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ORIGINAL PAPER

Changes in Pregnant Patients' Beliefs About COVID-19

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Abstract

COVID-19 is a novel coronavirus with data suggesting a more serious clinical course in pregnancy. We aimed to assess changes in knowledge, behaviors, and intentions of pregnant women regarding COVID-19. This was a cross-sectional survey study of 58 and 77 predominantly African-American and Afro-Caribbean pregnant patients presenting for prenatal care in Brooklyn, NY in 2020 (during the first surge of the pandemic) and 2021, respectively. Descriptive and inferential statistics were performed. Many beliefs and intentions were unchanged between 2020 and 2021 (e.g. believing pregnant women were at higher risk of COVID-19 infection and subsequent ICU admission due to pregnancy, having the desire to breastfeed, among others). Other beliefs and behaviors changed between 2020 and 2021 (fewer women believed they received information from their provider regarding COVID-19 and fewer would miss a prenatal visit for fear of COVID-19 contagion). Patients' behaviors and intended behaviors in both 2020 and 2021 were directly influenced by their beliefs, many of which were based on unsupported data regarding COVID-19 and pregnancy (ie: babies were at increased risk of being born with congenital malformation following a mother's COVID-19 infection). Patients who held these beliefs were more likely to say that they did not attend prenatal visits and did not receive information from their provider regarding COVID-19. Knowledge of patient beliefs is useful for structuring care as the pandemic evolves. This study demonstrates that pregnant patients make decisions regarding behaviors based on beliefs grounded in misinformation. Accordingly, it is the provider's responsibility to ensure that beliefs regarding COVID-19 are based in fact, so patients can make informed decisions.

Keywords COVID-19 · Pregnancy · Women's health · African American · Afro-Caribbean

Introduction

COVID-19 was first reported from Wuhan, China in December 2019. Since then, it has become a global pandemic with more than 219 million cases and 4.55 million deaths worldwide with 43.4 million cases and over 69600 deaths in the United States [1]. New York State has had more than 2.42 million reported cases and over 54,000 deaths, with 1.08 million cases and more than 34,000 deaths in New York City (NYC) alone. [1]

Initial reports on COVID-19 suggested that the clinical course in pregnant women was like that of non-pregnant women [2]. More recent studies indicate that COVID-19 is associated with a more serious clinical course, preterm deliveries, and low birth weight infants [3]. A retrospective review of 43 pregnant women presenting to NYC hospitals found that 9.3% of women developed severe disease and 4.7% required intensive care [4]. There have also been case reports suggesting a higher incidence of cardiomyopathy in pregnant patients following COVID-19 infection [4]. Given the physiological changes of pregnancy (e.g. decreased immunity) and the emerging data, pregnant women appear to be at higher risk for severe infection and complications compared to non-pregnant women. [3]

To inform counselling, correct any misinformation, and to reduce anxieties associated with the issues discussed above, it is first necessary to understand the beliefs of pregnant women regarding COVID-19. While studies have shown

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that the pandemic has increased anxiety in pregnant women, which has affected access to prenatal care, many of those studies had small sample sizes. In addition, the current data is dated to the beginning of the pandemic, which is not reflective of recent times. Finally, few relevant studies have focused on a population of particular interest in the United States- African Americans who have suffered disproportionately from the pandemic. Current data on pregnant patient's beliefs and behaviors may facilitate better counseling during pregnancy and better postpartum screenings. The purpose of this study was to describe COVID-related knowledge, beliefs, and intended behaviors of pregnant minority women living in NYC and to assess any change between 2020 and 2021.

Methods

This was a cross-sectional study of two convenience samples of pregnant women presenting for prenatal care in a tertiary care center in Brooklyn, NY. Inclusion criteria were English speaking pregnant women presenting at Downstate Health Sciences University. One group presented between April and June of 2020 (N = 58), and the second between February and March of 2021 (N = 77). The study was approved by the SUNY Downstate IRB.

