus, subgenus Sarbecovirus. It is an RNA virus that is highly infectious and prone to rapid mutations. More than 4.92 million people have died from COVID-19 as of October 20, 2021 [2]. Alongside widespread public health measures to counter the spread of SARS-CoV-2 (e.g., social distancing, face coverings, quarantine, isolation, improved sanitation), the race to find safe and effective vaccines has begun as this. The latter turns out to be the only way to sustainably fight the virus [3]. Thus, in December 2020, two mRNA vaccine candidates received emergency use authorizations from the United States Food and Drug Administration: Pfizer BioNTech BNT162b2 and Moderna mRNA-1273.5,6. Around the same time, AstraZeneca and the University of Oxford announced positive interim results for their viral vaccine. vector vaccine ChAdOx1.7 [4]. In a report, the WHO says that more than 6 billion doses of COVID-19 vaccines have been administered. As of October 18, less than half (47%) of the world's population had received at least one dose of vaccine.

Given the speed with which COVID-19 vaccines were brought to market and the exclusion of pregnant women in phase III studies, uncertainties remain regarding the vaccination of pregnant and lactating women.

In Senegal, the rapid progression of the disease led the country's authorities to proclaim a state of emergency on March 23, 2020, establishing both a curfew and a ban on gatherings and public demonstrations in open places or closed and a limitation of travel. Travel to raise the level of response to COVID-19 [5]. The vaccination campaign will begin on February 23, 2021 with a cumulative dose of 1,845,249 doses administered as of October 18, 2021.

In order to improve vaccination coverage of pregnant women in the Dakar region, it was deemed necessary to evaluate postpartum vaccination coverage at the Gaspard Kamara health center, central district of Dakar.

## 2. Method

### 2.1. Study Framework

The Central Health District located in the region and department of Dakar served as the framework for carrying out this study. It is made up of 2 districts and 7 local authorities with an area of 28 km<sup>2</sup> for a population of 387,325 inhabitants in 2019, i.e. a density of 13,834 inhabitants/ m<sup>2</sup> according to the National Agency for Statistics and Demography (ANSD).

### 2.2. Study Site

The Gaspard Kamara health center located in the Plateau district and in the district commune of FANN -Point E-Amiti é served as the site for this study. The IT polarizes the neighborhoods of: Sicap rue 10, Point E, Fann residence, Fann Hock, Amiti é 1 and 2. It is the reference center for the central

DAKAR district which covers the entire population of the district.

### 2.3. Type and Duration of Studies

This was a cross-sectional analytical study. Data collection was carried out from May 31 to June 28, 2022.

### 2.4. Population Studied

The population studied was represented by all women followed postpartum at the Gaspard Kamara health center in 2022.

#### 2.4.1. Inclusion Criteria

All women followed postpartum at the Gaspard Kamara health center in 2022 were included in our study.

#### 2.4.2. Non-Inclusion Criteria

Not included are all women followed postpartum at the Gaspard Kamara health center in 2022 and who refused to participate in the survey.

### 2.5. Recruitment

Exhaustive recruitment of all women meeting the inclusion criteria was carried out during the collection period.

### 2.6. Data Collection

#### 2.6.1. Collection Tool

Data was collected using a tested and validated structured questionnaire.

#### 2.6.2. Data Collection Method

Data were collected during an individual interview with the women. Data relating to COVID-19 vaccination status was collected on the basis of their declarations. The survey was carried out by a medical student and the data were collected at the normal and pathological postpartum unit of the gynecology department of the Gaspard Kamara health center.

#### 2.6.3. Collection Instrument

Data collection was carried out with the ODK (Open Data Kids) application. It is a suite of tools that allows you to collect data using mobile devices (running Android) and submit that same data to an online server.

### 2.7. Analysis Method

The analysis was carried out with SPSS version 22 software and included two parts: descriptive analysis and analytical analysis.

### 2.7.1. Descriptive Analysis

In the descriptive analysis, qualitative variables were described as number, percentage and quantitative variables as mean with standard deviation, extremes, mode and median.

