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Knowledge and Practices of Women Attending Postnatal Consultations on Vaccination Against COVID-19 in the Health District of Sakal in 2022 (Senegal)

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ABSTRACT

Introduction: *The COVID-19 pandemic remains a public health problem despite the lulls between waves. Achieving the goal of broad vaccination coverage is of paramount importance, particularly for populations at risk of severe forms of COVID-19. Hence the interest in studying vaccination among women attending post-natal consultations in the Sakal Health District.*

Methodology: *A cross-sectional, descriptive and analytical study was conducted from 28 June to 27 October 2022. The study population consisted of women who had given birth and/or come for a postnatal consultation in the Sakal health district. Data were analysed using R 4.2 software.*

Results: *The mean age of the women surveyed was 26.56±6 years, with extremes of 17 to 43 years. The median age was 25 years. The age groups most represented were [20-30], with a proportion of 50.6%. More than 80% of these women were uneducated (30.4%) or had no more than primary education (51.4%). A further 17% had completed secondary education, and only 1.2% had completed higher education. A quarter of these women had an income-generating activity (15.2%). Almost ¾ of respondents had a television at home (70.2%) and a telephone (73.1%). Of those who had a phone, more than half (65.1%) had a smartphone, almost all of which had access to social networks (96.3%). The types of social network whose use was significantly associated with vaccination against COVID-19 were: WhatsApp (p=0.004), Facebook (p=0.008), TikTok (p=0.021) and YouTube (p=0.015). YouTube was the source of information with a statistically significant association with vaccination against COVID-19 (p=0.015). The next three elements, i.e. knowledge of previous COVID-19 infection (p=0.01), knowledge of someone who had been infected with the disease (p=0.042) and knowledge of available COVID-19 vaccines (p<0.001) were significantly linked to vaccination against COVID-19. Women who were aware of the available COVID-19 vaccines were 8.33 times more likely to be vaccinated. All the women surveyed were married, 25.7% of whom had been vaccinated, and those whose spouses had been vaccinated were 7.3 times more likely to be vaccinated in turn (p<0.001).*

Conclusion: *The results of this study demonstrate the need to raise awareness of COVID-19 vaccination among pregnant women, with the full involvement of the spouse. Priority should be given to raising awareness of the seriousness of COVID-19 in pregnant women, the benefits of being vaccinated and, of course, reassurance about the safety of the available COVID-19 vaccines.*

Keywords

Vaccination, COVID-19, Women, Pregnancy, Post-natal, Senegal.

Introduction

COVID-19 is an infectious disease caused by the latest coronavirus to be discovered. It was unknown until the outbreak in Wuhan

(China) in December 2019 and rapidly became pandemic, affecting many countries around the world, where its ability to spread in a population without immunity is well established.

Most people infected with the virus have a mild to moderate respiratory illness and recover without needing any special treatment. Some, however, become seriously ill and require medical attention. Elderly people and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease or cancer are at greater risk of developing a severe form. Anyone, at any age, can contract COVID-19 and become seriously ill or die from it [1].

Among other things, a number of studies have shown that the risk of contracting a severe form of COVID-19 is greater for a pregnant woman than for a woman of the same age who is not pregnant [2]. COVID-19 increases the risk of premature delivery, especially in severe forms. The rate of premature birth before 37 weeks' amenorrhoea (SA) was 27.6%. Among other things, a number of studies have shown that the risk of contracting a severe form of COVID-19 is greater for a pregnant woman than for a woman of the same age who is not pregnant [2]. COVID-19 increases the risk of premature delivery, especially in severe forms. The rate of premature birth before 37 weeks' amenorrhoea (SA) was 27.6% among the 617 cases in the French study, with a rate of 10.1% in women with a minor form and 63.8% in women with a severe form [3]. Vaccination is one of the best ways of protecting a population from epidemics (from the Greek epi = above and demos = people). It is a public health measure designed to prevent the sudden spread of an infectious disease to the entire population, but it does not prevent the occurrence of sporadic cases. It is a collective protection measure that minimises the health and economic impact of any infectious disease that may benefit from it.

