



A Quantitative Assessment of the Changes in Self-reported Menstrual Cycle and Other Reproductive Issues of Jamaican Females ages 18 to 55 years after taking the COVID-19 Vaccine

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Abstract

Introduction: The commencement of the menstrual cycle establishes that a woman's uterine wall is shedding therefore reproduction has not occurred. The menses is driven by hormones that cause the uterus lining to thicken and release certain hormones at certain times during the cycle. A woman understands her cycle over time becoming aware of any changes that they consider abnormal or of concern. Little to no literature has identified the Jamaican women population as affected individuals by how the coronavirus disease 2019 (COVID-19) pandemic has altered their menstrual cycle.

Aim: The objective is to examine the menstrual cycle changes of women who are 18 years and older during the COVID-19 pandemic and the effects after taking the COVID-19 vaccine. The research focuses on Jamaican women who experienced any changes during the coronavirus period and observed logical differences.

Methods and materials: A web-based standardized self-administered survey was designed and used to collect pertinent information on the topic of Jamaica females 18 years and 'Changes in the Menstrual Cycle after taking the COVID-19 vaccine.' The data collection started on October 2, 2022, to November 15, 2022. It was given to 1089 female participants between the ages eighteen (18) to sixty-one (61).

Results: Most respondents represented were ages 18-23yr old, fibroids were the leading issue of the reproductive system of most of the respondents. Other challenges stood out in the findings as unexpected experiences the women faced after taking the vaccine.

Conclusion: This research has provided insight into women in Jamaica struggling to protect their reproductive system as it is not given the attention it requires when developing vaccines.

Keywords: Women, Menstrual Cycle, Covid-19/ Coronavirus, Pandemic, Reproductive system.

Introduction

December 2019, a time when everyone across the world would be preparing for a new year, but little did the majority of the world's population know or would be prepared for was a pandemic. A pandemic in which lives would be changed and many lives were taken. According to the World Health Organization as of December 23, 2022, the total number of confirmed cases to date of the coronavirus disease 2019 (COVID-19) was 651,918,402 with an unfortunate number of deaths being 6,656,601. COVID-19 has affected 228 countries and territories [1]. Jamaica has 152,758 confirmed cases of COVID-19 recorded with 3,461 related deaths [2]. A pertinent question in the health discourse in Jamaica is whether the COVID-19 vaccine is influencing the menstrual cycle of women.

The forethought of a pandemic affecting women and their natural occurrence of the menstrual cycle did not appear in any considerations or recommendations while already protecting themselves from the virus. Menstruation is defined as the cyclic, orderly sloughing of the uterine lining, in response to the interactions of hormones produced by the hypothalamus, pituitary, and ovaries [3]. The menstrual cycle starts from the puberty age of a young woman and once she starts to ovulate a mature egg or ovum is released from one of the ovaries. The ovaries are the two female reproductive organs found in the pelvis. If the egg is fertilized by a sperm as it travels down the fallopian tube, then pregnancy occurs. The fertilized egg attaches to the lining of the uterus. If the egg does not become fertilized, the lining of the uterus (endometrium) is shed during menstruation [4].

Over 50% of the global population will experience menstruation, and menstrual disorders are extremely common and debilitating. Problematic menstruation may cause anaemia and has a significant negative impact on quality of life which can lead to a huge socioeconomic burden for women, their families, health services, and society [5]. Furthermore, with the increasing effects of the virus, vaccinations were developed as a means of aid in combating the severity and controlling the level of hospitalization of those affected or exposed. Whilst women within their menstrual years would also participate in being vaccinated the side effects did not originally stipulate cautions for one's menstrual cycle. According to Edelman A. et al, studies confirm that there's a link between the Covid-19 vaccination and an increase in menstrual cycle length [6]. With further research, others have stated that not only does the vaccine play a part but the changes in lifestyle during a lockdown where several women, were forced to work from home, became unemployed, lost a loved one, move from one place to a next due to financial constraints,

to those even trying to start a family. All of this has contributed to depression, grieving, anger, or other emotional changes in many forms, which in turn contributed to biological changes. It is observed that the normal length of menses would be under 6 days, but since the pandemic, many have experienced longer and heavier periods, and they may have one thing in common [7].

The effects of COVID-19 on the reproductive system are still widely studied and changes in the menstrual cycle after taking the vaccine is just another recent finding and is just as concerning as it affects women across the globe.

Theoretical Framework

The Health Belief Model came about in the 1950s. Researchers and social psychologists Godfrey Hochbaum, Stephen Kegels, Howard Leventhal, Irwin Rosenstock, et al established the Health Belief Model to explain why persons were failing to participate in programs that help to prevent and detect diseases. The essential objective of the Health Belief Model is to explain the impact of a person's insight and perception toward a specific disease and what it means for their well-being related to decision-making. It is now and again used to develop preventative and intervention programmes. The health belief model has been adjusted to foresee a wide range of health-related behaviours, for example, being assessed for the early detection of asymptomatic sicknesses (i.e., Coronavirus) and getting vaccinations (i.e., a yearly influenza shot) [8]. The Health Belief Model has a few constructs that are utilized to foresee why individuals participate in counteraction, screening, or potentially controlling medical issues. According to Figure 1, Modifying Factors such as demographic and socio-psychological variables influence how a person responds to their health, some of these variables are age, sex, marital status, etc. Individual beliefs consist of Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, and Self-Efficacy. Perceived threat of not using condoms influences the decision to use condoms. Cues to action also influence the decision to use condoms.

