



## RESEARCH LETTER

# Pandemic-induced stress and obesity leading to abnormal uterine bleeding: A prospective study

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## 1 | INTRODUCTION

The world has failed to battle the COVID-19 induced physical ailments, and the psychological component has been neglected or ignored. The studies around the pandemic have found enhanced psychological problems due to the decrease in quality of life across countries and occupations (eg, healthcare professionals to the general public).<sup>1</sup>

In the modern world, women are multitaskers. These pressures have significantly increased during the pandemic and have led to increased psychosocial stressors like stress, anxiety, and depression. Menstrual health has taken a downward spiral due to their stressful life. The normal menstrual cycle requires a balance of sex hormones, namely androgens and estrogens. The incidence of menstrual abnormalities increased with the increase of BMI when BMI was  $>25 \text{ kg/m}^2$ .<sup>2</sup>

The importance of female reproductive health has gained significance over the last decade, and the impact of the COVID-19 pandemic on it is being studied globally.<sup>3</sup> For most women, a regular menstrual cycle ranges from 21 to 35 days, with bleeding lasting for 2 to 7 days. Menstrual disturbances manifest in different ways, and any change from the normal cycle is generally termed abnormal uterine bleeding (AUB). The key markers used to analyze the menstrual cycle pattern are regularity, heaviness of flow, frequency, and duration of flow, where each of these may show considerable variability.<sup>4</sup> AUB can be used to define any deviation from the normal pattern of the menstrual cycle, including length of cycle, duration of flow, amount of bleeding, etc. The menstrual cycle is not the same in every woman. It changes from woman to woman. In many cases, AUB can occur due to the failure of ovaries to release an egg, which

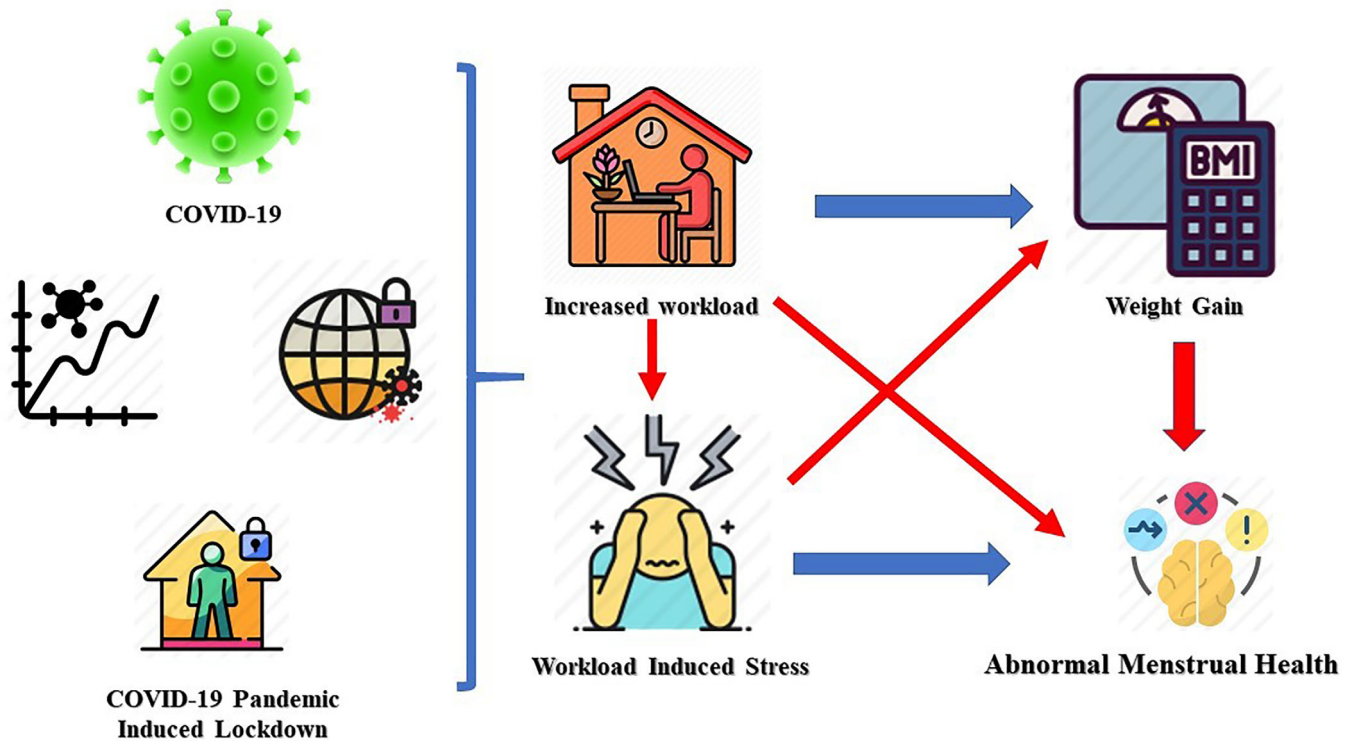
eventually leads to hormonal imbalance. Hormonal imbalance has deep-rooted relation with psychological stress, which can also be contributing factor for inducing AUB.<sup>5</sup> There is an apparent relationship between obesity and the advancement of endometrial polyps, endometrial hyperplasia, and ovulatory dysfunction, which results in AUB.<sup>6</sup> Amid the widespread COVID-19, the world has seen a tremendous change and increase in the psychological aspects.<sup>7</sup> The pandemic has been associated with increased cases of obesity, which can be attributed to increased workload and stress that can eventually cause hormonal imbalance.<sup>8</sup> During the entire lockdown period, women have been associated with various household chores, work pressure, family pressure, etc, which has led to hormonal changes and thus obesity. Increased leptin production by adipose tissue indicates obesity reduces LH production by negatively affecting the secretion of kisspeptin, causing altered GnRH release and reducing adiponectin that causes decreased insulin utilization.<sup>9</sup> The correlation between pandemic-induced stress, obesity, and menstrual health is illustrated in Figure 1. This study aims to substantiate the influence of psychological changes (stress, anxiety) and obesity developed due to the COVID-19 pandemic on the menstrual cycle in premenopausal women, leading to AUB.