### 2.7.2. Analytical Analysis

For the multivariate analysis, a binary logistic regression method was used. All variables whose p-value was  $\leq 0.25$  were retained to model the factors associated with COVID19 vaccination. Bottom-up modeling was carried out. The adjusted ORs with their [95% CI] were determined for each variable retained in the final model. The goodness of fit of the model was studied with the Hosmer and Lemeshow test to verify its adequacy.

## 2.8. Ethical Considerations

Authorization from the chief physician of the health district and that of the chief physician of the gynecology department was obtained before the start of the investigation. Free and informed consent from each woman was obtained before the start of the investigation. The data was collected anonymously and confidentially.

The survey having been carried out in the midst of an epidemic, the prevention rules against Coronavirus were respected, in particular the compulsory wearing of a mask, the use of hydroalcoholic gel and social distancing of at least 1 m from the respondent.

## 3. Results

The study included 235 patients. The mean age of the patients was  $28.22 \pm 5.96$  years and ranged between 16 and 44 years. The mode and median were 25 and 27 years, respectively. The 20-29 age group was the most represented, at 56.17%.

The average number of pregnancies was  $\pm 1.5$  and ranged from 1 to 7 pregnancies. The mode and median were 1 and 2 pregnancies, respectively. Paucigestosis increased in this study, i.e. 39.57%.

More than half of the patients, or 68.94%, gave birth vaginally compared to 31.06% who had a cesarean section.

Of the 235 patients, 12.77% developed complications during pregnancy.

Almost all patients (94.47%) were married, only 5.11% were single compared to 0.43% widowed.

More than half of the patients (72.34%) were educated and had mainly reached secondary school level (31.06%). Uneducated people accounted for 8.94% and 18.72% had received Arabic Quranic education.

A little more than half of the patients (52.27%) had an income-generating activity. Of our entire sample, 70.97% carried out activities in the informal sector compared to 22.58% in the formal private sector. Almost all patients (96.98%) had

a television at home.

Almost all patients (90.64%) had a telephone.

**Table 1.** Distribution of women according to sociodemographic and gynecological characteristics.

Features	Number	%
Age (year)		
<20	11	4.68
20 - 29	132	56.17
30 - 39	88	37.45
$\geq 40$	4	1.70
Number of pregnancies (Gestation)		
1	88	37.45
2 - 3	93	39.57
4 - 5	47	8:00 p.m.
$\geq 6$	7	2.98
Delivery method		
Low way	162	68.94
Caesarean section	73	31.06
Complications during pregnancy		
Yes	30	12.77
No	205	87.23
Marital status		
Brides	222	94.47
Simple	12	5.11
Widow	1	0.43
Education level		
None	21	8.94
Arabic/Quran	44	18.72
Primary	58	24.68
Secondary	73	31.06
Superior	39	4:60 p.m.
Branch of activity		
Informal sector	88	70.97
Private formal sector	28	10:58 p.m.
Official	6	4.84
Public sector (non-civil servant)	2	1.61
Total	124	100.00
Availability of television at home		
Yes	225	96.98

Features	Number	%
No	10	3.02
Telephone possession		
Yes	213	90.64
No	22	9.36

A total of 17 patients (7.23%) tested positive for COVID19.

Almost all patients 96.60% had received information on the fight against COVID19. The media was the main source of information on the fight against COVID19 with 94.71%.

Among the 235 patients surveyed, 22.98% knew someone with COVID19. Regarding the people cited by women, par-

ents and friends represented 62.96% and 55.56% respectively.

Among the 235 patients questioned, 53.19% knew the risks of severe forms of COVID-19 in pregnant women.

Of the 235 patients questioned, 40.43% knew the vaccines available in Senegal. Johnson & Johnson was the leading 80% known vaccine.

Almost all of the patients, i.e. 82.55%, believed in the effectiveness of vaccination for the eradication of diseases compared to 12.34% who did not believe in it and 5.11% who had no opinion.

