

MENSTRUAL PATTERN CHANGES AMONG WOMEN DURING THE COVID-19 PANDEMIC IN IBADAN, A CROSS-SECTIONAL STUDY

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ABSTRACT:

Background: Coronavirus disease (COVID-19) is an infectious respiratory disease characterised by a spectrum of symptoms ranging from asymptomatic to severe. The COVID-19 pandemic and subsequent lockdowns were associated with varying degrees of stress among individuals. The hypothalamus-pituitary-ovarian axis, which regulates the menstrual cycle, may be significantly affected by stress.

Objective: To investigate the effect of COVID-19 infection and pandemic lockdown on the menstrual pattern of women.

Methods: A cross-sectional study of women exposed to COVID-19 was conducted using a questionnaire to collect data on socio-demographic characteristics, COVID-19 exposure, and menstrual patterns. Participants were categorised based on their COVID-19 test results. Analyses were conducted using STATA (StataCorp L.L.C.) version 15.0 and at a significance level of $p < 0.05$.

Results: Among the 218 respondents, only 93 (42.7%) had testing for COVID-19. Among those who tested, only 36 (16.5% of all participants) tested positive for COVID-19 infection. Majority of respondents (80.7%) had regular menses before pandemic lockdown. About 1 in 5 (21.4%) respondents reported changes in menstrual pattern. The odds of experiencing changes in menstrual pattern was not significantly higher among women who tested positive for SARS-CoV2 (aOR = 1.71, 95% CI: 0.47 – 6.23). Extremes of reproductive age was associated with menstrual irregularities before the pandemic and changes in menstrual pattern during the lockdown.

Conclusion: Irregularities in menstrual pattern remains common especially in the early and late reproductive years. Changes in menstrual pattern was common among respondents during the pandemic lockdown. Infection with SARS-CoV2 virus was not associated changes in menstrual pattern during the pandemic.

Keywords: COVID-19, Menstrual pattern, Coronavirus, Pandemic lockdown

INTRODUCTION

SARS-CoV-2 is a Ribonucleic acid (RNA) virus of the Coronavirus family that causes COVID-19 disease. It was first identified in Wuhan, China, but soon became a pandemic.¹ It is an infectious disease characterised by fever, dry cough, tiredness, aches, runny nose, sore throat, dyspnoea and other potentially severe symptoms.²

As measures to curtail the contagious COVID-19 infection, total lockdown was implemented in most countries.¹ Nigeria implemented its first COVID-19

lockdown on 30 March 2020, targeting Lagos, Ogun, and the FCT.³ The nationwide restrictions involved stay-at-home orders, movement limits, and closure of schools and businesses.⁴ The lockdown began easing in phases from 4 May 2020, with gradual reopening through mid-2020.⁵

The COVID-19 pandemic exerted profound psychosocial stress across all segments of society, extending far beyond its physical health consequences. Individuals who became ill often experienced fear of

deterioration, isolation during treatment, and anxiety about stigma within their communities.⁶ Caregivers—both professional and informal—faced emotional exhaustion, heightened workload, and the persistent fear of transmitting the infection to loved ones.⁷ Even those who remained uninfected were not spared, as prolonged lockdowns, job losses, social restrictions, and pervasive uncertainty generated widespread stress, loneliness, and financial strain. Together, these intersecting pressures highlighted the pandemic's deep and multifaceted impact on mental and social well-being.^{4,8,9}

The COVID-19 pandemic lockdown was also associated with a lot of anxiety and panic due to the associated high morbidity and mortality recorded in many countries. COVID-19 was a major stressor on individuals with significant physiological changes affecting the hypothalamic-pituitary-adrenal axis, which serves as the body's stress response system and regulates the menstrual cycle.¹⁰