## 2 | STUDY DESIGN

The study design is a prospective cross-sectional online questionnaire-based research among college students/working women and frontline workers in Chennai region in south India. The

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**FIGURE 1** Interaction between COVID-19 pandemic, stress, and obesity

sampling technique was random and inclusion criterion was women aged between 18 and 45. The study was to establish a relation between the sedentary lifestyle during the pandemic, which has led to AUB. The study was carried out during the second wave in Chennai circle through an online survey using a semi-structure questionnaire for 2 months. It comprised of 13 inquiries discussing their pandemic prompted pressure and menstrual cycle. The questionnaire has been adopted from a previously validated article.<sup>10</sup> An online questionnaire was sent to women ( $N = 450$ ). The responses were recorded and the data were given in frequency and percentage. The data are analyzed using SPSS software 22v. The descriptive statistics such as frequency and percentage are calculated. Chi-square test and correlation are evaluated at a 5% level of significance.

### 3 | RESULTS

From the 450 responses, nearly 70% of women have faced increased workload compared with pre-pandemic. The increase in workload was attributed to many factors such as household chores, online classes, children at home, work pressure, etc. The reason for stress was continuous online classes, and pandemic pressure such as someone sick at home, death of someone were highly reported by a majority of the responders. In the past 3 months, participants in the age group of 18 to 25 years have reported that they are having moderate bleeding ( $P < .05$ ) and moderate pain ( $P < .05$ ) during the period than the other age groups. The irregular cycle has been noticed in 117 women (26%), with 13.6% reporting cycles longer than 35 days. Women have reported changes in their menstrual

cycle during the past 3 months of lockdown due to increased workload at the time of the pandemic, which is statistically significant ( $r = 0.249$ ,  $P < .005$ ). Increased workload due to pandemic leads to drastic changes in body weight, which had a positive correlation ( $r = 0.128$ ,  $P < .005$ ). Unmarried participants have an increased workload during the pandemic than married people, which is significantly associated ( $P < .005$ ). Nearly 175 Students and research scholars reported that they had a slightly high workload when compared with pre-pandemic due to continuous online classes. There is a significant association between increased workload and occupation ( $P < .005$ ) [Table 1].

