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Menstrual Abnormalities and Body Adiposity among the Poumai Women of Manipur, North East India

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Abstract

Objective The present study aims to understand the prevalence of certain menstrual abnormalities among the adolescents and adults of the Poumai tribe of Manipur and explore the association of anthropometric variables and body adiposity with menstrual disorders.

Materials and Methods The study is a cross-sectional study conducted on 1,008 Poumai women among the reproductive age groups, consisting of 496 adolescents and 512 adults. Menstrual history was collected from each participant, and menstrual abnormalities in the menstrual frequency and flow volume were identified per the International Federation of Gynecology and Obstetrics classification. Relative indices of the measured anthropometric variables defined body adiposity. Descriptive statistics and tests of significance were calculated. Regression odd ratio analysis was also conducted to infer the odds ratio risk of menstrual abnormalities.

Results The overall prevalence of menstrual frequent and infrequent is 8.2% and 19.6%, respectively, where frequent is more prevalent in adolescents and infrequent in adults. Note that 15.4% and 5.6% of the women have a heavy and light flow, while comparatively, adults have a higher prevalence of heavy and light flow than adolescents. Anthropometric variables are associated with menstrual frequency abnormalities among adolescents, while these variables are associated with menstrual frequency and flow volume abnormalities in adults. Higher body adiposity has a higher odd ratio to the studied menstrual abnormalities, significantly with light menstrual flow.

Conclusion Disparity observed in the menstrual abnormalities among adolescents and adults could reflect hormonal changes. The association of obesity with menstrual abnormalities highlights the concern of weight management that can lead to healthy reproductive health in women.

Keywords
- menstrual abnormalities
- flow volume
- frequent
- Poumai
- obesity
- hormonal

Introduction

Menstruation is a normal physiological phenomenon in women, indicating their capability for procreation.[1] Abnormalities in the cycle and its characteristics are major gynecological problems among female adults affecting their psychological health due to the inability to conceive. Certain factors like hormonal, genetic, lifestyle, and socioenvironmental conditions can affect the normal and regular cycle of menstruation,[2,3] leading to different menstrual abnormalities and

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reproductive health issues and morbidities among women of reproductive age group.[4,5]

Obesity is considered an important risk factor in gynecological issues,[6] as obese women are more likely to suffer from infertility and menstrual dysfunction,[7,8] which further leads to several other health issues. Numerous studies show that obese women are more liable to experience menstrual cycle abnormalities than nonobese women.[9] Moreover, menstrual issues are often given less importance and not openly discussed because of social taboos and restrictions, especially among tribal societies.[10] Based on this consideration, the present study was designed to understand the prevalence of menstrual abnormalities among Poumai adolescent and adult women of Manipur. Further, the article also attempts to explore the association of menstrual abnormalities with anthropological variables and body adiposity.

Materials and Methods

The study was a cross-sectional study conducted among 1,008 women aged 15 to 45 years in Poumai-inhabited villages of Senapati district, Manipur, India, from June 2019 to January 2020. The sample size was determined using the EpiInfo software developed by the Centers for Disease Control and Prevention[11] at a 99% confidence interval with confidence limits of 5 and 50% expected frequencies of menstrual abnormalities, thus giving an expected sample size of 663. However, considering the high chance of being nonresponsive in the data collection, more samples were included than the calculated value to make a final sample size of 1,008. These samples were further subcategorized into adolescents and adults to make a comparative account of the menstrual abnormalities.

The data were collected from educational institutions and households in Poumai villages in the Senapati district of Manipur, India. Educational institutions were selected using convenient sampling until the appropriate sample size was obtained. The authorities of these schools were approached to seek permission for data collection from the adolescents. The mean age of menarche is 13.71 ± 1.22 years[12]; hence, adolescents of only 15 years and above were included in the study as they can give more precise information. A household survey in the Poumai-inhabited villages of Senapati was adopted to collect information for the adults. Women who were pregnant, lactating, and consuming contraceptives (including oral contraceptives, progestin-releasing intrauterine devices, and subdermal implants), using intrauterine devices, and hysterectomies were excluded from the study.

