Original Article

Menstrual Abnormalities Post COVID-19 : Reality or Myth

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Abstract

Background : Many women with a history of COVID were reporting menstrual abnormalities post infection. The possibility of this development being linked to COVID-19 became the genesis of this study.

Aims : To find out the prevalence and nature of menstrual function abnormalities in women of reproductive age, who have recently recovered from COVID-19 infection.

Objectives : Questionnaire based retrospective, analytical study was carried out at a Tertiary Care Hospital in western Maharashtra among 300 women of reproductive age group with history of COVID-19 infection with no recent delivery or not on Oral Contraceptive Pills.

Materials and Methods : Analysis was done in MedCalc v18.2.1 and SPSS v26.0. Categorical variables in frequency and percentage; continuous variables as mean (Standard Deviation, SD). McNemar test and McNemar-Bowker Test for statistical significance. P<0.05 to be statistically significant.

Results : 143 (47%) women noticed changes in their menstrual cycles post covid; change in frequency of cycle in 24% participants, alteration of menstrual flow in 15.6% and 22% reporting a change in severity of dysmenorrhea were the statistically significant findings. However, these changes were very random and did not show any definitive pattern. The average duration for menstrual patterns to revert back to normal was 2.52 (SD=1.33) months.

Conclusions : COVID-19 definitely had an impact on menstruation. Whether these changes are directly linked to the infection or other associated factors like social and psychological will remain a moot question.

Key words : Prevalence, Dysmenorrhea, Menstruation, COVID-19, Menstrual Cycle, Prevalence, Surveys and Questionnaires.

This research topic occurred to us after personal experience with several females reporting insidious onset of menstrual abnormalities. Despite some inconsistencies, we were able to see a pattern emerge in their clinical complaints – they all were in post covid recovery phase.

The possibility of these menstrual abnormalities being linked to COVID-19 in these patients was intriguing. This research was taken up to discover the existence of such an association.

Since a large number of the female population has been infected with COVID-19, there is a need to expand our perception on effects of COVID-19 on reproductive health, and menstruation as a significant marker of this entity.

Editor's Comment :

- Post COVID-19, women were found to have significant ($p<0.05$) change in the quantum of bleeding (hypomenorrhea or menorrhagia) as well as the frequency of their menstrual cycle (10% Change).
- These changes could be attributed to either the infection and/or associated stress.
- A larger controlled study may validate these findings.

Aims :

To find out the prevalence and nature of menstrual function abnormalities in women of reproductive age, who have recently recovered from COVID-19 infection.

Objectives :

(1) Compare the menstrual cycle pattern pre- and post COVID-19.

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(2) To detect changes in cycle frequency, duration and blood loss.

(3) To estimate the time taken to revert back to pre-COVID menstrual state.

Materials and Methods

A Retrospective analytical study was conducted at Tertiary Care Hospital in Western Maharashtra after the approval of the institutional ethics subcommittee. Data collection was done from June, 2021 to October, 2021. Assuming the menstrual cycle change from normal to abnormal is 12% between pre and post COVID-19. Entering this data in WinPepi v11.65, within 95% CI and power of 80% the minimum required sample size is calculated to be 247. Data collection was done on 300 women. Women in reproductive age group who had a positive history of COVID-19 infection were included in the study. Exclusion criteria were Pregnant/Lactating women, recent postpartum women, women on oral contraceptive pills/ other hormonal pills.

The google form link shared with the participants began with the participant information sheet and participant consent. By accepting and proceeding to the next section, 347 participants consented to the study. If participants did not wish to proceed, they were able to decline consent and exit the survey. 300 women of reproductive age group were recruited on a continuous basis satisfying the inclusion and exclusion criteria. Information obtained was depersonalized and maintained confidentiality. A detailed menstrual history including frequency, duration of blood flow, presence or absence of dysmenorrhea and passage of clots in both pre and post COVID phase along with the sociodemographic details was elicited and documented. The severity of COVID-19 (as classified by the treating physician) as well as the mental state during COVID-19 were also recorded.