The arrival of vaccines against COVID-19 at the end of December 2020 is therefore of crucial importance. While it usually takes several years to develop a vaccine against a new infectious disease, it has taken just a few months for various laboratories to make vaccines available on a very large scale.

Although pregnant women were not included in the first clinical trials of COVID-19 vaccines, the evidence for the safety of vaccination against COVID-19 during pregnancy is mounting. It was against this backdrop that several countries introduced vaccination of pregnant women against the new coronavirus [4].

However, in 2015, the World Health Organization (WHO) Strategic Advisory Group of Experts on Immunisation defined vaccine reluctance as a "delay in acceptance or refusal of vaccination despite the availability of vaccination services", which can vary in form and intensity depending on when and where it occurs and the vaccine involved, as has been confirmed in numerous studies. In many countries, reluctance to vaccinate and misinformation are major barriers to vaccination coverage and community immunity [5].

Against this background, we felt it necessary to study the knowledge and practices of women attending post-natal consultations regarding vaccination against infection with the new coronavirus (COVID-19) in the Sakal health district in Senegal in 2022.

Materials and Method

The aim is to carry out scientific studies in order to contribute to the orientation of strategies to combat COVID-19. This is a cross-sectional, descriptive and analytical study of knowledge and practices concerning vaccination against COVID-19 among women attending PNC (postnatal consultation) in the Sakal health district from 17 April to 10 January 2023.

The general objective was to study the knowledge and practices of women attending postnatal consultations on vaccination against COVID-19 in the Sakal health district in the Louga medical region, in order to contribute to the reduction of mortality and morbidity linked to COVID-19 in Senegal. To do this, we studied the sociodemographic characteristics of women undergoing PNC, determined their level of knowledge about vaccination against COVID-19, estimated the proportion of women undergoing PNC(postnatal consultation) who were vaccinated against COVID-19, and analysed the factors associated with this vaccination.

The study population consisted of all women attending postnatal consultations in the Sakal health district. All women undergoing PNC (postnatal consultation) in the district who agreed to participate in the study were included. Any woman whose clinical condition did not allow her to take part in the survey was not included. A questionnaire was used. It was administered to people who met the inclusion criteria. The data were analysed using R 4.2 software. The data analysis consisted of two parts: a descriptive part and an analytical part. Qualitative variables were described by calculating frequencies and their 95% confidence intervals, while quantitative variables were described by calculating means and standard deviations. A bi-variate analysis was carried out using cross-tabulations between variables. These were carried out using the Chi-square or Fisher tests, depending on their applicability. The test was significant if the p was less than 0.05. The odds ratio, surrounded by its confidence interval (CI), was used to quantify the strength of the relationship. For the multivariate analysis, bivariate analyses with a p less than 0.2 were used to construct models using simple logistic regression. The adjusted odds ratio (ORaj) with its confidence interval was calculated.

Results

Descriptive results

Localities

The study covered women undergoing ANC in the Sakal Health District, with 106 women surveyed at the Sakal health centre, 24 at the Keur Sambou health post, 15 at the Potou health post, 13 at the Médina Thiolom health post, 10 at the Syer Peulh health post, and 03 at the Ngueun Sarr health post, making a total of 171 women surveyed.

Antenatal and Postnatal Monitoring Data

■ Age

The average age of the women surveyed was 26.56±6 with extremes of 17 to 43 years. The median was 25 years. The most common age range was [20-30], with a proportion of 50.6% (Figure1).