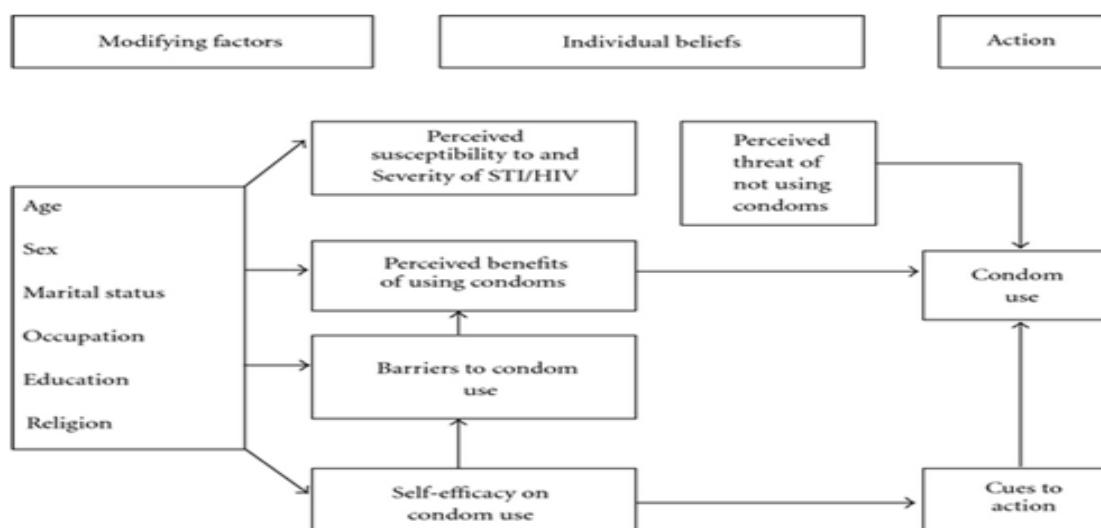


Figure 1 Showing the Health Belief Models

Perceived Susceptibility is how an individual reacts to a disorder or illness. Perceived Severity is a conviction about the sincerity of the condition or leaving it untreated. Perceived Benefits are the singular's conviction about the expected positive attributes of health action. Perceived

Barriers are the conviction about the likely bad parts of a specific health action. Self-efficacy is the conviction that one can accomplish the way of behaving expected to execute the result. The action is Cues to Action. These are factors that trigger an individual to need to be more proactive about their well-being and health [9].

Literature Review

According to the Ministry of Health and Wellness, which was adopted by the World Health Organization, Coronavirus is a group of viruses that can cause illnesses ranging from a common cold to Middle East Respiratory Syndrome. It can become a novel virus, which is when the virus mutates into a different strain of the virus that has not been studied in human beings. It is a highly contagious disease and can be transmitted between animals and other animals, as well as, between animals and humans and human-to-human contact. This virus mostly affects the respiratory system causing shortness of breath, chest congestion, difficulty breathing, coughing, and fever. It could also lead to pneumonia, severe acute respiratory syndrome, and even death in more severe cases [10].

This Coronavirus disease that caused the 2019 series of lockdowns, produced psychological and lifestyle consequences for women of reproductive age. The effects of the virus, as well as the Covid-19, vaccine caused many different changes in their menstrual cycles. The menstrual cycle occurs in females of reproductive age, typically from between 10 and 16 to 51 years of age. It is the female's body's preparation for fertilization of the egg from the ovary and pregnancy. When pregnancy does not occur the lining of the uterus as well as the egg is broken down and excreted from the vagina as blood. These cycles occur anywhere from 28 to 35 days [11]. As it is widely known the effects of this pandemic on women's reproductive health, have not been studied in-depth. As such this is one of the first systematic reviews to characterize changes in the menstrual cycle associated with lockdowns compared to non-lockdown periods. A search on the 5th of May 2022, retrieved articles published between the 1st of December 2019, and the 5th of May 2022, from Medline, Embase, and Web of Science. The included articles were peer-reviewed observational studies with full texts in English, which reported menstrual cycle lengths during the lockdowns. A study found that the COVID-19 pandemic was significantly associated with higher levels of stress, anxiety, depression, posttraumatic stress disorder (PTSD), and more severe psychological impacts in women. It is known that psychological distress can affect menstruation [12].

A study also showed that the degree of stress and anxiety caused by the COVID-19 pandemic was high enough to affect women's menstrual cycle characteristics. Psychological distress is associated with menstrual changes. A study showed that depression and anxiety disorders affect the regulation of the hypothalamic-pit-adrenal (HPA) axis, which can inhibit the luteinizing hormone (LH) surge and lead to ovarian dysfunction. Stress can affect the hypothalamic-pituitary-gonadal axis, altering the regulation of gonadotropin-releasing hormone, gonadotrophs, and gonads. In distress, the body produces cortisol, which can inhibit gonadotropin-releasing hormone (GnRH) secretion. Decreased GnRH secretion leads to reduced follicle-stimulating hormone (FSH) levels, LH levels, follicular development, and estrogenic secretion. These changes can lead to an ovulation and functional hypothalamic amenorrhea. Psychological distress

has also been associated with worsening dysmenorrhea and heavy menstrual bleeding (HMB) [13].

The effects of COVID-19 on the reproductive system are still being widely studied. The SARS-CoV-2 infection could affect the hypothalamic-pituitary-ovarian-endometrial axis, resulting in menstrual cycle changes. Hypothalamic hypogonadism may occur in severe COVID-19, which can cause temporary amenorrhea and infrequent menstruation. ACE-2 receptors are widely expressed in the ovaries and endometrium. This could allow SARS-CoV-2 infection to directly affect ovarian hormones and endometrial responses that lead to menstrual disturbances. Menstrual cycle changes were also reported after mRNA and adenovirus vectored COVID-19 vaccines were administered. The mechanism behind this is immunological influences on menstrual cycle hormones. The current study shows that changes in the menstrual cycle do occur following COVID-19 vaccination; however, the changes are slight and are reversed quickly. A few studies have evaluated the impact of the COVID-19 pandemic and quarantine on women's mental health and menstrual changes [14].

Methods and Materials

This research was carried out with the use of quantitative data. According to the book entitled "Social Research Methods: Qualitative and Quantitative Approach," written by W. Lawrence Neuman; quantitative research involves collecting data in the form of numbers [15]. Quantitative researchers are concerned with measurement. In quantitative studies, measurement is a distinct step in the research process that occurs before data collection. This study used a cross-sectional web-based descriptive research design. According to the book entitled "Research Methods for Everyday Life," written by Scott W. Vanderstoep and Deirdre D. Johnston; cross-sectional design studies several different groups of people of different ages to compare whether age differences exist in the behaviour or attitude being studied. A cross-sectional design is the most efficient way to identify the age at which certain social and psychological factors occur [16].