Only 20 patients (8.51%) had been vaccinated against COVID-19 during the current pregnancy. Johnson & Johnson was the primary vaccine women received.

**Table 2.** Distribution of respondents according to sources of information on the fight against COVID-19.

Sources of information on the fight against COVID19	Number	%
Media	215	94.71
Social networks	155	68.28
Surroundings	119	52.42
Personal health	93	40.97
Knowledge of a person with COVID19		
Colleagues	7	12.96
Neighborhood resident	16	29.63
Friends	30	55.56
Parents	34	62.96
Total	54	100.00
Knowledge of the risk of severe forms of COVID-19 in pregnant women		
Yes	125	53.19
No	110	46.81
Knowledge of anti-Covid vaccines available in Senegal		
Yes	95	40.43
No	140	59.57
Total	235	100.00
Type of anti-Covid vaccines available in Senegal		
Johnson & Johnson	76	80.00
AstraZeneca	38	40.00
Sinopharm	3	3.16
Belief in the effectiveness of vaccination for the eradication of diseases		
Yes	194	82.55
No	40	12.34
No reviews	12	5.11

Sources of information on the fight against COVID19	Number	%
Type of vaccine received by women		
Johnson & Johnson	117	50.00
AstraZeneca	82	35.00
Sinopharm	24	10.00 a.m.
I don't know	12	5.00 a.m.

Among the 20 vaccinated patients, 70% had received one dose and 30% 2 doses.

Almost all patients (95.0%) were vaccinated before pregnancy; only one patient (5%) was affected during pregnancy.

Only 29.36% of patients knew if their spouse was vaccinated against COVID19.

The vaccination location was 75% in a vaccinodrome compared to 20% in a health center.

The reasons for getting vaccinated were mainly due to better health.

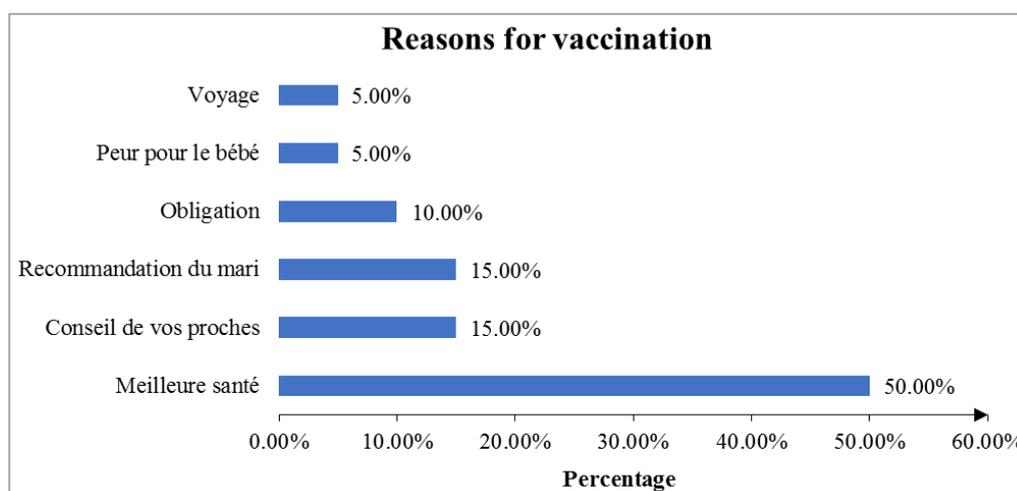


Figure 1. Distribution of patients according to reasons for vaccination.

Regarding factors associated with COVID19 vaccination, age group was significantly associated with COVID19 vaccination. Indeed, COVID19 vaccination was 3.54 [1.15-10.92] higher among patients aged 30 and over.

Source of information on combating COVID19 was significantly associated with COVID19 vaccination. Indeed, vaccination was 7.56 [2.15-26.59] higher among patients who had not been informed about the fight against COVID19 by those around them.

Knowledge of the risk of severe forms of COVID19 among FEs was significantly associated with vaccination against COVID19. Indeed, vaccination was 3.61[1.16-11.23] higher

in patients unaware of the risks of severe forms of COVID19 in FE.