Stress, anxiety, and mental health disorders were common during the COVID-19 pandemic due to the consequent lockdown in most countries, and remarkably among the Nigerian population^{1,10,11}; and it is posited that these mental health changes affected the reproductive system by disrupting menstruation.¹² Self-isolation and quarantine restrictions among women with COVID-19 disease were implemented as strategies to curtail the spread of the virus; they also posed a threat to the mental and reproductive health of the affected women.^{9,13,14} The psychological impacts of the quarantine period on asymptomatic individuals with COVID-19 infection included stress (46%), anxiety (14%), and depression (8%).² Quarantine restrictions with no physical and social interaction affected the mental and psychological health and daily functioning.² In Nigeria, Olaseni *et al.* found insomnia, anxiety, depression, and post-traumatic stress disorder in the general population with no gender difference.⁴ Nri-Ezedi and colleagues also found a significant level of psychological stress among Nigerians during the COVID-19 pandemic.¹¹ Moreso, the COVID-19 pandemic lockdown was also associated with shortages of menstrual hygiene supplies which further exacerbated the challenges related to menstruation in women.⁷

The prevalence of menstrual irregularity among adult women aged 19-54 years can be as high as 14.2%.¹⁵ These menstrual irregularities may be worsened by COVID-19 associated changes, Mitra *et al.* reported that as much as 75% of women reported a change in menstrual cycles described as irregular menstrual cycles, bleeding more than seven days, longer cycle length,

and worsening of premenstrual symptoms during the pandemic.¹⁶ COVID-19 related stress may also be associated with menstrual irregularity and menstrual changes among women who tested positive to the virus.¹⁷

The recognition of emotional disturbances due to COVID-19 disease or the pandemic and lockdown may be delayed or masked by premenstrual symptoms such as irritability, depression, mood swings, fatigue, and food cravings, which can be attributed to the effects of reproductive hormones on mood and behavior.¹⁸ Also, amenorrhea and abnormal uterine bleeding are frequently encountered gynaecologic symptoms among women of reproductive age before COVID-19 and may therefore be considered as regular complaints rather than as a consequence of the COVID-19 disease.¹⁹

Many studies have evaluated the impact of COVID-19 on the reproductive system among different population of women. Li *et al.* reported menstrual disturbances in women with COVID-19, including changes in menstrual volume as observed in 25% of women, decreased menstrual cycle length in 21%, and prolonged menstrual cycles in 19% of the participants. Henarejos-Castillo *et al.* evaluated the susceptibility of the endometrium to SARS-CoV-2 and its potential damage. Their findings suggest that endometrial tissues may be protected from infection; however, susceptibility appears to increase with age.²⁰

This study evaluated the effect of COVID-19 infection and the pandemic lockdown on the menstrual pattern of women in Ibadan, Nigeria

MATERIALS AND METHODS

Study Design, Study Site, and Population:

This was a cross-sectional study conducted among women of reproductive age. Women who experienced the COVID-19 pandemic with the national lockdown were recruited randomly from the outpatient clinics. The participants selected were categorised into 3 groups based on COVID-19 test results (those who tested positive or negative for the coronavirus (SARS-CoV-2) or had no COVID test during the pandemic) The study was conducted in Ibadan, at the University College Hospital (UCH), Ibadan, Oyo State, a government-owned tertiary health institution, over three months (June to August 2022).

Sampling and enrolment of study participants

The study included consenting women of reproductive age (15 to 49 years). Women with a known history of polycystic ovarian syndrome, oligomenorrhea, amenorrhea, hormonal contraceptive use, and those

on intrauterine contraceptive devices with a history of abnormal uterine bleeding, especially with obvious menstrual cycle irregularity, were excluded.

A total of 218 women were enrolled in the study. Potential participants were randomly selected and approached at the specialist outpatient clinics of the hospital; they were counselled about the study, and consenting participants were recruited. Semi-structured interviewer-administered questionnaires were administered to obtain data. A pre-test of the questionnaire was done with the first 20 participants, and the questionnaire was adjusted based on feedback to improve the ease of understanding. The data obtained included socio-demographic characteristics, occurrence of COVID-19 infection, duration of disease, admission into isolation centre or health facility, symptoms experienced and severity, last menstrual period, duration since resolution of symptoms, menstrual history since exposure to COVID-19, practices, use of medications, and natural or local remedies.