Researchers created a web-based standardized survey questionnaire and used purposive sampling techniques to collect pertinent information on the topic 'Changes in the Menstrual Cycle after taking the COVID-19 Vaccine.' The data collection started on October 2, 2022, to November 15, 2022. The survey was submitted and approved by the course facilitator. The web-based standardized survey questionnaire was created using Google Forms, consisting of nine (9) close-ended questions and eight (8) open-ended questions. There were three (3) demographic questions and fourteen (14) other questions intended to highlight the changes in the menstrual cycle after taking the COVID-19 vaccine. It was given to 1089 female participants between the ages eighteen (18) to sixty-one (61), from the three counties in Jamaica: Cornwall, Middlesex, and Surrey, which consist of a total of 14 parishes. The web-based standardized survey questionnaire was distributed to participants via social media platforms, WhatsApp, Facebook, and Instagram. Dissemination of the survey was done using a link. The respondents were informed about the purpose of the research and the data collection process included limited personal data such as age, gender, marital status, and parish of residence, and these could not be used to identify the participants.

Data collected from the Google Form were transferred to the IBM Statistical Packages for Social Sciences (SPSS), Version 29.0; where they were analyzed using tables consisting of frequencies, percentages, descriptive statistics, and graphs.

Methods and Materials

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A web-based standardized self-administered survey was to collect pertinent information from Jamaican women 18 years to 55 years on whether there were changes in their menstrual cycle after taking the COVID-19 vaccine. The data collection was from October 2, 2022, to November 15, 2022. The web-based standardized survey questionnaire was created using Google Forms, consisting of nine (9) close-ended questions and eight (8) open-ended questions. There were three (3) demographic questions and fourteen (14) other questions intended to highlight the changes in the menstrual cycle after taking the COVID-19 vaccine. It was given to 1089 females ages eighteen (18) to fifty-five (55) years across the three counties in Jamaica (i.e., the three counties: Cornwall, Middlesex, and Surrey or the 14 categorized parishes of the island). Multi-stage probability sampling technique was used to identify and collect the data from the prospective sampled population. The respondents were informed about the purpose of the research and the data collection process included minimal personal data such as gender, age, educational level and marital status that cannot be used to identify a participant.

This study collects data from Jamaican females ages 18 to 55 years old based on information on menopause. The Northern American Menopause Society stated, “Menopause is defined as the final menstrual period and is usually confirmed when a woman has missed her period for 12 consecutive months (with no other obvious causes). Menopause results in lower levels of estrogen and other hormones. It is a normal, natural life event that all women experience if they live long enough.... Most women experience menopause between ages 40 and 58. The average age is 51”[17]. The National Institute of Aging (NIA) indicated that the period of menopause transition begins between 45 and 55 years old. Hence, this study used a maximum of 55 years and a minimum of 18 years. The minimum age of 18 years was used based on the legal age of consent in Jamaica, and the researchers not wanting to take on the responsibility of seeking parental/guardian consent for the respondents.

The data for this study was obtained from 1089 Jamaican females ages 18 to 55 years old. The sample size was determined based on Jamaica’s female population (ages 18 to 55 years old) for

2018 (i.e., 902,421). Using a population of 902,421 Jamaican females 18 to 55 years old, a 2.967% margin of error, and a 95% confidence level, the sample size is 1,089. A multi-stage sampling design was used for collecting data from the sampled respondents across the 14 parishes in Jamaica. The research team collected data from resident Jamaicans at the time of the survey based on females ages 18 to 55 years old who resided in a parish of residence distribution as published by the Statistical Institute of Jamaica (STATIN) for 2018 [19]. The population statistics for 2018 are the latest published figures from the STATIN.

Data were collected, stored, and retrieved from the Statistical Packages for the Social Sciences for Windows, Version 29.0. The data analysis was analyzed using frequencies and percentages, chi-square, and ordinary least squares (OLS) regression. Researchers used a p-value of 5% to determine the statistical significance.

Findings

Demographic data

Table 1: Demographic data of females in Jamaica of the sampled (n=1089)

Details	% (n)
Gender:	
Female	100 (1089)
Age Group:	
18-23 years	30.8 (335)
24-29 years	22.4 (244)
30-36 years	18.0 (196)
37-42 years	11.8 (128)
43-48 years	9.3 (101)
49-55 years	7.7 (84)
Marital Status:	
Single	43.0 (468)
Married	25.4 (277)
Divorced	9.3 (101)
Area of Residence:	
Kingston	8.2 (89)
St. Andrew	12.0 (131)
St. Thomas	4.7 (51)
Portland	4.6(50)
St. Catherine	13.7 (149)
St. Mary	4.9 (53)
St. Ann	8.4 (92)
Manchester	7.1 (77)
Clarendon	9.5 (103)
Hanover	5.0 (54)
Westmoreland	5.2 (57)
St. James	6.5 (71)
Trelawny	4.8 (52)
St. Elizabeth	5.5 (60)

Table 2: Length of Menstrual Cycle, other the reproductive faced, the vaccine chosen, and the stress-related factors experienced during the pandemic, (n=1089)

Details	%(n)
How long does your cycle usually last?	
3-5 days	48.5 (528)
6-8 days	39.9(435)
9-12 days	9.7 (106)
13-15 days	1.4(15)
Do you have any reproductive issues?	
Fibroids	12.2 (133)
Polycystic Ovary Syndrome (PCOS)	9.6 (105)
Endometriosis	7.1 (77)
Ovarian Cyst	10.3 (112)
Other	0.5 (5)
Which brand of vaccine did you take?	
Pfizer	25.3 (276)
Johnson & Johnson	14.1 (154)
AstraZeneca	37.7 (411)
Moderna	0.4 (4)
Were you experiencing any of these stress-related factors during the pandemic?	
Anxiety	58.2 (634)
Depression	80.7 (879)
Grief	79.9 (870)
Weight Gain	78.3 (853)
Weight Loss	84.6 (921)
Headache	99.2 (1080)
Cravings	99.8 (1087)

Table 3: Issues relating to childbearing, sex drive, and the vaccine, (n=1089)