Knowledge of the availability of the anti-COVID19 vaccine in Senegal was significantly associated with vaccination against COVID19. Indeed, vaccination was 11.36 [3.03-43.48] higher among patients who knew the availability of the anti-COVID19 vaccine in Senegal.

Taking the vaccine by the spouse was significantly associated with vaccination against COVID19. Indeed, vaccination was 4.72 [1.57-14.28] higher in patients whose spouse had received the vaccine.

Table 3. Factors associated with COVID-19 vaccination.

Factors	Frequency and %	[95% CI]	adjusted GOLD	P-value
Age				0.028 *

Factors	Frequency and %	[95% CI]	adjusted GOLD	P-value
Under 30	9 (6.29)	1		
30 years and over	11 (11.96)	[1.15-10.92]	3.54	
Information on the fight against COVID19 from those around you				0.002 *
Yes	1 (3.36)	1		
No	16 (13.79)	[2.15-26.59]	7.56	
Knowledge of the risks of severe forms of COVID19 in pregnant women				0.018 *
Yes	8 (6:40 a.m.)	1		
No	12 (10.91)	[1.16-11.23]	3.61	
Knowledge of the availability of the anti-COVID19 vaccine				0.000*
Yes	16 (16.84)	[3.03-43.48]	11:36 a.m.	
No	4 (2.86)	1		
Spouse vaccination				0.006*
Yes	13 (18.84)	[1.57-14.28]	4.72	
No	7 (4.22)	1		

P-value = 0.959

## 4. Discussion

Almost all women in this study believe in the effectiveness of vaccines in eradicating the disease. Indeed, in a report published by the coraf project (Coronavirus Anthrope Africa) on the relationships between perceptions of the anti-COVID-19 vaccine and other vaccines in Senegal, the majority of people interviewed express their satisfaction and confidence in EPI (Expanded Vaccination Program) vaccines, by mentioning their effectiveness [6].

Postpartum women in the Gaspard Kamara district showed a low vaccination rate compared to the study population. Although we do not have statistics on vaccination coverage of postpartum women at the national level, these results are consistent with those obtained by the COVID-19 module of the National Adult Immunization Survey (NIS-ACM) in a survey of COVID-19 vaccination coverage and intention. 19 in women aged 18 to 49 by pregnancy status, in the United States, between April and November 2021. Indeed, this study included 110,925 women aged 18 to 49. COVID-19 vaccination coverage ( $\geq 1$  dose) was 63.2% overall. Vaccination coverage was lowest among pregnant women (45.1%), followed by women who were trying to become pregnant (49.5%), women who were breastfeeding (51.5%), and all other women (64.9%) [7]. This low vaccination rate among postpartum women could be partly explained by limited information on the effects of the vaccine on pregnancy, breast-

feeding and long-term risks for the newborn. At the start of the global vaccination campaign, there were few scientific studies on the effect of vaccination on pregnancy. Thus in the United States, the American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) unanimously said they were disappointed by the lack of inclusion of pregnant women in clinical trials. And that pregnant women should be allowed to participate and benefit from the safety measures built into modern IRB-approved clinical trials [8]. At the national level, the vaccination campaign has at no time taken into account the situation of pregnant and breastfeeding women. Several women said they had not received information about COVID-19 vaccination from their primary care physician. Furthermore, this low vaccination rate can also be explained by the fact that although the WHO in its roadmap of the Strategic Advisory Group of Experts (SAGE) on immunization, whose objective is to help countries to prioritize population groups for COVID-19 vaccination in contexts of limited supply, drawing on the best current understanding of the disease burden as well as generally accepted values and preferences, considers that in accordance with the principle of equal respect for the value framework, pregnant women are included in stage II of all epidemiological scenarios of the roadmap, in the category "Groups with comorbidities or a particular health state considered to be considerably more at risk serious illness or death. In many contexts, including scenarios of community transmission and sporadic cases or clusters of cases, it is likely that these risks are greater than any theoretical risks posed by

vaccination (to date, available data do not indicate any additional risks) [9]. In Senegal, The government has developed a recovery plan focused on vaccinating high-risk groups, including the elderly, those with co-morbidities and frontline health workers. Thus, at the start of the vaccination campaign, pregnant women were not among the priority people.