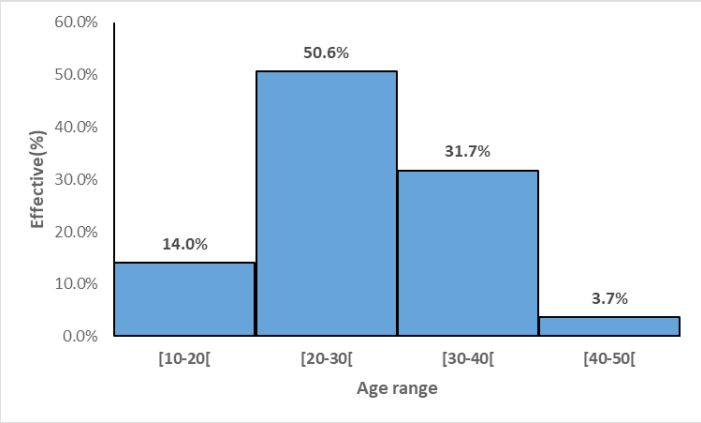

Figure 1: Breakdown of women by age group (years).

■ Gender

The average gestational age was 4, with extremes of 1 and 8. Among the women surveyed, the gestational age was 1 in 18.1%, 2 in 18.8%, 3 in 18.1% and greater than or equal to 4 in 45%. (Figure 2).

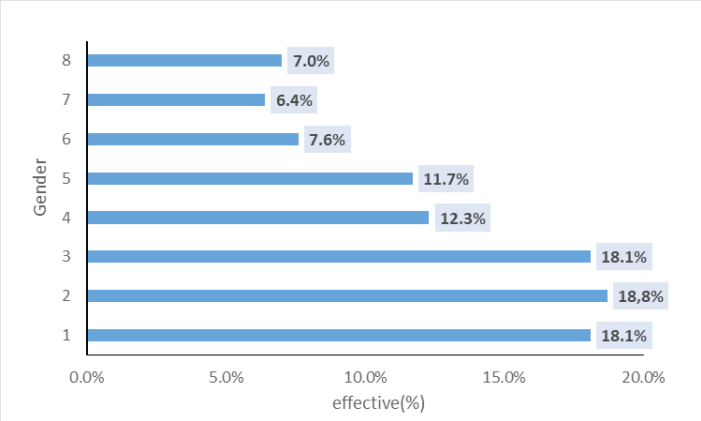

Figure 2: Breakdown of women by gender.

■ Parity

The average parity was 3, with extremes of 1 and 8. Of the women surveyed, 22.2% were primiparous; parity was 2 in 21.2%, 3 in 12.3% and greater than or equal to 4 in 44.3% of the women surveyed (Figure 3).

■ Mode of delivery

The rate of vaginal delivery was predominant at 91.2%.

■ Complications

There were 14 women surveyed who had complications during childbirth, representing 8.2%.

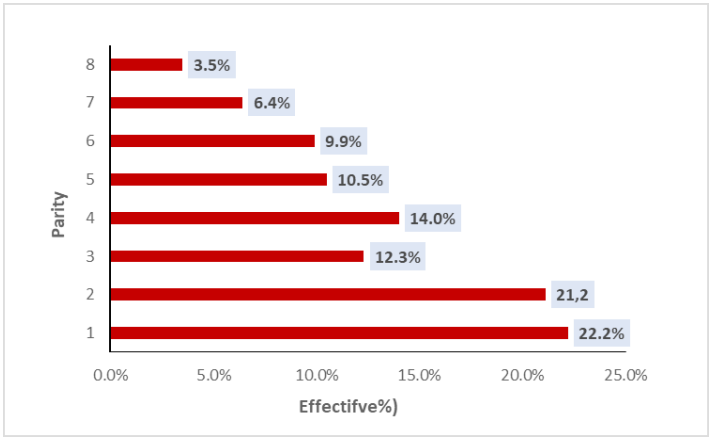

Figure 3: Breakdown of women by parity.

■ Number of PNC

Of the women surveyed, 33.9% were in their 1st PNC, 48% in their 2nd PNC and 18.1% in their 3rd PNC (Table 1).

Table 1: Breakdown by number of PNCs.

Number of PNC	Effective	(%)
1	58	33,9
2	82	48
3	31	18,1
Total	1	100

Socio-demographic characteristics

All the women surveyed stated that they were married. Of these, 30.4% were uneducated, 1.2% educated to tertiary level, 17% to secondary level and 51.4% to primary level. In terms of income, 15.2% had an income-generating activity, 70.2% had a television at home, 73.1% had a telephone, 65.1% of which was a smartphone, and 96.3% had access to social networks.