Details	% (n)		
	Yes	No	Not Applicable
1. Is your menstrual cycle irregular?	37.6 (406)	57.2 (623)	
2. Do you have any child/children?	60.8 (662)	38.8 (423)	
3. Were you pregnant during the early stages of the pandemic?	23.0 (251)	67.4 (734)	9.4 (102)
4. Did you have any issues conceiving during the pandemic?	18.5 (201)	44.0 (479)	37.4 (407)
5. Have you taken the COVID-19vaccine?	77.1 (835)	22.9 (248)	
6. Are you fully vaccinated?	68.1 (742)	17.4 (190)	14.0 (152)
7. Have you experienced any changes in your sex drive since taking the COVID-19 vaccine?	14.8 (161)	66.9 (728)	18.2 (198)
8. Did you experience any menstrual changes during the COVID-19 pandemic?	69.7 (756)	30.3(328)	

Figure 1 depicts data on the self-reported menstrual cycle length. Of the sampled females (n=1089), the majority of them were seeing their cycle for 3-5 days (48.7%, n=528), followed by 6-8 days (40.2%, n=435), 9-12 days (9.8%, n=106) and 13-15 days (1.4%, n=15).

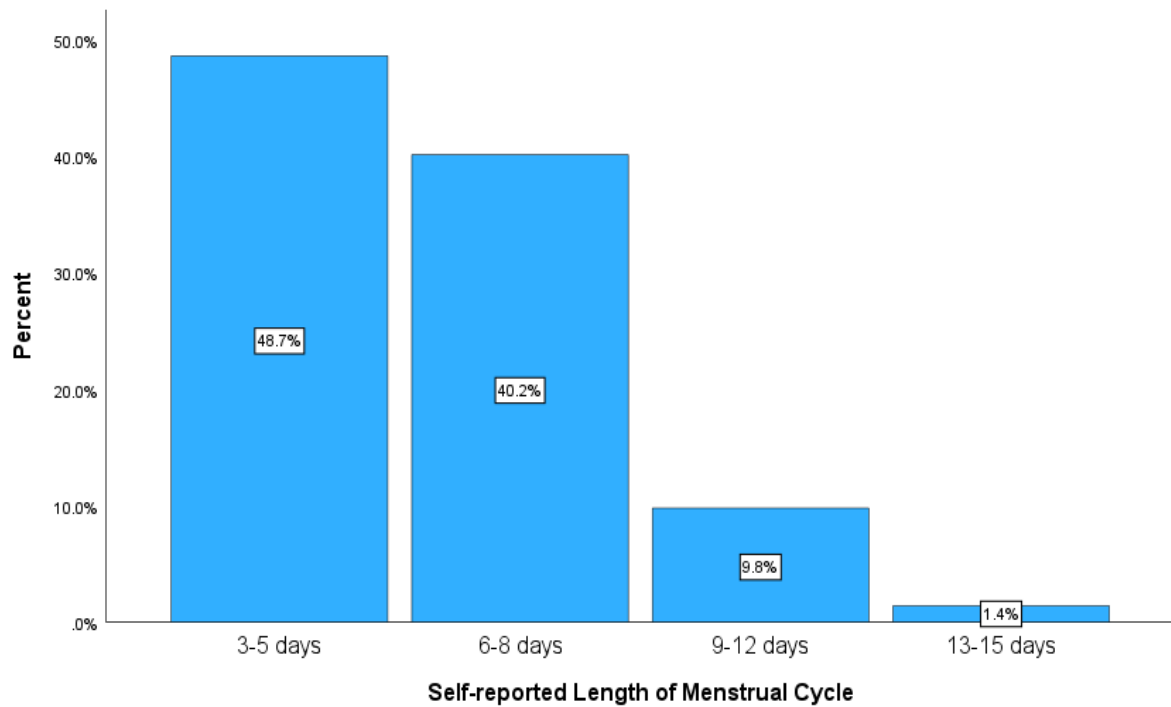


Figure 1: Self-reported length of Menstrual Flow

Of the sampled respondents (n=1089), the response rate to the question ‘Have you seen a change in your menstrual cycle’. Almost 70% (n=835) of the sampled females indicated that they have experienced a change in their self-reported menstrual cycle flow after taking the COVID-19 vaccine.

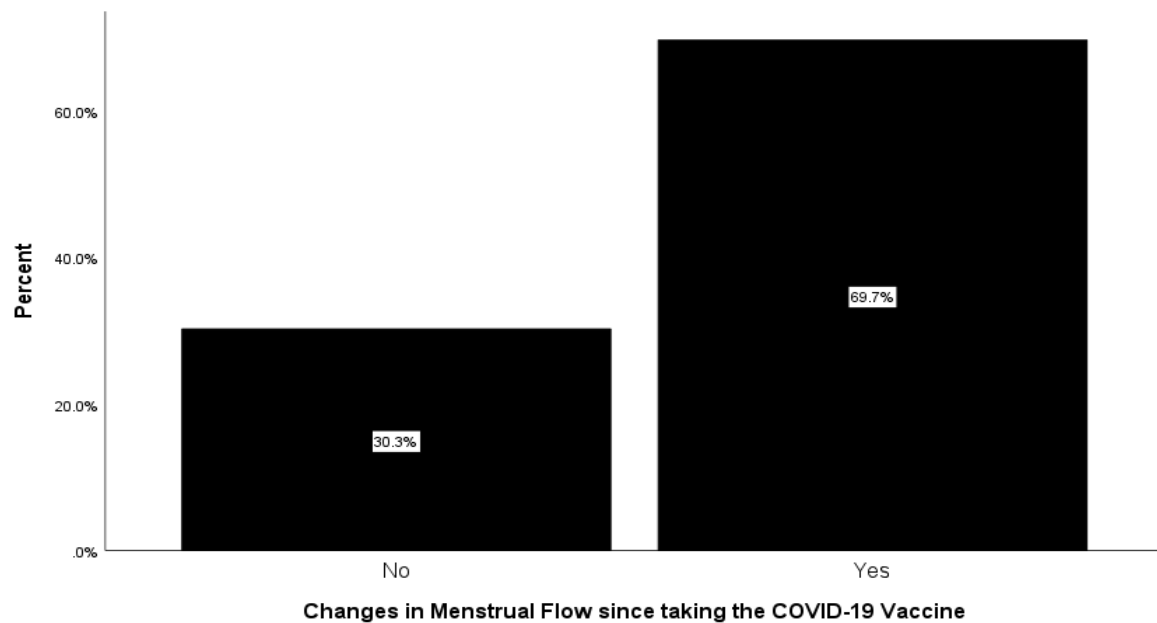


Figure 2: Changes in Self-reported Menstrual Cycle Flow after taking the COVID-19 vaccine