Statistical analysis

The data collected were entered and analysed using STATA (StataCorp L.L.C. version 15). Participants who had changes in the length of their menstrual cycle, duration of menstrual flow, number of pads used, passage of blood clots, or painful menstruation during the COVID-19 pandemic were classified to have experienced a change in menstrual pattern. The association between participants' characteristics and changes in menstrual patterns was examined using the chi-square or Fisher's exact test. Logistic regression was performed to assess the association between the COVID-19 status and the changes in menstrual patterns. The first model obtained the crude odds ratio using the COVID-19 test results as the primary independent variable while the second model obtained the adjusted odds ratio after adjusting for the socio-demographic characteristics in the model. Statistical significance was set at a p-value ≤ 0.05 .

Ethical consideration

Ethical approval was obtained from the UI/UCH Ethics Committee of the University of Ibadan/ University College Hospital, with the approval number UI/EC/21/0073. The principles of ethical practice in research were upheld.

RESULTS

A total of 218 female participants were recruited, only 93 (42.7%) ever had testing for COVID-19, majority (57.3%) had no COVID test. Among those who tested, only 36 (16.5% of all participants) tested positive for COVID-19 infection and 54 (24.8% of

Table 1: Descriptive statistics of the participants' socio-demographic characteristics

Variables	Frequency	Percentage
Age¹		
18-24 Years	20	10.05
25-34 Years	78	39.20
35-44 Years	70	35.18
45-59 Years	31	15.58
Occupation²		
Skilled	125	61.58
Semi-Skilled	39	19.21
Unskilled	17	8.37
Unemployed	22	10.84
Ethnicity		
Yoruba	166	76.15
Igbo	28	12.84
Hausa	3	1.38
Others	21	9.63
Education		
Secondary and below	18	8.29
Tertiary	199	91.71
Marital Status		
Single	50	22.94
Married	165	75.69
Others	3	1.38
COVID-19 status³		
Positive	36	22.22
Negative	54	33.33
Not screened/not tested	72	44.44
Regular menstruation before COVID-19⁴		
Yes	167	80.68
No	40	19.32
Experienced Menstrual pattern changes during COVID-19 pandemic⁵		
Yes	44	21.15
No	164	78.85

Note: The missing was excluded in the variable percentage, 1 – 19 missing; 2 – 15 missing; 3 – 2 inconclusive, 54 missing; 4 – 11 missing; 5 – 10 missing

all participants) tested negative and 3(1.4%of all participants) had inconclusive or missing results. The sociodemographic characteristics of the participants are showed in Table 1. Majority (74.4%) were aged 25 to 44years, 76% are of Yoruba ethnicity, 61.6% are skilled artisans or professionals and 91% had tertiary education.

Among participants, 167 (80.68% of responders) had regular menstruation before the COVID-19 pandemic, while 40 (19.32% of responders) experienced irregular menstruation. During the COVID-19 pandemic, 164 (78.85% of responders) of the participants reported having regular menstrual patterns, while only 44 (21.15% of responders) experienced a change in menstrual patterns as shown in Table 2. Irregular menstrual pattern was more prevalent among women in the 45-49 age group 19 (61.29%).

Table 2: Regular menstruation before the COVID-19 pandemic by participants' socio-demographic characteristics

Variables	Regular menstruation before COVID-19 ¹		p-value
	Yes n (Row %)	No n (Row %)	
Age²			<0.001
18-24 Years	14 (70.0)	6 (30.0)	
25-34 Years	71 (95.95)	3 (4.05)	
35-44 Years	60 (88.24)	8 (11.76)	
45-59 Years	12 (38.71)	19 (61.29)	
Total	157 (81.35)	36 (18.65)	
Occupation³			0.912
Skilled	98 (81.67)	22 (18.33)	
Semi-Skilled	31 (83.78)	6 (16.22)	
Unskilled	14 (82.35)	3 (17.65)	
Unemployed	16 (76.19)	5 (23.81)	
Total	159 (81.54)	36 (18.46)	
Ethnicity			0.138
Yoruba	125 (80.13)	31 (19.87)	
Igbo	24 (88.89)	3 (11.11)	
Hausa	1 (33.33)	2 (66.67)	
Others	17 (80.95)	4 (19.05)	
Total	167 (80.68)	40 (19.32)	
Education			0.682
Pre-Tertiary	16 (84.21)	3 (15.79)	
Tertiary	151 (80.68)	37 (19.68)	
Total	167 (80.68)	40 (19.32)	
Marital Status			0.692
Single	40 (80.0)	10 (20.0)	
Married	124 (80.52)	30 (19.48)	
Others	3 (100)	0	
Total	167 (80.68)	40 (19.32)	