Participants were approached and asked to complete a 30-question multiple-choice anonymous survey regarding knowledge and beliefs about COVID-19 in pregnancy. The survey first focused on demographics including age, gestational age, race and religion. The next set of questions focused on level of religiosity including belief in God, prayer, and attendance of religious services. The religiosity score was based on a validated scale, the Centrality of Religiosity Scale (CRS), which uses five questions with Likert scale answers to produce a score of 1–2 = not religious, 2.1–3.9 = religious, and 4–5 = highly religious [5]. Religiosity score was used as a potential confounder or predictor for questions on pregnancy terminations. The survey then asked a series of questions addressing patients' beliefs about COVID-19 including risk to the fetus with responses including yes, no and maybe. Patients were given a list of behaviors that changed during the pandemic and patients were asked to check all that applied to them. These included self-quarantine, frequency of social and public engagements, handwashing and shaking hands. The survey ended with addressing patients' level of concern, on a scale of 1–10, regarding COVID-19 and other infections including the flu, Hepatitis, HIV and Group B strep. The primary outcome was a change in beliefs between 2020 and 2021.

Survey responses were coded, such that discontinuous variables were assigned a numerical value for analysis. Continuous variables were assessed as is. Descriptive analyses were performed. Chi-square tests were performed to compare survey responses of pregnant women's attitudes, knowledge, and behavior in 2020 with those in 2021. Multiple linear regression analyses were performed to determine which variables (e.g. believing pregnant women were at higher risk for COVID-19 infection and subsequent ICU admission, believing their baby would be born with a congenital malformation following COVID-19) were significant predictors of intended behaviors (e.g. terminating the pregnancy following COVID-19 infection, skipping OB visits, breastfeeding, etc.). Correlations between various attitudes and behaviors/intended behaviors were also assessed. JASP was used to perform all analyses.

Results

Sixty patients were approached to fill out the survey in 2020. Fifty-eight out of sixty completed the survey (97%). In 2021, eighty-four women were approached; 77 of 84 completed the survey (92%).

Table 1 shows the demographics of the two groups. African Americans constituted 73% of surveyed women in 2020 and 70% in 2021; 17% (2020) and 16% (2021) were Afro-Caribbean. The rest of the patients in both groups identified as Caucasian, Asian, or Other. The average age of patients was 30.35 (SD 5.23) years and 29.83 (SD 6.07) years in 2020 and 2021, respectively, and the average gestational age were 27.23 (SD 6.07) weeks and 24.98 (SD 9.75) weeks in 2020 and 2021, respectively. The 2020 and the 2021 cohorts had similar religiosity (average scores were 2.04 in 2020 and 2.18 in 2021 ($P = 0.80$). Religiosity was not correlated with behaviors or other beliefs regarding COVID-19 and pregnancy.

Attitudes and behaviors of both groups are presented in Table 2. Several COVID-related beliefs and behaviors did not change between 2020 and 2021. Many women in both groups believed that pregnant women were at higher risk of getting COVID-19 infection (47% in 2020 and 45% in

Table 1 Demographic Data of Survey Participants

Demographics	2020 (N = 58)	2021 (N = 77)
Maternal Age (years)	30.35 ± 5.23	29.83 ± 6.07
Gestational Age (weeks)	27.23 ± 6.07	24.98 ± 9.75
Race		
Caucasian	1 (2%)	3 (4%)
African American	38 (73%)	56 (70%)
Afro-Caribbean	9 (17%)	13 (16%)
Asian	5 (6%)	4 (5%)
Other	1 (2%)	4 (5%)

Data presented as N (%) or mean ± Standard deviation

Table 2 Behaviors and Attitudes of Pregnant Patients in 2020 vs. 2021

Responses to questions on behaviors/intended behaviors	2020 (N = 58)	2021 (N = 77)	P values
Skipping an OBGYN visit	7 (13%)	5 (7%)	$P = .01$
Decreased use of public transportation	39 (10%)	42 (51%)	$P = .03$
Not Considering Termination at 12 weeks	49 (85%)	68 (85%)	$P = .90$
Attend Work after Coworker Tested Positive for COVID-19	3 (5%)	13 (16%)	$P = .002$
Self-quarantine	43 (77%)	52 (63%)	$P = .97$
Meeting with friends less often	26 (46%)	55 (66%)	$P = .02$
Increased frequency of hand washing	39 (70%)	57 (69%)	P = .2
No longer shaking hands	32 (57%)	39 (47%)	$P = .45$
Desire to Breastfeed	49 (85%)	64 (80%)	$P = .37$
Not Breastfeeding with COVID-19	34 (69%)	47 (73%)	$P = .31$
Experimental Medication for COVID-19	2 (3%)	2 (3%)	$P = .52$
COVID-19 Vaccine	6 (11%)	10 (13%)	$P = .52$
Receiving COVID-19 Info during OBGYN appointment	46 (84%)	44 (54%)	$P < .001$
Attitudes			
COVID-19 Associated with Congenital Malformation	10 (17%)	27 (34%)	$P = .02$
Skipping an OBGYN visit	7 (13%)	5 (7%)	$P = .01$
Receiving COVID-19 Info during OBGYN appointment	46 (84%)	44 (54%)	$P < .001$
Receive Flu Vaccine	8 (14%)	18 (23%)	$P = .01$
Attend Work after Coworker Tested Positive for COVID-19	3 (5%)	13 (16%)	$P = .002$