Of those who reported taking the vaccine (n=835), 99.9% of them self-identified various changes in their menstrual cycle flow since taking the COVID-19 vaccine. Almost 20% (n=164 or 1 in every 5) of the sampled females self-reported that their menstrual cycle flow has remained normal since taking the COVID-19 vaccine. This means that 80% of females self-reported various changes in their menstrual cycle flow since taking the vaccine, with 28.9% (n=241) indicating having increased menstrual cycle flow and 10.7% having shortened menstrual cycle flow.

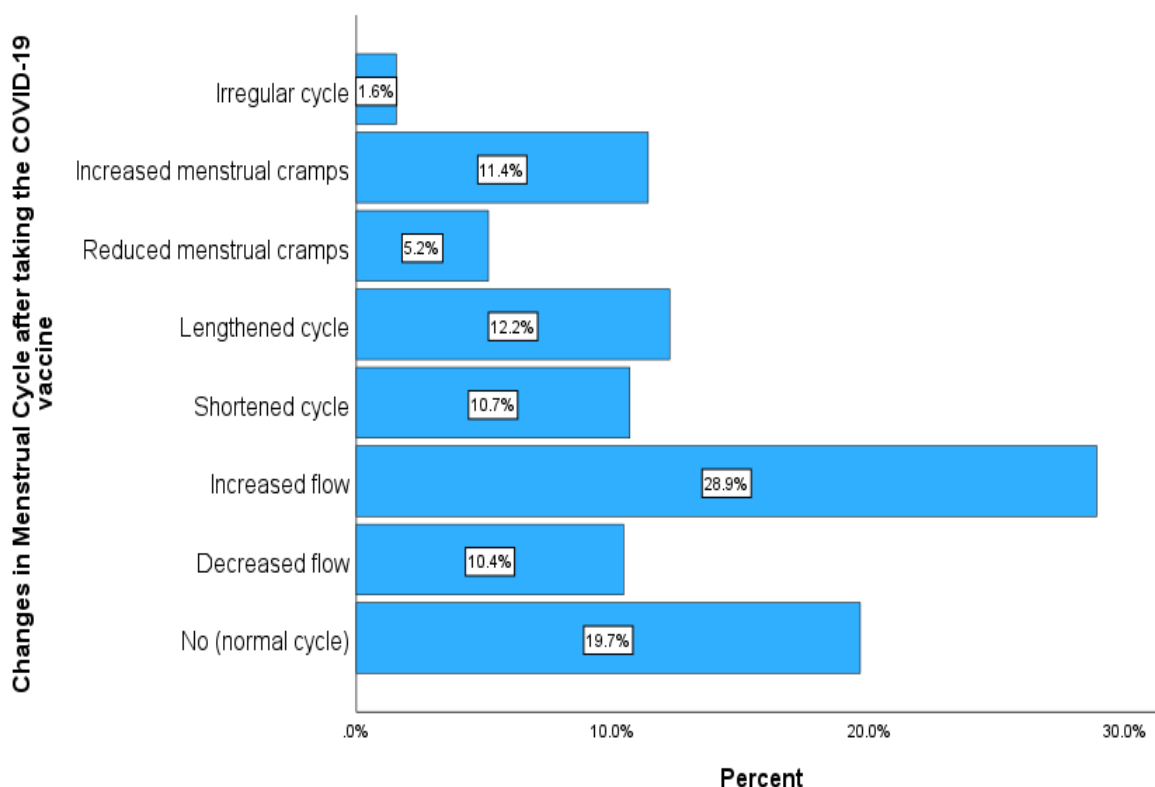


Figure 3: Changes in Self-reported Menstrual Flow after taking the COVID-19 vaccine

Of the sampled respondents (n=1089), 99.1% (n=1079) were used to establish the cross-tabulation tabulation between taking the COVID-19 vaccine and the changes in the self-reported menstrual cycle of Jamaican females ages 18-55 years old (Table 4). Fifty percent of sampled respondents who indicated that their menstrual cycle has remained the same have taken the vaccine compared to 92.9% whose menstrual cycle has been irregular, 87.6% have had an increased flow, 92.6% a decreased flow, and 92.7% indicated having shortened menstrual cycle ($\chi^2(7) = 197.727, P < 0.001$).

Table 4.A cross-tabulation of taking the COVID-19 vaccine and changes in self-reported menstrual cycle flow

Taking the COVID-19 vaccine	Changes in Self-reported Menstrual Cycle								Total
	No (normal cycle)	Decreased flow	Increased flow	Shortened cycle	Lengthened cycle	Reduced menstrual cramps	Increased menstrual cramps	Irregular cycle	
Yes	164	87	241	89	102	43	95	13	834
	50.3%	92.6%	87.6%	92.7%	90.3%	81.1%	88.0%	92.9%	77.3%
No	162	7	34	7	11	10	13	1	245
	49.7%	7.4%	12.4%	7.3%	9.7%	18.9%	12.0%	7.1%	22.7%
Total	326	94	275	96	113	53	108	14	1079

Of the sampled respondents who reported taking the COVID-19 vaccine (n=835), 99.9% (n=834) were used to establish the cross-tabulation tabulation between the changes in the self-reported menstrual cycle of Jamaican females ages 18-55 years old and the age cohort. Using chi-square analysis, a significant statistical relationship existed between the two variables ($\chi^2(5) = 42.034$, $P < 0.001$). Ninety-one percent of sampled respondents ages 43-48 years old reported that taking the COVID-19 vaccine has changed their menstrual cycle compared to 91.1% whose ages 37-42 years old, 80.3% of those ages 30-36 years old, 89.0% of those ages 49-55 years old, and 76.9% of those ages 18-23 years old (Table 5)