In our study 46.2% of the women surveyed used WhatsApp, 24% used YouTube, 24.6%, 19.3% and 23.4% used TikTok, Facebook and Snapchat respectively.

Knowledge of COVID-19 and vaccination

In our study, 93.6% of the women surveyed stated that they had received information about the fight against COVID-19, 8.1% knew someone who had been infected by this disease, 5.3% (9 women surveyed) had themselves been infected by the COVID-19 virus and 49.4% knew that pregnant women are at risk of developing a severe form of COVID-19. The proportion of women with knowledge of the COVID-19 vaccines available in Senegal was 6.8% (11 women), 18.2% of whom were familiar with AstraZeneca, Johnson & Johnson and Sinopharm. The proportion of women who believed in the effectiveness of the vaccine in eradicating the disease was 81.9% (140 women). The media was the source of information for 66.7% of the women surveyed, 43.3% obtained information from friends and family and 24.6% from social networks (Table 2).

Table 2: Distribution of women according to knowledge of the disease and vaccine source of information.

Knowledge on the desease	Effectifve	%
Women who have received information about the fight against COVID-19	160	93,6
Women who knew someone who had contracted the disease	13	8,1
Women who knew that pregnant women are at risk of developing a serious form of COVID-19	80	49,4
Women already infected with the COVID-19 virus	9	5,3
Knowledge on the vaccine	**Effective**	**%**
AstraZeneca	5	45,4
AstraZeneca/Johnson & Johnson/Sinopharm	2	18,2
AstraZeneca/Sinopharm	1	9,1
Johnson & Johnson	2	18,2
Sinopharm	1	9,1
Origin of information	**Effective**	**%**
Media	114	66,7
Surroundings	74	43,3
Social networks	42	24,6
Healthcare workers	109	63,7
YouTube	41	24,
Instagram	15	8,8
Snapchat	40	23,4
YouTube	41	24,
Instagram	15	8,8
Snapcha	40	23,4

Vaccination practices

In our study the proportion of women vaccinated was 25.7% (44 women), of whom 20.5% had been vaccinated with Sinopharm, 11.4% with AstraZeneca and 9.1% with Johnson & Johnson.

Our study showed that 68.2% of women had received one dose of COVID-19 vaccination, 29.5% had received 2 doses and 2.3% had received their 3rd dose (Table 3).

Table 3: Distribution of women according to the type of vaccine used and Number of doses.

Type of vaccine used	Effectifve	%
Sinopharm	9	20,5
AstraZeneca	5	11,4
Johnson & Johnson	4	9,1
Don't know	26	59
Total	44	100
Number of doses	**Effectifve**	**%**
1	30	68,2
2	13	29,5
3	1	2,3
Total	44	100

■ The vaccination period

The proportion of women vaccinated before pregnancy was 52.3%. The remaining 34.1% were vaccinated during pregnancy and 13.6% after pregnancy (Table 4). Of the women surveyed, 47.7% were vaccinated at the Sakal health centre, 27.3% at health posts and 22.7% at a vaccinodrome (Table 4).

Table 4: Distribution of women according to vaccination period.

Period de vaccination	Effective	%
Before your pregnancy	23	52,3
During your pregnancy	15	34,1
After your pregnancy	6	13,6
Total	44	100
Place of vaccination	**Effective**	**%**
Health Center	21	47,7
Health post	12	27,3
Vaccinodrome	10	22,7
SAMU Municipal	1	2,3
Total	44	100

■ Reasons for vaccination against COVID-19

74.4% of women were vaccinated to protect their health, 18.6% followed the recommendations of their husband or a village authority, 16.3% were afraid for their baby and 11.6% took their relative's advice into account (Table 5).

The proportion of women who agreed to take an additional dose was 86% (37 cases). A total of 55 spouses were vaccinated, i.e. 32.2%.