Data presented as N (percentage)

2021; $P = 0.52$). Similarly, pregnant women consistently believed that they were at higher risk of ICU admission following COVID-19 infection (35% in 2020 and 38% in 2021; $P = 0.19$). Most women in both groups, 85% in 2020, and 85% in 2021 would not consider terminating their pregnancy if they contracted COVID-19 at twelve weeks of gestation *(*$P = 0.90$). In both 2020 and 2021, most women wanted to breastfeed (85% of women in 2020 and 80% in 2021; $P = 0.30$). However, of those, 69% in 2020 and 73% in 2021 would not breastfeed if they were found to have COVID-19. Finally, most of the participants expressed vaccine and experimental medication hesitancy; only 11% of women in 2020 and 13% in 2021 said they would take a vaccine against SARS-CoV-2 (p = 0.517) and only 4% in 2020 and 3% in 2021 *(*$P = 0.52$) would take an experimental medication with unknown risk to their fetus. [Table 2].

Other behaviors and knowledge did change significantly between 2020 and 2021. Pregnant patients in 2021 were significantly more likely to state that COVID-19 during pregnancy would be associated with malformations in newborns (34% vs. 17%; $P = 0.02$). Pregnant patients in 2021 were less likely to receive information about COVID-19 from their provider than pregnant patients in 2020 (54% v. 84%; $P < 0.001$). Despite the COVID-19 vaccine hesitancy, pregnant patients in 2021 were more likely to receive the flu vaccine during their pregnancy than pregnant patients in 2020 (23% vs. 14%; *P = 0.18*). Pregnant patients in 2021 were significantly more likely to go to their job work after a coworker tested positive for COVID-19 than pregnant patients in 2020 (16% v. 5%; $P = 0.03$), though the percent was small in both years.

In 2020 missing prenatal visits was significantly correlated with choosing not to breastfeed following COVID-19 infection (R = 0.307; $P = 0.03$). [Table 3]. In 2021, skipping prenatal visits was significantly correlated with the beliefs that pregnant women were at higher risk for COVID-19 infection (R = 0.225; $P = 0.049$) and subsequent ICU admission (R = 0.346; $P = 0.002$), believing that their baby would be born with a congenital malformation following their COVID-19 infection during pregnancy (R = 0.349; $P = 0.002$), and terminating the pregnancy at 12 weeks following COVID-19 infection (R = 0.317; $P = 0.005$). [Table 3] Multiple linear regression determined that receiving information about COVID-19 and skipping visits were explanatory covariates for pregnant patient's intended behavior of terminating their pregnancy at 12 weeks following COVID-19 infection ($P = 0.016$). Differences between 2020 and 2021 remained after performing regression analysis.

Discussion

The COVID-19 pandemic remains a major concern for pregnant women due to increased risks of adverse outcomes. These concerns may be amplified in the studied population, predominantly Black women, since they have worse pregnancy outcomes even without COVID-19, including a higher maternal mortality rate and lower infant birth weights. This

Table 3 Correlations with Skipped Prenatal Visits in 2020 and 2021

Correlations	2020 (N = 58)		2021 (N = 77)	
	R value	P value	R value	P value
Belief that pregnant women were at higher risk for ICU admission following COVID-19 infection	R = 0.067	*P* = .64	R = 0.346	*P* = .002
Belief that pregnant women were at higher risk for contracting COVID-19	R = -0.025	*P* = .86	R = 0.225	*P* = .049
Belief that child would be born with congenital malformation following COVID-19 infection during pregnancy	R = -0.056	*P* = .69	R = 0.349	*P* = .002
Terminating pregnancy at 12 weeks following COVID-19 infection	R = -0.153	*P* = .27	R = 0.317	*P* = .005
Breastfeeding following COVID-19 infection	R = 0.307	*P* = .03	R = 0.091	*P* = .43