The Johnson & Johnson vaccine was the main vaccine received followed by the ASTRAZENECA vaccine and the SINOPHARM vaccine. This predominance of the Johnson & Johnson vaccine is explained by the fact that it is through its arrival that the vaccination campaign was extended to non-priority people. In the survey carried out by the Consultative Committee on Vaccination in Senegal (CCVS) on the acceptability of COVID19 vaccines within communities in Senegal, the majority of respondents had a preference for single-dose vaccines. The results of this same survey show that Vaccination decision-making remains influenced by several factors. Indeed, the type of vaccine, the country of manufacture, the number of doses and communication on the side effects of the vaccine are considered key factors related to decision-making [10]. The Sinopharm and Astrazeneca vaccines requiring several doses were available at the start of the vaccination campaign. During the month of MAY 2021, Senegal was faced with the 3rd wave of the COVID-19 epidemic. This 3rd wave of the epidemic is characterized by a sharp increase in the number of cases with the presence of the Delta variant with very high contagiousness rapidly spreading [11]. During this same period, there was a shortage of Sinopharm and Astrazeneca vaccines. One of the consequences of this 3rd wave was the influx of populations to hospitals and health centers.

COVID-19 vaccines and data show that several determining factors help or hinder vaccination. For half of the vaccinated women in our study, the reason which pushed them to be vaccinated was to improve their health. Indeed, COVID-19 vaccines protect against severe forms of the disease and death, by helping the body develop immunity. They can also help reduce human-to-human spread of the virus. Adequate vaccination coverage against COVID-19 is the guarantee of herd immunity. Studies indicate that when the basic reproduction number ( $R_0$ ) is estimated at three, the herd immunity threshold for COVID-19 is approximately 67% [12]. In its report on how to create community engagement for COVID-19 vaccines, WHO says community engagement encourages acceptance and uptake of COVID-19 vaccines by communities and individuals [13]. Thus 15% of vaccinated women did so on the recommendation of their loved ones and particularly the “badjenu gox” who went around the neighborhoods to explain the importance of vaccination. Among the factors hindering vaccination, ignorance was the main factor for the women in our study. An online registration platform has been set up to make an appointment for people wishing to be vaccinated, but in its latest report the National Agency for Statistics and Demography (ANSD) estimates the illiteracy rate to “54.6% with 62.3% women, compared to 46.3%” for men”

[14]. Distrust of COVID-19 vaccines is also a factor slowing vaccinations. The suspension of use of the AstraZeneca vaccine in some European countries, South African data on its effectiveness and the temporary halt of the Johnson & Johnson vaccine in the United States to study cases of blood clots have shaken confidence in COVID-19. 19 vaccinations [15]. Rumors about the supposed dangerousness of vaccines hamper their acceptability. Controversies and unfavorable prejudices maintained via social networks and digital platforms. This false information about the dangerousness of vaccines spreads on networks and constitutes sources of distrust and resistance towards vaccines. The findings reveal that this “misinformation” centers on sensitive issues, including that vaccines harm fertility. According to the WHO, vaccine hesitancy is considered a threat to global health [16].

Factors such as age, information on the fight against COVID19 from those around you, knowledge of the risks of severe forms of COVID19 in pregnant women, knowledge of the availability of the anti-COVID19 vaccine, vaccination of the spouse were statistically associated with COVID vaccination. 19.

The results of our study suggest that vaccination against COVID-19 is higher among patients aged 30 and above. In its fourth report, the PERC (Partnership for Evidence-Based Response to COVID-19), on striking a balance: Social and public health measures show that vaccination intention was higher among older people. Indeed, three out of four respondents over the age of 46 say they are vaccinated or probably would be, which is the case for only half of respondents aged 18 to 25 [17]. Research has shown that in adolescents, SARS-CoV-2 infection generally results in milder illness than in adults and results in fewer deaths [18].