■ Reasons for refusing to be vaccinated

Our survey revealed that 33.10% of women were afraid to be vaccinated, 10.2% were suspicious, 28.3% would not have been vaccinated out of ignorance, 23.6% could find no reason for their non-vaccination, while 7.9% said that the vaccines were unavailable and 1.6% obeyed their husband's refusal (Table 5).

Table 5: Distribution of women according to reasons for or refusal of vaccination.

Reasons for vaccination	Effective	%
For your health	32	74,4
Recommendations (Husband/Authority)	8	18,6
Fear for the baby	7	16,3
Advice from relatives	5	11,6
Reasons for refusing vaccination	**Effective**	**%**
Fear	42	33,1
Ignorance	36	28,3
Don't know	30	23,6
Mistrust	13	10,2
Vaccine unavailable	10	7,9
Husband refuses	2	1,6
Permanent illness	1	0,8

Analytical results

Bivariate analysis

Factors favouring vaccination

■ Vaccination and antenatal and postnatal follow-up data

There was no statistically significant association between vaccination and antenatal and postnatal follow-up data (Table 6).

Table 6: Vaccination and antenatal and postnatal follow-up data.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Age	26.4 (6.25)	27.1 (6.73)	0.564
Gender			0.418
[0-2]	48 (76.2%)	15 (23.8%)	
[3-5]	50 (69.4%)	22 (30.6%)	
[6-8]	29 (80.6%)	7 (19.4%)	
Parity			0.476
[0-2]	53 (71.6%)	21 (28.4%)	
[3-5]	46 (73.0%)	17 (27.0%)	
[6-8]	28 (82.4%)	6 (17.6%)	
Complications			0.523
No	115 (73.2%)	42 (26.8%)	
Yes	12 (85.7%)	2 (14.3%)	
Nomber of CPoN			0.597
1	45 (77.6%)	13 (22.4%)	
2	58 (70.7%)	24 (29.3%)	
3	24 (77.4%)	7 (22.6%)	

■ Vaccination and socio-demographic characteristics

Only the smartphone ownership was significantly associated with vaccination against covid-19: p=0.017 (Table 7).

Table 7: Vaccination and socio-demographic characteristics.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Level of education			0.203
No education	41 (78.8%)	11 (21.2%)	
Primary	67 (76.1%)	21 (23.9%)	
Secondary	17 (58.6%)	12 (41.4%)	
Higher	2 (100%)	0 (0.00%)	
Income generating activity			0.063
No	112 (77.2%)	33 (22.8%)	
Yes	15 (57.7%)	11 (42.3%)	
Television at home			0.316
No	41 (80.4%)	10 (19.6%)	
Yes	86 (71.7%)	34 (28.3%)	
Ownership of a telephone			0.357
No	37 (80.4%)	9 (19.6%)	
Yes	90 (72.0%)	35 (28.0%)	
Smartphone			**0.017***
No	38 (86.4%)	6 (13.6%)	
Yes	53 (64.6%)	29 (35.4%)	
Access to social networks			0.549
No	3 (100%)	0 (0.00%)	
Yes	50 (63.3%)	29 (36.7%)	

■ Types of social networks

The types of social network whose use was significantly associated with vaccination were :

-WhatsApp: p=0.004

-Facebook: p=0.008

-TikTok: p=0.021

-YouTube: p=0.015 (Table 8)

Table 8: Vaccination and type of social network.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
WhatsApp			**0.004**
No	77 (83.7%)	15 (16.3%)	
Yes	50 (63.3%)	29 (36.7%)	
Facebook			**0.008**
No	109 (79.0%)	29 (21.0%)	
Yes	18 (54.5%)	15 (45.5%)	
Twitter			0.273
No	125 (74.9%)	42 (25.1%)	
Yes	2 (50.0%)	2 (50.0%)	
TikTok			**0.021**
No	102 (79.1%)	27 (20.9%)	
Yes	25 (59.5%)	17 (40.5%)	
YouTube			**0.015**
No	103 (79.2%)	27 (20.8%)	
Yes	24 (58.5%)	17 (41.5%)	
Instagram			0.538
No	117 (75.0%)	39 (25.0%)	
Yes	10 (66.7%)	5 (33.3%)	
Snapchat			0.185
No	101 (77.1%)	30 (22.9%)	
Yes	26 (65.0%)	14 (35.0%)	

■ Vaccination and knowledge about the disease

The factors with a statistically significant association with vaccination against COVID-19 were:

-knowledge of a previous infection with COVID-19: p=0.01 ;

-knowledge of someone who had been infected with the disease: p=0.042

-knowledge of available COVID-19 vaccines: p<0.001 (Table 9).