Data Analysis :

Data was analysed using MedCalc v18.2.1 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2018), and SPSS v26 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Categorical variables are expressed in terms of frequency and percentage. Continuous variables were expressed as mean (Standard Deviation, SD) & Median (Interquartile Range, IQR). Normal distribution was verified by Shapiro-Francia test. McNemar test and McNemar-Bowker Test were applied to check for statistical significance. In all the tests performed, $P<0.05$ was considered to be statistically significant.

Results

342 (Three Hundred Forty-Two) participants consented to the study and filled a questionnaire in the form of an online survey (google forms), out of which 42 participants were excluded not fulfilling the inclusion criteria.

34% of the participants were 14-20 years old, 58.67% 21-40 years old and 7.33% 41-51 years old. 55.33% [49.51-61.05], 38.67% [33.13-44.43] and 6.00% [3.59-9.32] participants had mild, moderate and severe COVID-19 respectively.

On being questioned about changes in their menstrual patterns post COVID, 87 (29%, 23.93%-34.49%) women responded with “yes” while 56 (18.67%, 14.42%-23.54%) and 157 (52.33%, 46.52%-58.10%) with “Not Sure” and “No” respectively.

Out of 300 women, 282 (94%) did not have any change in duration of bleeding post COVID-19. Whereas 4.64% (N=13) women shifted from normal to abnormal. The difference in change pre- and post COVID-19 infection was only 2.67% [-0.089 to 5.42] which is not statistically significant ($p = 0.0963$).

Whereas, the change in frequency of cycle was much more drastic wherein 24% (72/300) of the participants had a change. Among 222 women who had normal cycle frequency before COVID-19 infection, 51(23%) drifted to abnormal whereas of 78 with abnormal frequency, 21 (26.90%) rectified. This difference in proportion post COVID-19 was 10.00% [4.57 to 15.43] which is statistically significant ($P=0.0005$).

Among 281 females who experienced no clots/small clots before COVID-19 infection, 276 (98.20%) denied experiencing any significant change in clots post COVID-19 infection. Similar was the case in a group of 19 with abnormal clots pre COVID where 84.2% remained unchanged. The difference in proportion of participants experiencing clots pre and post COVID was only 0.67% [-1.18 to 2.51]. This was not statistically significant ($p=0.72$).

Initially 246 (82%) people had normal flow Pre-COVID-19 which changed to 220 post COVID (210

from normal, 7 from heavy and 3 from scanty). Whereas 40 women who had heavy flow pre-COVID-19 became 50 (33 from heavy, 16 from normal and 1 from scanty) while 14 women who had scanty flow pre-COVID-19 increased to 30 (10 from scanty and 20 from normal). The flow change post COVID-19 is statistically significant (McNemar- Bowker Test = 17.087, df=3, P=0.001)

Out of 300 participants,166 had mild dysmenorrhoea, which changed to 134(123 from mild, 11 from moderate).116 had moderate dysmenorrhoea changed to 136(97 from moderate, 35 from mild and 4 from severe). 18 had severe dysmenorrhea which rose to 30 (14 from severe, 8 each from mild and moderate). The change in severity post COVID is statistically significant (McNemar- Bowker Test = 21.855, df=3, P<0.001).

The mean (SD) duration for menstrual patterns to revert back to normal was 2.52(1.33) months [Min 1 month, Max 6 months] (Table 1).

Discussion

The COVID-19 pandemic led to worldwide lockdowns which imposed the shutdown of all commercial, industrial and transport activities[1]. People were confined to their homes during this period for the longest time. Many lost their jobs and others constantly under the stress of having their livelihoods at stake, students were unable to attend school. As everyone sat through this devastating period of massive job losses, shrinking economies and loss of livelihoods[2], the worst to be impacted seem to be women. During the lockdown, women were victims of domestic violence, overburdened domestic work (unpaid care), in addition to threats to their financial independence. Lack of financial security, social isolation, coupled with lack of awareness, fear and stigma of a new disease has been responsible for inducing a lot of stress and mental trauma.