Table 5.A cross-tabulation of changes in self-reported menstrual cycle flow after taking the COVID-19 vaccine and Age Cohort

Change in Self-reported Menstrual Cycle Flow	Age Cohort						Total
	18-23	24-29	30-36	37-42	43-48	49-55	
No	59	50	30	9	8	8	164
	23.1%	29.6%	19.7%	8.9%	9.5%	11.0%	19.7%
Yes	196	119	122	92	76	65	670
	76.9%	70.4%	80.3%	91.1%	90.5%	89.0%	80.3%
Total	255	169	152	101	84	73	834

Table 6 presents a cross-tabulation of changes in self-reported menstrual cycle flow after taking the COVID-19 vaccine and Age cohort. The findings revealed that the youngest females were most likely to indicate having increased menstrual flow (26.1%) compared to older females ($\chi^2(35) = 77.679$, $P < 0.001$).

Table 6: A cross-tabulation of changes in self-reported menstrual cycle flow after taking the COVID-19 vaccine and Age Cohort

Age cohort (in years)	Changes in the Menstrual cycle								Total
	No (normal cycle)	Decreased flow	Increased flow	Shortened cycle	Lengthened cycle	Reduced menstrual cramps	Increased menstrual cramps	Irregular cycle	
18-23	111	30	72	18	36	17	44	5	333
	33.8%	31.9%	26.1%	18.4%	31.9%	32.1%	40.7%	35.7%	30.7%
24-29	100	14	60	23	19	9	16	2	243
	30.5%	14.9%	21.7%	23.5%	16.8%	17.0%	14.8%	14.3%	22.4%
30-36	63	16	56	12	20	10	14	5	196
	19.2%	17.0%	20.3%	12.2%	17.7%	18.9%	13.0%	35.7%	18.1%
37-42	27	9	37	17	15	6	14	2	127
	8.2%	9.6%	13.4%	17.3%	13.3%	11.3%	13.0%	14.3%	11.7%
43-48	16	12	31	14	12	5	11	0	101
	4.9%	12.8%	11.2%	14.3%	10.6%	9.4%	10.2%	0.0%	9.3%
49-55	11	13	20	14	11	6	9	0	84
	3.4%	13.8%	7.2%	14.3%	9.7%	11.3%	8.3%	0.0%	7.7%
Total	328	94	276	98	113	53	108	14	1084

Table 7 presents a cross-tabulation of changes in self-reported menstrual cycle flow after taking the COVID-19 vaccine and being fully vaccinated. Of the vaccinated respondents (n=835), 99.0% (n=827) of them used this cross-tabulation. The findings revealed that 81.1% of the fully vaccinated females self-reported a change in their menstrual cycle compared to 75.0% of those who have received one dose ($\chi^2(1) = 2.197, P = 0.138$).

Table 7: A cross-tabulation of changes in self-reported menstrual cycle flow after taking the COVID-19 vaccine and being fully vaccinated

Changes in Menstrual Cycle	Fully Vaccinated		Total
	Yes	No	
No	136	27	163
	18.9%	25.0%	19.7%
Yes	583	81	664
	81.1%	75.0%	80.3%
Total	719	108	827

Table 8 presents a cross-tabulation of challenges trying to conceive during the pandemic and taking the COVID-19 vaccine. Of those who had challenges trying to conceive during the pandemic (n=200), 90.5% of them had taken the COVID-19 vaccine ($\chi^2(2) = 31.501, P < 0.001$).

Table 8.A cross-tabulation of challenges trying to conceive during the pandemic and taking the vaccine

Taken the COVID-19 vaccine	Challenges trying to conceive during the pandemic		Total
	Yes	No	
Yes	181	336	517
	90.5%	70.7%	76.6%
No	19	139	158
	9.5%	29.3%	23.4%
Total	200	475	675

Discussion

A study conducted by Edelman et al. [6] and published by the National Institutes of Health found a statistical relationship between women receiving the COVID-19 vaccine and experiencing an increase in menstrual flow. The issue of menstrual cycles and sexual health in Jamaican women, since going through the COVID-19 pandemic and receiving the Coronavirus vaccine, has not been explored in great detail. This research is one of the first systematic self-reported quantitative inquiries that focus on menstrual cycles, other reproductive issues, and taking the COVID-19 vaccine. The current findings revealed that a shocking 69.7% out of a sample of 1089 females (i.e., almost 7 in every 10 females), ages 18 to 55 years, and 77.3% of those who took the COVID-19 vaccines have experienced changes in their menstrual cycles during the pandemic, which concurs with the literature on changes in menstrual flow since dating the COVID-19 vaccine [20-24]. The COVID-19 vaccine is only changing the menstrual cycle of Jamaican women as 14.8% of them also reported having changes to their sex drives. This correlates to the studies showing that the pandemic affected many stress factors in women causing changes to the menstrual cycle [7] and the mRNA and adenovirus vectored COVID-19 vaccines caused slight, but reversible changes after being administered to women [4].

From the current study of Jamaican females ages 18-55 years old, 77% have reported taking different types of the COVID-19 vaccine and 68.5% stated that they are fully vaccinated. Almost 38% of the sample stated that they usually have irregular periods and a majority 48.5% stated that their periods usually last 3-5 days. 39.2% have various reproductive issues such as Fibroids, PCOS, Ovarian cysts, and Endometriosis. Edelman et al. [6] found that “Women who were younger and who had longer cycle length before vaccination were more likely to experience the increase”, the current study concurs with this finding.

Unlike the literature, this study provides critical self-reported information on the ages of women who were experiencing changes in their menstrual cycle after taking the COVID-19 vaccine. The majority of the respondents indicated experiencing changes in their menstrual cycles since experiencing the COVID-19 pandemic. The findings revealed that at least 3 in every 4 Jamaican females ages 18-55 years old have experienced changes in their menstrual cycle with the most being 9 in every 10. Almost 3 in every 5 women have produced children, and about 23.1% of the women were pregnant during the pandemic. However, another 18.5% of these women stated that they had issues conceiving during the pandemic.