Table 9: Vaccination and knowledge of the disease and vaccination.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Already infected with the COVID-19 virus			**0.010**
No	124 (76.5%)	38 (23.5%)	
Yes	3 (33.3%)	6 (66.7%)	
Women who have received information on the fight against COVID-19			0.731
No	9 (81.8%)	2 (18.2%)	
Yes	118 (73.8%)	42 (26.2%)	
Knowledge of someone who has had the disease			**0.042**
No	112 (76.2%)	35 (23.8%)	
Yes	6 (46.2%)	7 (53.8%)	
Knowledge that pregnant women are at risk of developing severe forms of COVID-19			0.178
No	65 (79.3%)	17 (20.7%)	
Yes	55 (68.8%)	25 (31.2%)	

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Knowledge of COVID-19 vaccines available in Senegal			**<0.001**
No	118 (78.1%)	33 (21.9%)	
Yes	2 (18.2%)	9 (81.8%)	

■ Sources of information

The source of information that was significantly associated with vaccination was :

YouTube: p=0.015 (Table 10).

Table 10: Vaccination and sources of information.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Media			0.757
No	41 (71.9%)	16 (28.1%)	
Yes	86 (75.4%)	28 (24.6%)	
Surroundings			0.222
No	76 (78.4%)	21 (21.6%)	
Yes	51 (68.9%)	23 (31.1%)	
Social networks			0.274
No	99 (76.7%)	30 (23.3%)	
Yes	28 (66.7%)	14 (33.3%)	
Healthcare staff			0.372
No	49 (79.0%)	13 (21.0%)	
Yes	78 (71.6%)	31 (28.4%)	
YouTube			**0.015**
No	103 (79.2%)	27 (20.8%)	
Yes	24 (58.5%)	17 (41.5%)	
Instagram			0.538
No	117 (75.0%)	39 (25.0%)	
Yes	10 (66.7%)	5 (33.3%)	
Snapchat			0.185
No	101 (77.1%)	30 (22.9%)	
Yes	26 (65.0%)	14 (35.0%)	

■ Vaccination of the respondent and vaccination of the spouse

The vaccination of the spouse was significantly related to the vaccination of the women surveyed: $p < 0.001$ (Table 11).

Table 11: Respondent's vaccination and spouse's vaccination.

Variable	Vaccination against COVID-19		p-value
	No	Yes	
Spouse's vaccination			**<0.001**
Don't know	46 (82.1%)	10 (17.9%)	
No	56 (93.3%)	4 (6.67%)	
Yes	25 (45.5%)	30 (54.5%)	

Multivariate analysis

Multivariate analysis was used to model vaccination against COVID-19 in women followed up in PNC, showing the factors associated with this vaccination (Table 12).

-Women who were aware of the vaccines available were 8.33 times more likely to be vaccinated.

-Women with a vaccinated partner were 7.3 times more likely to be vaccinated.

Table 12: Factors associated with vaccination against COVID-19.