Table 1 — *Changes in Menstrual cycle duration, Frequency and Clots Pre- and Post COVID-19*

Menstrual Pattern	Post COVID Normal N (%)	Post COVID Abnormal N (%)	Total N (%)%	McNemar Test P value, Change [95% CI]
Duration of cycle (Pre-COVID) :				
Normal	267(95.40)	13(4.60)	280(93.33)	P=0.0963,
Abnormal	5(25.00)	15(75.00)	20 (6.66)	2.67%
Total	272(90.70)	28(9.30)	300(100)	[-0.089 to 5.42]
Cycle Frequency (Pre-COVID) :				
Normal	171 (77.00)	51 (23.00)	222 (74.00)	P=0.0005,
Abnormal	21 (26.90)	57 (73.10)	78 (26.00)	10.00%
Total	192 (64.00)	108 (36.00)	300 (100.00)	[4.57 to 15.43]
Clots (Pre-COVID) :				
Normal	276 (98.20)	5 (1.80)	281 (93.60)	P=0.7266,
Abnormal	3 (15.80)	16 (84.20)	19 (6.33)	0.67%
Total	279 (93.00)	21 (7.00)	300 (100)	[-1.18 to 2.51]

Various aspects of women's health have suffered due to COVID, be it physical, mental or emotional. We have noticed such observations when we came across some women with a positive history of COVID-19 infection complaining of changes in pattern of their menstrual cycles. This was the genesis of our present survey.

The responses in this survey were collected from participants through a google-form based questionnaire, which extended from demographic details to detailed information on menstrual patterns pre- and post COVID-19. Details reflecting severity of the infection and perceived mental state were also collected.

55.33% [49.51-61.05], 38.67% [33.13-44.43] and 6.00% [3.59-9.32] participants had mild, moderate and severe COVID-19 respectively.

Majority (59%) of the participants were between the age of 21-40 years. The highest education level of participants varied from primary schooling to postgraduate level. Most of the participants (58%) were undergraduate students. Since the majority of the participants were college going and above, it was presumed that their responses would be reliable.

The normal menstrual cycle frequency is 21-35 days, lasts for 2-7 days, with an average blood loss of 30-35 ml per cycle[3]. Clotting of menstrual blood is a marker of excessive bleeding as it results from the quantum of bleeding surpassing the capacity of the fibrinolytics released to liquefy menstrual blood for easy passage.

The results show that there was a significant impact of COVID-19 infection on the female reproductive system in the form of menstrual abnormalities. Significant menstrual changes were noted in frequency, flow and severity of dysmenorrhea. The change in all parameters was bidirectional. However, the change in duration of flow and passage of clots were not significant. Although the said changes were well appreciated by the participants on individual

levels, collectively the findings did not follow any particular pattern and were random.

In an observational study conducted by Phelan, *et al*[4] on 1031 women, there was no significant effect of COVID-19 on change in days of menstruation. However, the change in cycle length though significant was bidirectional with 28% and 29% participants experiencing increase and decrease respectively. The study also showed that 49% women reported painful periods, 7% more than the pre-pandemic. 30% reported new onset painful periods and 12% showed resolution of dysmenorrhoea during the pandemic. Our study also showed significant changes in dysmenorrhea post COVID-19. Study by Phelan also shows that heavy periods increased from 42% to 47% in COVID times which is consistent with our study where heavy flow increased from 13.33% to 16.66%. Overall, Phelan, *et al* concluded that COVID-19 pandemic has a significant impact on the reproductive health of women. The conclusion was consistent with the findings of the present study.