Based on previous studies carried out on stress factors and menstrual cycle disturbances [25-27], this survey concurs that stress/uncertainty directly relates to the changes in menstruation patterns. A little over 2 in every 5 women reported having anxiety during the pandemic, 1 in every 5 reported having depression, and another 1 in every 5 experienced griefs. Sudden weight gains and weight loss played a factor as well as 21.6% reported gaining weight and 15.4% noted losing a notable amount of weight. A majority 20.7% of the women in the study reported having an increased flow, 13.4% increased menstrual cramps, 12.8% lengthened cycles, 9.7% shortened cycles, 8.9% decreased flow, 6.4% reduced menstrual cramps, .5% spotting between periods, .3% missed period, .4% missed periods, and 0.1% reported vomiting, nausea, irregular period, having no period at all, having a skip of a monthly period, or a cycle switch.

Having examined other issues such as depression, the researchers are forwarding that the perceived stress, as well as depression, is also associated with influencing the menstrual cycle of Jamaican women as well as the COVID-19 vaccine which has also been established in the research literature [28]. The truth is there is no clinical evidence that the COVID-19 vaccine is causing changes in the menstrual cycle of Jamaican women, but this self-reported inquiry is the rationale for a clinical study on the matter. Notwithstanding the absence of a clinical study issue of menstruation and the COVID-19 vaccine in Jamaica, clinical and cohort studies by Edelman et al. [6], Edelman et al. [20], Male [21], and Hallberg *et al*[29] can substantiate the self-reported information provided by Jamaican women that the COVID-19 vaccine has changed their menstrual cycle. Hallberg *et al.* [29] found that the COVID-19 vaccine is associated with a small change in menstrual cycle length, which emerged in the current self-reported cross-sectional study.

The literature does not find a relationship between the taking of the COVID-19 vaccine and infertility [30-33], which is contrary to this self-reported study. In the current study, 90.5% of Jamaican females who experienced challenges trying to conceive during the pandemic had taken the COVID-19 vaccine. Magnus et al. [30] found that “Covid-19 Vaccination in Early Pregnancy and miscarriage In this case-control study performed with the use of registry data in Norway, there was no evidence of an increased risk of first-trimester pregnancy loss associated with Covid-19 vaccination during early pregnancy” [30], which means that challenges experienced by Jamaican females may be due to other reproductive health issues as well as psychological issues such as stress and depression. Another explanation for the changes in the menstrual cycle experienced by Jamaican females is associated with the COVID-19 infection and its severity, which was established in a cross-sectional study by Abdel-Moneim et al. [34]. Additionally, 15% of currently sampled Jamaican females also indicated that their sex drive has changed following taking the COVID-19 vaccine. With Professor Edelman’s study that the vaccine influences the length of the menstrual cycle in women, then it follows that there are hormonal changes and can explain what is self-reported in the current study.

Conclusion

It is important to place focus on the effects of vaccines on the reproductive system of a woman. Each day women struggle in protecting their health as they are prone to unfortunate reproductive issues. The system which brings forth life is not given the attention it requires when it comes to

developing vaccines to protect women in their childbearing age. Therefore, further studies would be beneficial not just to them but to society and the way forward when developing vaccines.

Recommendations

- Further research is to be carried out on the changes in the menstrual cycle after taking the COVID-19 vaccine.
- For individuals to inquire about various aspects of a product before using it; for example, side effects

References

- [1]. World Health Organization (WHO). Who coronavirus (COVID-19) dashboard. Washington DC, WHO; 2022.<https://covid19.who.int/>.
- [2]. World Health Organization. Global: Jamaica. Washington DC: WHO; 2022. <https://covid19.who.int/region/amro/country/jm>.
- [3]. Reed BG, Carr BR. The Normal Menstrual Cycle and the Control of Ovulation. 2018 Aug 5. In: Feingold KR, Anawalt B, Boyce A, Chrousos G, de Herder WW, Dhatariya K, Dungan K, Hershman JM, Hofland J, Kalra S, Kaltsas G, Koch C, Kopp P, Korbonits M, Kovacs CS, Kuohung W, Laferrère B, Levy M, McGee EA, McLachlan R, Morley JE, New M, Purnell J, Sahay R, Singer F, Sperling MA, Stratakis CA, Trencé DL, Wilson DP, editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000–. PMID: 25905282.
- [4]. John Hopkins Medicine (JHM). Menstrual cycle: An Overview. Baltimore Maryland, JHM; ud.
- [5]. Gemma C Sharp, Abigail Fraser, Gemma Sawyer, Gabriella Kountourides, Kayleigh E Easey, Gemma Ford, Zuzanna Olszewska, Laura D Howe, Deborah A Lawlor, Alexandra Alvergne, Jacqueline A Maybin. The COVID-19 pandemic and the menstrual cycle: research gaps and opportunities, *International Journal of Epidemiology*. 2022; 51(3):691-700. DOI: 10.1093.
- [6]. Edelman A, Boniface ER, Benhar E, Han L, Matteson KA, Favaro C, Pearson JT, Darney BG. Association Between Menstrual Cycle Length and Coronavirus Disease 2019 (COVID-19) Vaccination: A U.S. Cohort. *Obstet Gynecol*. 2022 Apr 1;139(4):481-489. DOI: 10.1097/AOG.0000000000004695. Epub 2022 Jan 5. PMID: 34991109; PMCID: PMC8936155.
- [7]. Levine, C.G. and B. Covid-19 can mess with your periods in multiple ways, *EverydayHealth.com*; 2022.
- [8]. Rural Health Information Hub. Health Belief Model. Atlanta: Rural Health Information Hub; nd.<https://www.ruralhealthinfo.org/toolkits/health-promotion/2/theories-and-models/health-belief>
- [9]. Katikiro, E. & Njau, B. Motivating factors and psychosocial barriers to condom use among out-of-school youths in Dares Salaam, Tanzania: A Cross-Sectional Survey using the health belief model; 2012.
- [10]. Ministry of Health and Wellness Jamaica (MOHW). Learn about the coronaviruses. Kingston: MOHW; 2022.