FEATURES	OR[1]	IC 95%[1]	p-value
WhatsApp			
No	—	—	
Yes	0.57	[0.19 - 1.78]	0.3
YouTube			
No	—	—	
Yes	0.38	[0.10 - 1.29]	0.13
Notion of previous COVID-19			
No	—	—	
Yes	0.35	[0.05 - 2.26]	0.3
COVID-19 and Pregnancy			
No	—	—	
Yes	1.38	[0.54 - 3.67]	0.5
Knowledge Available Vaccines			
No	—	—	
Yes	8.33	[1.44 - 100]	**0.029**
Spouse Vaccinated			
FEATURES	—	—	
WhatsApp	0.18	[0.06 - 0.46]	**0.019**
No	7.30	[1.66 - 52.9]	**<0.001**

[1]OR = Odds Ratio, IC = Confidence Interval

Discussions

Knowledge of the disease and vaccination

In our study, 49.4% of the 93.6% of women surveyed who said they had received information about COVID-19 knew that pregnant women are at risk of developing severe forms of COVID-19, and 81.9% believed in the effectiveness of vaccination in eradicating the disease. These figures contrast with the proportion of women surveyed who knew about the types of COVID-19 vaccine available in Senegal, which was 6.79%, or 11 women, 2 of whom had accurate knowledge. These results show that, on the one hand, major communication efforts were made to inform these women about SARS-Cov-2, especially at the start of the epidemic, but that, on the other hand, the challenge of providing information in order to improve these women's knowledge of the disease, and of vaccination in particular, is still relevant. All the more so since 59.10% of the women vaccinated had no knowledge of the type of covid-19 vaccine they had been given. The main sources of information revealed in our study were the media (66.7%), healthcare staff (63.7%), friends and family (43.3%) and social networks (24.6%). Diaw M. conducted a study on the knowledge, attitudes and practices of the population of the Dakar region regarding infection linked to the new coronavirus (SARS-COV-2) in Senegal in 2020, in which all the people surveyed had received information about COVID-19, with the media as the main source of information, testifying to the undeniable effort made

by the Ministry of Health in disseminating awareness messages about COVID-19 via information channels, in particular public and private radio and television stations and internet sites [6]. The study also showed that 4.7%, 3% and 47.8% of people did not have a good knowledge of the signs, risks of transmission and prevention measures respectively. A study of attitudinal and practical knowledge of vaccination against COVID-19 during the third wave of the disease in Bosnia Herzegovina conducted by Šljivo A et al. also showed that the vast majority of subjects had little knowledge of vaccination against COVID-19, with correct response rates as low as 3.8% for some questions [7].

Vaccination practices

A study by Goncu Ayhan S et al. published on 01 May 2021 reported low acceptance of vaccination against COVID-19 in a sample of pregnant women.Concerns about vaccine safety were the main reason for hesitancy [9], in the study by Yilmaz S et al. the most important theme of vaccine hesitancy that emerged was fear and lack of confidence in vaccines, which was expressed at a higher rate than any other theme.The reason most cited for fear and lack of confidence in vaccines was fear of side effects.In the same study, it was observed that some of the women who said they were reluctant to be vaccinated were pregnant or breastfeeding [10]. A UNICEF study assessing the determinants of acceptability of COVID-19 vaccines in Senegal also aims to show that reluctance to vaccinate is reflected in the sense of fear that vaccines arouse in communities [11]. This shows that access to the right knowledge considerably increases vaccine acceptability. A study by Tao L. revealed that among 1,392 pregnant women, the acceptance rate for a vaccine against COVID-19 vaccine was 77.4% and that this acceptance rate was associated with a high score of knowledge about COVID-19 [8]. A study by Goncu Ayhan S et al. Published on 01 May 2021 reported low acceptance of vaccination against COVID-19 in a sample of pregnant women. Concerns about vaccine safety were the main reason for hesitancy [9], in the study by Yilmaz S et al. the most important theme of vaccine hesitancy that emerged was fear and lack of confidence in vaccines, which was expressed at a higher rate than any other theme. The reason most cited for fear and lack of confidence in vaccines was fear of side effects. In the same study, it was observed that some of the women who said they were reluctant to be vaccinated were pregnant or breastfeeding [10]. A UNICEF study assessing the determinants of acceptability of COVID-19 vaccines in Senegal also aims to show that reluctance to vaccinate is reflected in the sense of fear that vaccines arouse in communities [11]. Moreover, doubts about the safety of the vaccine are the main reason why people refuse to be vaccinated [11]. However, in contrast to our study, this study showed that people who had suffered from the disease and lived with a victim of COVID-19 were more reluctant to be vaccinated because they were afraid of the adverse effects of the vaccine [11]. Elsewhere Spousal vaccination was also identified as a factor significantly associated with vaccination among the women surveyed (54.5%); women whose spouses were vaccinated were 7.3 times more likely to be vaccinated. The husband remains an important figure in these women's decision to be vaccinated against COVID-19. With this in mind, the World Health Organization (WHO) Technical Advisory Group on Behavioural Insight and the Health Sciences published a report on behavioural considerations for the acceptance and uptake of COVID-19 vaccines, stating that Vaccination decision-making is influenced by the network, which includes family members, friends, health professionals and others with whom they interact [12]. A study by Bish A et al. also found evidence of social pressure in that people who thought others wanted them to be vaccinated were more likely to do so [13].