Note: The missing was excluded in variable percentage, 1 – 11 missing, 2 – 19 missing; 3 - 15 missing

More unemployed participants (23.81%) reported irregular menstruation than those with skilled (18.33%), semi-skilled (16.22%), or unskilled (17.65%) occupations, though not statistically significant (p=0.91). Participants' age was significantly associated with the experience of regular menstruation before the COVID-19 pandemic (p<0.001) (Table 2).

The distribution of changes in menstrual patterns during the COVID-19 pandemic by participants' characteristics is shown in Table 3. During the COVID-19 pandemic, 164 (78.85% of respondents) of the participants reported having regular menstrual patterns, while 44 (21.15% of respondents) experienced changes

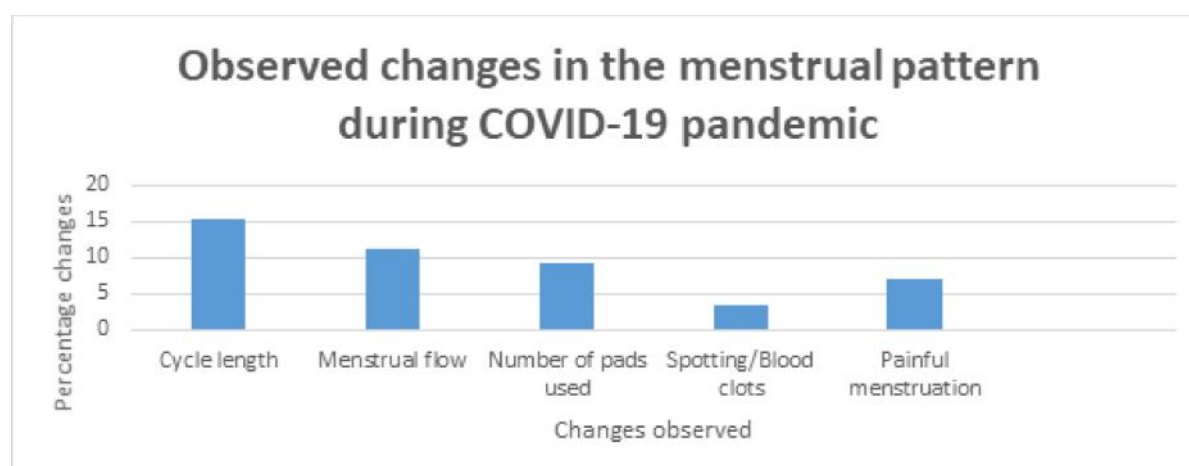


Figure 1: Observed changes in the menstrual pattern during the COVID-19 pandemic

Table 3: Change in menstrual patterns during COVID-19 pandemic by participants' socio-demographic characteristics