predominantly African American and Afro-Caribbean population has also been disproportionately impacted by the COVID-19 pandemic and has systemically less access to care. Between March and June of 2020, the height of the coronavirus pandemic in NYC, a total of 203,792 COVID-19 cases were reported among residents in NYC. The prevalence was highest among African American persons (1590 per 100,000). Age-adjusted rates of hospitalization (699 and 248 per 100,000) and death (658 and 260 per 100,000) were also highest among Black and Hispanic/Latino (Hispanic) persons respectively [6]. The results of this study highlight areas of particular concern for these patients, and areas for enhanced educational efforts.

During both 2020 and 2021, patient's behaviors and intended behaviors were influenced by their beliefs and were associated with the frequency of their prenatal visits. Specifically, pregnant patients' decisions regarding breastfeeding, pregnancy termination, COVID-19 vaccination, and skipping OB visits were correlated with their beliefs regarding the impact of COVID-19 during pregnancy. Many of these beliefs were not supported by existing data regarding COVID-19 and pregnancy. The patients who held those beliefs were more likely to skip prenatal visits and to state they have not received information from their OB-GYN provider regarding COVID-19. In general, this speaks to the importance of communications with patients and fostering a trusting relationship between the obstetrical provider and the patient. A qualitative Turkish study found that women who reported frequent interruptions in their obstetric care, felt it contributed to feelings of anxiety and sleeplessness [7]. Researchers from the United Kingdom found that the main reasons for contacting maternity triage during COVID-19 included the need for mental health support, anxiety, birth options, COVID-19 symptoms, obstetric concerns, and medication inquiries. Other studies have demonstrated that pregnant women have misapprehensions. A prospective observational study found that 47% of pregnant participants believed that COVID-19 could induce fetal structural anomalies [8]. All of these studies are important given that maternal stress and anxiety during pregnancy are well established risk factors for preterm birth, low birth weights, and infant health issues. These concerns highlight potential barriers to care, a serious challenge pregnant women faced during the pandemic. Our study builds on studies assessing the impact of the interruptions of care pregnant women faced during the pandemic. These interruptions have all the aforementioned impacts, while also directly affecting the behaviors of pregnant women, including behaviors with potential long-term consequence for both mother and child, like breastfeeding and termination.

The frequency of missed appointments had the strongest correlation with patient behaviors in this study, especially in 2021. In 2020, more patients did not attend their OB visits in general, which may be attributed to lockdown regulations that occurred during the height of pandemic. Skipped visits could also be explained by lack of access to resources including safe transport, and masks, and to social distancing guidelines that were more available by 2021. The use of public transportation was significantly decreased during the height of the pandemic, and if patients were reliant solely on that method of transport, they might be more likely to miss their prenatal visits. In 2021, women who skipped visits were more likely to believe that pregnant women were at higher risk of COVID-19, which could explain their hesitation to go to appointments, and the inability of providers to have the opportunity to educate the women. While a possible solution to missed visits could be telehealth, some studies have described barriers for pregnant women accessing healthcare with telehealth, including equitable access to the internet and privacy concerns. In one study, 62% of participants felt that telehealth visits provided "impersonal care" and 14% of participants relayed that they were reluctant to speak about mental health issues over the phone [9]. One participant explained that they didn't want to disclose certain information to their partner, but having a telehealth visit while quarantining with her partner made this difficult [9]. Additionally, telehealth medicine has its own disadvantages with properly relaying information to patients as patient literacy is already an established concern in the medical field. Social and physical cues can be more easily picked up by physicians in person and may be missed through a telehealth visit.

In 2020, patients who reported that they didn't receive information during their last provider visit were more likely to say that they would terminate their pregnancy if they became infected with COVID-19 at 12 weeks' gestation. It should be noted that patients' claim of whether they received information from their OB provider could not be verified. Even though our patient population was English speaking, English proficiency does not translate to health literacy. In a study that measured self-reported limitations in health literacy, 60% of Black Americans were reported to have limited health literacy [10]. These patients may not be inclined to ask for clarification, which further emphasizes the importance of a strong physician–patient relationship with adequate communication, specifically focused on patient comprehension.