### 4 | DISCUSSION

Through this survey, we have established that psychological stress has been highest in females during the pandemic. Many studies across the world, including Australia,<sup>11</sup> China,<sup>12</sup> turkey,<sup>13</sup> etc, have also reported elevated levels of psychological distress among female. Our results also go in accordance with these previous findings. Obesity associated with pandemic has been reported worldwide, including Italy,<sup>14</sup> India,<sup>15</sup> etc. Through this work, we have correlated the impact of these stressors on menstrual health and have thus identified a gradual change in women's menstrual cycle pattern. Exactly 53.4% have noticed changes in their usual menstrual cycle compared with that of pre-pandemic. They have reported moderate-heavy bleeding associated with pain, irregular cycles, etc, which marks AUB. Psychological or physical stress increases noradrenaline and adrenaline, resulting in increased

**TABLE 1** Response from study participants

General description	Response (n)	Response (%)
Participants age		
18-25	380	84.4
26-30	26	5.8
31-35	20	4.4
Above 35	24	5.3
Marital status		
Married	65	14.4
Unmarried	385	85.6
Occupational status		
Student/research scholar	314	69.8
Work from home	90	20
Housewife	31	6.9
Frontline workers	15	3.3
Has the pandemic increased your workload?		
Not at all	133	29.6
Slightly high compared with pre-pandemic	246	54.7
Extremely high compared with pre-pandemic	71	15.8
In what ways has the pandemic caused increased workload (Can choose multiple options as well)		
Children at home	37	8.2
Work pressure	120	26.7
Household chores	136	30.2
Financial problem	96	21.3
Pandemic pressure such as someone sick at home, death of someone close to you, etc	183	40.7
Continuous online classes	220	48.9
On an average, did you notice any significant changes in your body weight?		
Increased	222	49.3
Decreased	73	16.2
No changes	155	34.4
On an average, during the last 3 months, for how many days did your period last?		
Less than 3 days	67	14.9
3-7 days	342	76
6-10 days	27	6
More than 10 days	14	3.1
Were your periods regular or irregular in the past 3 months?		
Regular	333	74
Irregular	117	26
On an average, what is the length of your menstrual cycle?		
Less than 21 days	21	4.7
Between 21 and 35 days	368	81.8
More than 35 days	61	13.6
On an average, during the past 3 months how would you describe your period?		
Light	56	12.4
Moderate	323	71.8
Heavy	59	13.1
Very heavy	12	2.7

(Continues)

TABLE 1 (Continued)

General description	Response (n)	Response (%)
Have you passed any blood clots in the past 3 months?		
Yes	122	27.1
No	328	72.9
During the last 3 months, have your period been associated with any pain?		
No pain at all	58	12.9
Slight pain	122	27.1
Moderate pain	172	38.2
Severe pain	81	18
Very severe pain	17	3.8
How has your cycle changed compared with pre-pandemic?		
No change at all	210	46.7
Slight changes	151	33.6
Moderate changes	57	12.7
Very drastic change	32	7.1

concentration of these in the brain. The hypothalamic-pituitary-adrenal axis is affected by many stressful occasions, which cause discharge of ACTH from the anterior pituitary. The rise in ACTH can cause expanded discharge and biosynthesis of glucocorticoid hormones from the adrenal cortex.<sup>16</sup> Increased prolactin levels also decrease GnRH release and suppress normal follicular steroidogenesis. The lack of LH can result in an anovulatory and short cycle, amenorrhea, prolonged cycle, and delayed ovulation,<sup>17</sup> which marks the beginning of AUB. These increased workloads have induced stress and have impacted women in many ways, including compromised mental health, obesity, etc. From being a gamble of class to a cocoon of the worst gender trope, the pandemic has caused a significant shift in the paradigm. This pandemic has undoubtedly helped spark the conversation of the disproportionate and skewed balance of domestic work and gender disparity.

## 5 | CONCLUSION

The results of this online questionnaire-based study have demonstrated the importance of menstrual health that women must understand in ordinary and pandemic times. There has been a significant increase in the workload and weight, which has resulted in changes in their menstrual cycle. In this pandemic state, this research paper discusses the extent of the stress- and obesity-induced uterine bleeding. These insights may lead to more effective and individualized stress-induced uterine bleeding treatment strategies. It is high time that we realize the importance of menstrual health and spread awareness among women to avoid further complications.

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### CONFLICT OF INTEREST

No conflicts of interest have been identified or declared by any of the authors.

### AUTHOR CONTRIBUTIONS

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Writing and Editing: Preethi Lakshminarayanan.

All the authors have read and approved the final version of the manuscript.

Corresponding author, Sarvesh Sabarathinam, had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

### TRANSPARENCY STATEMENT

The lead author, Sarvesh Sabarathinam, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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