Almost all women in our survey received information about the fight against COVID-19 and the media is the main source of information. This could be explained by the fact that the Ministry of Health and Social Action continued to disseminate awareness information via television, radio and social media. Almost all women have access to information. The results of a survey on the knowledge, attitudes and practices of the Dakar population on infection linked to the new coronavirus in Senegal report that almost all (99.3%) found the information useful on the fight against it. new coronavirus. coronavirus (91.3%) [19].

The study results show that the source of information on combating COVID-19 was significantly associated with COVID-19 vaccination. The sudden and almost continuous flow of information has fueled fear among certain populations. Thus, some people were much more reluctant, despite the presence of symptoms of the disease, to use the diagnostic test and vaccines. Thus only 7.23% of the women in our study had tested positive for COVID-19 and 22.98% knew someone with COVID-19. The director of the WHO will say “Our greatest enemy to date, this is not the virus itself. It’s rumors, fear and stigma” [20].

The results of this study show that women who knew the

risk of severe form of COVID-19 were less willing to be vaccinated. Indeed, knowledge of the risks of serious forms of COVID-19 combined with rumors about the existence of the disease and the safety of vaccines arouses fear in some women. In a study by Mhereeg et al on COVID-19 vaccination during pregnancy, they reported that the reasons for refusing to be vaccinated was the lack of research on the long-term consequences for the baby, anxiety related to vaccines, inconsistent advice/information [21].

## 5. Strengths and Limitations of the Study

This study is the first to examine vaccination coverage of pregnant women in Senegal. Limitations are that this study was only conducted in one health center in the central district, the sample size is relatively small (235 women), and the vaccination status data was obtained based on their claims.

## 6. Involvement in Research and Practice

The results of this study contribute to a better understanding of vaccination coverage of pregnant women in Senegal as well as the factors influencing this vaccination. The results of this study will help guide actions aimed at improving women's health in Senegal. They will also make it possible to consider other, larger studies, which will provide more important data to understand the barriers to access to vaccination for pregnant women.

## 7. Conclusion

The year 2020 was marked by the coronavirus pandemic which impacted the world on a health, socio-economic and cultural level. The speed of delivery of COVID-19 vaccines and so-called rumors about the existence of the disease and the vaccines have sowed doubt about the safety of the vaccines. Pregnant women considered since the start of the pandemic as people at risk of serious complications have been excluded from clinical trials for the development of vaccines against COVID-19.

Since then, many questions have been raised about the effectiveness and safety of vaccines in this population. Although the World Health Organization (WHO) and other medical organizations and committees have approved the use of COVID-19 vaccines in pregnant women based on a risk-benefit analysis, their vaccinations remain still weak.

## Abbreviations

ACOG	American College of Obstetricians and Gynecologists
RNA	Ribo-Nucleic Acids
ANSD	National Agency for Statistics and

COSV	Demography
Okay	Vaccination Strategy Guidance Council
WHO	Children of Open Data
SARS-CoV-2	World Health Organization
	Severe Acute Respiratory Syndrome
	Coronavirus 2
SMFM	Maternal-Fetal Medicine Society
WISE	Expert Strategic Advisory Group

## Author Contributions

Study design: BM, AOT, MMML

Data collection: BM.

Data analysis: BM and AOT

Initial writing of the manuscript: AOT and BM

Manuscript revision: MMML

The authors read and approved the final manuscript.

## Declarations

### Ethics Approval and Consent to Participate

Like any study involving human subjects, participants were informed of the study and provided informed consent before answering questions.

### Availability of Survey Data

The data supporting the results of this study are available from [Amadou Oury Tour [e](#)], but restrictions apply to the availability of this data and are therefore not publicly available, as our research group is working on other analyzes using the same data which will then be submitted for publication. However, these data are available on reasonable request from the corresponding author [Amadou Oury Tour [e](#)].

## Conflicts of Interest

The authors declare that there is no conflict of interest.

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