The likelihood of pregnancy termination was another behavior that was associated with missed visits, and with receiving information about COVID-19 from their OB providers. In 2021, patients who did not attend visits and who said they did not receive information about COVID-19 during their last visit were more likely to say they would terminate their pregnancy at 12 weeks' gestation if they contracted COVID-19. In 2020, women who skipped visits were also more likely to say that they would terminate at 12 weeks' gestation, but no such correlation was found with whether they said they received information about COVID-19. There was also no evidence of an interaction between skipped visits and claims of receiving COVID-19-related information. This can be attributed to the smaller patient population in 2020 or to the paucity of information regarding COVID-19 in 2020 as compared with 2021.

The intention to undergo pregnancy termination was significantly correlated with beliefs regarding the danger of COVID-19 during pregnancy in both 2020 and 2021. In 2020, patients who reported that they would terminate their pregnancy if they contracted COVID-19 at 12 weeks, believed that pregnant patients were at higher risk of ICU admission. Those patients also claimed they would terminate if a relative contracted COVID-19 at 12 weeks' gestation. In 2021, patients who would terminate believed their baby would be born with a congenital malformation following COVID-19 infection. These same patients were also more likely to have received the flu vaccine and stated that they would try an experimental medication for COVID-19 during their pregnancy. They were also more likely to skip an OB visit out of fear of contracting COVID-19 and would terminate if a family member contracted COVID-19 at 12 weeks' gestation as in 2020. All of these suggest a greater fear of infection, grounded, at least in part, on misiformation (e.g. the belief that COVID caused malformations). However, they were less likely to terminate at a higher gestational age. All of this highlights the importance of making sure pregnant patients are well informed.

Patients' responses may be altered based on what they believe their physician wants to hear about their COVID-based practices. Since participants were approached in a doctor's office, they may have felt the need to endorse positive habit changes. This could lead to an overestimation of the number of patients abiding by recommended COVID-modifying behaviors. Also, since not speaking English was an exclusion criterion, we cannot speak to beliefs of non-English speaking populations. There may also be a limitation of generalizability due to our focused study population (the Afro-American and Afro-Caribbean community in Brooklyn, NY). However, this population is of unique interest since they have disproportionately high rates of morbidity and for historical reasons are also vaccine hesitant. The disproportionate impacts of COVID-19 on Black persons were a trend that was unfortunately echoed throughout the United States [11, 12]. In Chicago, in five neighborhoods on the South Side, more than 50% of COVID-19 cases and 70% of COVID-19 deaths involved black individuals even though blacks made up only 30% of the population. In Louisiana, 70.5% of COVID related involved black individuals, who represent 32.2% of the state's population [13]. In Michigan, 33% of COVID-19 cases and 40% of deaths involved black individuals, who represent 14% of the population [13]. These statistics highlight the need to research the impacts of COVID-19 in this population that has been disproportionately impacted.

In addition to those limitations, the data is reflective only of study participants who presented for care. As such, the data may not reflect the attitudes of patients who did not leave their homes. Future studies should consider surveying patients presenting for telehealth and calling patients who do not come in for visits.

Conclusion

In conclusion, between the height of the pandemic in April of 2020, and March of 2021, certain beliefs and behaviors of pregnant women towards COVID-19 changed. However, throughout both years, patients' behaviors/intended behaviors were directly influenced by their beliefs, many of which had no factual backing. The main message is that fear, whether based on misinformation (beliefs that their baby will be born with a congenital malformation following COVID-19 infection during pregnancy) or fact (pregnant women with COVID-19 are at higher risk of ICU admission), is a motivator of patient behaviors. Physicians must clear up misunderstandings and contextualize facts to generate safe behaviors and minimize fears that can lead to self-destructive actions (e.g. skipping visits). There is a clear and continued need for support and education of pregnant

women about risks and consequences of COVID-19 during pregnancy and vaccination.

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Author's Contributions OP and SA wrote the manuscript with support from VT. VT collected the survey data in 2020; SA and OP collected the survey data in 2021. OP and SA completed all coding and data analyses. MD supervised and oversaw the project. HM and RM contributed to the final version of the manuscript by editing.

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Data Availability Paper copies of surveys were shredded. All existing digital data is de-identified.

Code Availability JASP was used for all analyses.

Declarations

Conflict of interest All authors have no conflicting of competing interests to report.

Ethical Approval IRB approval attached.

Consent to Participate Informed letter of consent attached.

Consent for Publication Informed letter of consent attached.

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