Variables	Change in menstrual pattern during COVID-19 ¹		p-value
	No n (Row %)	Yes n (Row %)	
Age²			0.410
18-24 Years	12 (66.67)	6 (33.33)	
25-34 Years	57 (75.0)	19 (25.0)	
35-44 Years	55 (82.09)	12 (17.91)	
45-49 Years	25 (83.33)	5 (16.67)	
Total	149 (78.01)	42 (21.99)	
Occupation³			0.370
Skilled	94 (78.33)	26 (21.67)	
Semi-Skilled	32 (82.05)	7 (17.95)	
Unskilled	11 (84.62)	2 (15.38)	
Unemployed	14 (63.64)	8 (36.36)	
Total	151 (77.84)	43 (22.16)	
Ethnicity			0.009
Yoruba	131 (83.44)	26 (16.56)	
Igbo	15 (55.56)	12 (44.44)	
Hausa	3 (100)	0	
Others	15 (71.43)	6 (28.57)	
Total	164 (78.85)	44 (21.15)	
Education			0.397
Pre-Tertiary	16 (84.21)	3 (15.79)	
Tertiary	148 (78.31)	41 (21.69)	
Total	164 (78.85)	44 (21.15)	
Marital Status			0.083
Single	34 (68.0)	16 (32.0)	
Married	127 (81.94)	28 (18.06)	
Others	3 (100)	0	
Total	164 (78.85)	44 (21.15)	
COVID-19 status⁴			0.585
Positive	26 (72.22)	10 (27.78)	
Negative	41 (80.39)	10 (19.61)	
Not applicable	53 (80.30)	13 (19.70)	
Total	120 (78.43)	33 (21.57)	

in menstrual patterns. Changes in menstrual patterns were more prevalent in the 18-24 age group 6/18 (33.33%). Contrary to the experience before the pandemic, the majority (83.33%) of women aged 45 and above experienced normal menstruation during the pandemic. The majority of participants who tested negative (80.39%) and positive (72.22%) for COVID-19 infection had normal menstruation.

Menstrual changes reported by participants during the COVID-19 pandemic included changes in cycle length which may be prolonged or reduced (15.42%), changes in menstrual flow (11.21%), changes in number of pads used (9.35%), painful menstruation (7.11%), and the occurrence of spotting or passage of blood clots (3.33%) (Figure 1).

Table 4 shows the crude and adjusted odds ratio of factors associated with changes in menstrual patterns

during the COVID-19 pandemic. The odds of experiencing a change in the menstrual pattern was 1.58 [Crude Odds Ratio (c OR) = 1.58, 95% CI: 0.58 – 4.31] times higher among participants who tested positive for COVID-19 infection than among those who tested negative for the infection. After adjusting for social-demographic characteristics in the model, the odds of experiencing a change in menstrual pattern was 1.71 [Adjusted Odds Ratio (aOR) = 1.71, 95% CI: 0.47 – 6.23] times higher among the participants who tested positive for the COVID-19 infection during the pandemic. Participants with a history of irregular menstrual patterns before the COVID-19 pandemic had higher odds of experiencing changes in their menstrual patterns during the pandemic (aOR = 2.42, 95% CI: 0.44–13.25) compared to those with regular menstruation before the pandemic. Ethnicity (p = 0.048) was significantly associated with change in menstrual pattern during COVID-19 pandemic.

Table 4: Factors associated with change in menstrual pattern during COVID-19 pandemic

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)
COVID-19 status		
Negative	1	1
Positive	1.58 (0.58 – 4.31)	1.71 (0.47 – 6.23)
Age		
18-24 Years		1
25-34 Years		8.97 (0.48 – 166.11)
35-44 Years		12.94 (0.51 – 325.64)
45-49 Years		3.85 (0.12 – 124.22)
Occupation		
Skilled		1
Semi-Skilled		1.07 (0.09 – 12.69)
Unskilled		0.65 (0.03 – 15.69)
Unemployed		4.85 (0.26 – 89.03)
Ethnicity		
Yoruba		1
Igbo		6.62 (1.43 – 30.68)
Others		2.41 (0.40 – 14.67)
Marital Status		
Single		1
Married		0.34 (0.05 – 2.25)
Regular menstruation before the pandemic		
Yes		1
No		2.42 (0.44 – 13.25)

DISCUSSION

The main finding of this study is that more than 4 in 5 women had regular menstrual patterns before the COVID-19 pandemic and about 1 in 5 reported having irregularities in their menstrual pattern before COVID. However, 1 in 5 respondents reported changes in their menstrual pattern irrespective of the regularity or otherwise of their menstrual pattern before the pandemic