The last points significantly linked to acceptance of vaccination against COVID-19 in our study were the ownership of a smartphone (35.4%), access to a certain type of social network such as WhatsApp (36.7%), Facebook (45.5%), TikTok (40.5%), and YouTube (41.5%), the latter itself being the source of information significantly linked to acceptance of vaccination against COVID-19 in our study. Social networks are an essential element in the dissemination of information these days. The emergence of new digital technologies has "disrupted" traditional communication of vaccine information [14]. While the anti-vaccine community has taken advantage of the Internet and social media to bypass traditional information sources and communicate, digital surveillance and mobile applications offer public health officials an important opportunity to develop new strategies to identify and respond to concerns in real time [15].

In response to increased concerns about the negative impact of anti-vaccine messages online, many social media networks have committed to countering anti-vaccination content as part of broader efforts to reduce misinformation [15]. In response to increased concerns around the negative impact of anti-vaccine messages online, many social media networks have committed to countering anti-vaccination content as part of wider efforts to reduce misinformation [15]. It is essential that social media agencies identify and report potentially harmful misinformation and consider actively promoting public health agency content [16]. Pinterest, for example, redirected vaccine-related searches to a small set of hand-picked results from public health organisations, including the WHO and CDC [15]. They further disabled advertising and commenting on these topics to prevent user contribution to vaccine misinformation or influence from external non-scientific entities [15].

Other platforms have also proposed strategies, albeit with less moderation [15]. Facebook is attempting to "combat misinformation about vaccines by reducing its spread and providing people with authoritative information on the subject" [17]. This will be achieved by algorithmically reducing the ranking of anti-vaccine pages, excluding these pages from search recommendations and rejecting ads with outspoken anti-vaccine messages [17]. This will be achieved by algorithmically reducing the ranking of anti-vaccination pages, excluding these pages from search recommendations and rejecting ads with outspoken anti-vaccination messages [17]. This will extend to their partner

networks, including Instagram, where anti-vaccination content will not be included on hashtag search pages [15]. These networks also report that they will identify mechanisms to provide more accurate information from reputable organisations regarding vaccinations to be included as primary results for vaccine-related searches [17]. In the US, Twitter partnered with the Department of Health and Human Services to link vaccine-related keywords to Vaccines.gov in the form of a Pinned Tweet [18]. In addition, in response to misinformation about COVID-19, a range of social media companies have again produced joint statements to combat "misinformation about the virus" [15]. Twitter is implementing tools to tag tweets as containing misleading information, provide links to validated sources of information and delete those tweets with a high propensity to cause harm [19]. In addition to combating misinformation, platforms such as YouTube are working with leading content producers to widely distribute videos in support of physical distancing and quarantine measures for COVID-19 control directly to users in the form of advertisements [15].

Conclusion

On 23 February 2021, Senegal began vaccinating against COVID-19, and by 20 November 2022 only 11.41 people had been vaccinated with at least one dose per 100 inhabitants. Even though pregnant women were not included in the first clinical trials on COVID-19 vaccines, there is increasing evidence that this vaccine is safe during pregnancy, which is why it is important to combat misinformation about the disease and to continue to raise public awareness of the importance of vaccination against COVID-19, especially for people at greater risk of developing severe forms of the disease, particularly pregnant women.

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