- [11]. Thiyagarajan DK, Basit H, Jeanmonod R. Physiology, Menstrual Cycle; 2021.
- [12]. Lebar, V. The effect of covid-19 on the menstrual cycle: A systematic review, Journal of clinical medicine. U.S. National Library of Medicine; 2022.
- [13]. Muharram, R., Agiananda, F., Budiman, Y., Harahap, J., Prabowo, K., Azyati, M., Sumapraja, K. Menstrual cycle changes and mental health status of women hospitalized due to covid-19; 2022.
- [14]. Chao, M., Menon, C., & Elgendi, M. Menstrual cycles during COVID-19 lockdowns: A systematic review and meta-analysis; 2001.
- [15]. Neuman WL. Qualitative and Quantitative Approaches. 2014; 201-244.
- [16]. Vanderstoep SW, Johnston DD. Research Methods for Everyday Life. 2009; 41
- [17]. The North American Menopause Society. Menopause 101: A primer for the perimenopausal. Ohio: The North American Menopause Society; 2022. <https://www.menopause.org/for-women/menopauseflashes/menopause-symptoms-and-treatments/menopause-101-a-primer-for-the-perimenopausal>.
- [18]. National Institute of Aging (NIA). What is menopause? National Institute of Aging; 2021. <https://www.nia.nih.gov/health/what-menopause#:~:text=The%20menopausal%20transition%20most%20often,begins%2C%20and%20race%20and%20ethnicity>.
- [19]. Statistical Institute of Jamaica (STATIN). Mid-year population by age and sex, 2018. Kingston: STATIN; 2022. https://statinja.gov.jm/Demo_SocialStats/newMidYearPopulationbyAgeandSex2008.aspx.
- [20]. Edelman A, Boniface ER, Male V, Cameron ST, Benhar E, Han L, Matteson KA, Van Lamsweerde A, Pearson JT, Darney BG. Association between menstrual cycle length and covid-19 vaccination: the global, retrospective cohort study of prospectively collected data. *BMJ Med.* 2022; 1(1):e000297. doi: 10.1136/bmjmed-2022-000297. Epub 2022 Sep 27. PMID: 36381261; PMCID: PMC9665108.
- [21]. Male V. COVID-19 vaccination and menstruation. *Science*, 378(6621), 704-706.
- [22]. Morris A. Women said coronavirus shots affect periods: the new study shows they're right. Washington DC: Washington Post; 2022. <https://www.washingtonpost.com/wellness/2022/09/27/covid-vaccine-period-late/>
- [23]. Al-Mehaisen LMM, Mahfouz IA, Khamaiseh K, AL-Beitawe SN, Al-Kuran OAH. Short-Term Effect of Corona Virus Diseases Vaccine on the Menstrual Cycles. *Int J Women's Health.* 2022; 14:1385-1394 <https://doi.org/10.2147/IJWH.S376950>.
- [24]. Chao MJ, Menon C, Elgendi M. Effect of COVID-19 vaccination on the menstrual cycle. *Frontiers in Medicine*, 2022; 9. <https://doi.org/10.3389/fmed.2022.1065421>
- [25]. Nagma S, Kapoor G, Bharti R, Batra A, Batra A, Aggarwal A, Sablok A. To evaluate the effect of perceived stress on menstrual function. *J Clin Diagn Res.* 2015 Mar;9(3):QC01-3. DOI: 10.7860/JCDR/2015/6906.5611. Epub 2015 Mar 1. PMID: 25954667; PMCID: PMC4413117.
- [26]. Rafique N, Al-Sheikh MH. Prevalence of menstrual problems and their association with psychological stress in young female students studying health sciences. *Saudi Med J.* 2018 Jan; 39(1):67-73. doi: 10.15537/smj.2018.1.21438. PMID: 29332111; PMCID: PMC5885123.

- [27]. Mittiku YM, Mekonen H, Wogie G, Tizazu MA, Wake GE. Menstrual irregularity and its associated factors among college students in Ethiopia, 2021. *Frontiers in Global Women's Health*, 2022; 3. <https://doi.org/10.3389/fgwh.2022.917643>.
- [28]. Sharp GC, Fraser A, Sawyer G, et al. The COVID-19 pandemic and the menstrual cycle: research gaps and opportunities. *Int J Epidemiol* 2022; 51:691-700. DOI:10.1093/ije/dyab239 pmid: <http://www.ncbi.nlm.nih.gov/pubmed/34865021>.
- [29]. Hallberg E, Sundström A, Larsson M, et al. Association between menstrual cycle length and coronavirus disease 2019 (COVID-19) vaccination: a U.S. cohort. *ObstetGynecol* 2022; 139:940–1. DOI:10.1097/AOG.0000000000004781 pmid: <http://www.ncbi.nlm.nih.gov/pubmed/35576361>.
- [30]. Magnus MC, Gjessing HK, Eide HN, et al. Covid-19 vaccination during pregnancy and first-trimester miscarriage. *N Engl J Med* 2021; 385:2008–10. DOI:10.1056/NEJMc2114466 pmid: <http://www.ncbi.nlm.nih.gov/pubmed/34670062>.
- [31]. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. COVID-19 Vaccines for People Who Would Like to Have a Baby. Atlanta: CDC; 2022. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/planning-for-pregnancy.html>.
- [32]. American Society for Reproductive Medicine (ASRM) Patient Management and Clinical Recommendations During the Coronavirus (COVID-19) Pandemic: UPDATE No. 16 – Reproductive Facts Regarding COVID-19 Vaccination. Available at: <https://www.asrm.org/covid-update-16>.
- [33]. American College of Obstetricians and Gynecologists (ACOG). COVID-19 Vaccination Considerations for Obstetric–Gynecologic Care. <https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2020/12/covid-19-vaccination-considerations-for-obstetric-gynecologic-care>.
- [34]. Abdel-Moneim YAS, Alghamdi HY, Alrashed AM, Jawhari AM, Bukhari SMM, Bukhari NMM, Abdel-Moneim AS. Menstrual cycle changes A cross-sectional study of Saudi females following SARS-CoV-2 infection. *PLoS One*. 2022 Dec 20; 17(12): e0279408. DOI: 10.1371/journal.pone.0279408. PMID: 36538566; PMCID: PMC9767340.