Cross Sectional study by Georgie Bruinvels, *et al*[5] titled "How lifestyle changes within the COVID-19 global pandemic have affected the pattern and symptoms of the menstrual cycle" on 749 women of reproductive age. They found that more than half (52.6%) had change in length of menstrual cycle (either increase and decrease), 36% participants had change in the duration of bleeding. Although change in cycle length was significant in women using oral contraceptives compared to non-users, both the groups had experienced changes. Only 16.1% of the study participants had a positive COVID-19 diagnosis or had symptoms of COVID-19 in the study. The study also states that the menstrual changes might be due to increased stress or job insecurity.

In a study by Omer Demir, *et al*[6] on 283 women where only 1.4% women contracted COVID-19. The study found no significant difference between the frequency of menstrual cycle, severity of dysmenorrhoea pre and during COVID-19 where no factors other than stress were at play. However, a significant change was noted in duration of bleeding and amount of bleeding even though only a minority of participants had contracted COVID-19.

In a retrospective study conducted by Kezhen Li, *et al*[7] on analysis of sex hormones and menstruation in COVID-19 women of child-bearing age. Out of 177 women who were included in the menstrual analysis, 25% of the patients had change in menstrual volume, of which 20% had a decrease whereas only 5% had increased volume. However, the study had also shown the change in menstrual volume with respect to the severity of the infection was not significant. When compared with age matched controls, it was found there is significant change in menstrual volume and duration of cycle. Hormonal evaluation showed no significant difference between sex hormones of COVID-19 patients and control group.

With the current results, it is difficult to arrive at any definitive conclusion on the effects of COVID-19 on menstruation. It is also not certain whether the changes we found were due to covid or other factors associated with the pandemic such as those covered by Niahm, *et al*[4] study like weight gain, psychological stress, lack of physical activity, diet changes, changes in work schedule etc.

The most probable explanation as inferred from existing studies is that these changes could be a result of the extreme mental stress patients underwent due to the associated panic created by this pandemic. According to our study 7% [4.39%-10.50%] of the participants were in a mental state of happiness, 42.67% [37.00-48.48%] were neutral and 50.33% [44.53-56.13%] in a stressed and anxious state.

A study conducted by Noelle, *et al*[8]. implies that the pandemic of COVID-19 might have a direct contribution to menstrual cycle irregularities in women experiencing moderate and high levels of stress and the stress could put women at high risk for endocrine dysregulation.

Nazish, *et al*[9] from Bin Faisal University that surveyed 738 young female students studying health sciences found strong positive correlations between stress and various menstrual irregularities with 4, 2.8, and 2 times Odds Ratio for experiencing amenorrhea, pre-menstrual syndrome and dysmenorrhea in women with high stress. Another study by Ansong, *et al*[10] established a relationship between menstrual irregularities and stress, where various menstrual disorders such as abnormal flow, premenstrual symptoms and dysmenorrhea were common amongst those with high stress levels. A study conducted by Shazia Iqbal[11] showed significant correlation between anxiety and duration of the bleeding phase, severity of bleeding and missed periods. Whereas, S Nagma's[12] study on 100 female medical undergraduate students found that high

stress levels (PSS>20) had association with only irregular menstrual cycles, but not with dysmenorrhoea, amount of flow or duration.

Limitation :

Few limitations of our study were that only women who had positive history of COVID-19 were invited to participate, due to which it is uncertain whether the COVID infection was responsible for these changes or the psychosocial stress associated with the pandemic caused them. Secondly, due to subjectivity of the individual responses it was not possible to reliably quantify the responses. However, a larger study under controlled settings could throw more light on the effect of COVID on menstrual physiology.

Conclusion

The study was conceptualised when a number of women who had gone through the agony of COVID-19 infection reported to us with recent onset menstrual problems. The significant impact was noted in the change of cycle frequency in both directions, heavier blood loss, and increase in severity of dysmenorrhoea post COVID. Whether these changes were a direct fall out of the infection or related to the frequent association of morbidities like social and psychological stress with COVID-19, will remain a moot question.

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Conflict of Interest : None

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