Although more than half of the participant were not tested for COVID-19, the majority of those who tested negative and those who tested positive for COVID-19 infection experienced normal menstruation before the pandemic. There were no significant differences in the odds of experiencing menstrual irregularity during the pandemic among those who tested positive or negative for COVID-19. This finding may suggest that stress and lifestyle disruptions associated with the pandemic, including factors such as changes in routines, heightened anxiety about COVID-19, and reduced access to healthcare services, may have contributed to the observed changes in menstrual pattern rather than the COVID-19 infection.¹⁶ This is in contrast to the findings of Li *et al.* who demonstrated that women infected with COVID-19 were at significantly higher risk of having menstrual irregularities, with nearly 25% experiencing changes in

the pattern of menstrual flow occasioned by testing positive to the virus. Our finding however agrees with that of Mitra *et al.* who found no significant difference when stratified by COVID-19 infection.¹⁶

The respondents reported the regularity of the menstrual pattern in this study in terms of changes in cycle length, duration of flow, and quantity of blood flow. This study assessed menstrual patterns based on the perception of these women about the regularity of their menses and not based on standard cut-offs to describe the regularity of menstrual patterns. A previous study reported that women's descriptions of the regularity of their menstrual pattern are important and may be a reliable measure of deviation from the normal range.²¹

The distribution of age groups with irregular menstrual patterns before the pandemic followed an expected pattern, with irregularities being more common among women in the early reproductive age group (18-24 years) and in the late reproductive years (45-49 years). Abnormal uterine bleeding, dysmenorrhea, and even premenstrual syndrome may be more common among adolescents and women in early reproductive age.^{22,23} Abnormal uterine bleeding may also be more common among perimenopausal women in the late reproductive age.²⁴ Age was a significant factor

influencing the risk of irregular menstrual patterns before COVID-19; the effect of age on menstrual patterns may be influenced by other sociodemographic factors such as employment status. Unemployed women were more likely to have irregular menstrual patterns.

The commonest change described in the menstrual pattern was a change in cycle length, and the least reported change was spotting per vagina and passage of clots. These changes in menstrual pattern, especially cycle length, are consistent with the findings of Li *et al.* and other studies.^{10,25} The prevalence of change in the menstrual pattern was lower than the finding of Mitra *et al.*, who found that 75% of women experienced menstrual changes.¹⁶

The odds of experiencing changes in menstrual patterns were higher among women who had irregular menstruation before the pandemic. This suggests that pre-existing menstrual irregularities may contribute to the susceptibility to changes in menstrual patterns during times of stress or illness such as the COVID-19 pandemic. Further research is needed to better understand the complex relationship between COVID-19 infection and menstrual health outcomes. A woman's menstrual regularity as indicated by the cycle length is a key indicator of her overall state of health.²⁶ Menstrual cycle irregularity may sometimes be the first sign of a disease as several diseases may affect the menstrual cycle length through alteration in hormonal balance and its control mechanisms. COVID-19 infection and its sequel, COVID-19-related stress and life style changes or disruption may be associated with menstrual irregularity.^{17,27}

Limitation

This is a cross-sectional design, which restricts the ability to establish causal relationships between variables of interest. Also, the use of a convenience sample may introduce selection bias and limit the generalizability of the findings to the broader population. The study was conducted after the COVID-19 pandemic lockdown and recall of experiences during the lockdown may be a limitation

CONCLUSION

This finding of this study suggests that menstrual irregularities remain common among women of reproductive age especially in the early and late phases. The lockdown resulting from the COVID-19 pandemic was associated with significant changes in menstrual pattern of women of reproductive age with no significant difference between women who tested positive and those who tested negative. This finding suggests that the stress associated with the lockdown

rather than being impact of infection with SARS-CoV2 virus may result in menstrual irregularities..

Author contributions

All authors were involved with the conceptualization of the study, data collection, analysis and drafting of this manuscript.

Conflict of interest

The authors have no conflict of interest.

Source of funding

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