A pretested questionnaire was used to collect information on the menstrual history of the study participants. Three different characteristics of two menstrual conditions, as defined by the International Federation of Gynecology and Obstetrics (FIGO), were included in the study[13]: the menstrual frequency with attributes of normal ($\geq$ 24 to $\leq$ 38 days), frequent ($<$ 24 days), and infrequent ($>$ 38 days), flow volume with attributes of normal, heavy, and light as determined by the respondents. Frequent and infrequent menstrual frequency and heavy and light flow volume were treated as menstrual abnormalities in these menstrual characteristics.

The anthropometric measurements such as height, weight, waist circumference (WC), and hip circumference (HC) were collected to the nearest 0.5 unit following standard protocol. Measurements were taken twice to obtain the average value for further data analysis. The related anthropometric indices for assessing obesity, body mass index (BMI), waist-hip ratio (WHR), and waist-height ratio (WHtR), were extracted from these anthropometric measures. BMI for age was used to assess body obesity in adolescents with $<$ 5th percentile as underweight, greater than or equal to 85th percentile and 95th percentile as overweight and obese, respectively.[14] For adults, BMI categories were classified into four groups according to the World Health Organization Asian cutoff.[15] Note that 90th percentile age-specific WC was used to define abdominal obesity in adolescents,[16] while WC $\geq$ 80 cm was used to define abdominal obesity in adults.[17] WHtR of 0.5 cutoff value was also used to assess the proportion of central fat by height for adolescents and adults.[18] The WHR with cutoff $\geq$ 0.85 (central obesity) was also calculated for both adolescents and adults in the study.[15]

Statistical Analysis

Relevant descriptive analyses were done using IBM SPSS Statistics version 26 (IBM, Armonk, New York, United States). The mean age, age at menarche of the participants, and the prevalence of menstrual abnormalities under study among the adolescents and adults were calculated. Chi-square analysis was used to determine the association of adolescents and adults with menstrual abnormalities under study. Analysis of variance (ANOVA) analysis was done to determine the significant association of the studied menstrual abnormalities with the anthropometric and body adiposity indices among adolescents and adults. Post hoc analysis was also conducted to identify the significant attributes in the ANOVA analysis. Multinominal regression analysis was done to assess the odd ratio risk to menstrual abnormalities. The entire significant test was analyzed at 0.05.

Before data collection, awareness of menstruation and its impacts on women's reproductive health was highlighted. The study's objectives were also explained, and proper prior written consent was taken. The study was reviewed and approved by the Institutional Ethical Committee, Manipur University, with reference no. MU/IHEC/2020/012.

Results

►**Table 1** shows that the prevalence of frequent menstrual cycles in the studied women is 8.2%, and that of the infrequent cycle is 19.6%. The prevalence of frequent cycles is comparatively higher among adolescents (12.9%), and that of the infrequent cycle is relatively higher in adults (21.9%). In overall, menstrual frequency abnormality is higher in adolescents (31.2%) than in adults (25.6%). Chi-square analysis reveals a significant association between menstrual frequency abnormalities and age groups: adolescents and adults (chi-square = 29.25) with a contingency coefficient of 0.19. In the case of menstrual flow volume, the prevalence of heavy flow is 15.4% and that of light is 5.6%. Both heavy and

Table 1 Prevalence of menstrual abnormalities among the Poumai adolescents and adults

Menstrual abnormalities	Adolescents		Adults		Total		Chi-square (CC)
	f	%	*f*	%	*f*	%	
Menstrual frequency							29.25[a] (0.19)
(a) *Frequent*	64	12.9	19	03.7	83	08.2	
(b) *Infrequent*	86	17.3	112	21.9	198	19.6	
(c) Normal	346	69.8	381	74.4	727	72.1	
Flow volume							44.97[a] (0.21)
(a) *Heavy*	48	09.7	107	20.9	155	15.4	
(b) *Light*	13	02.6	43	08.4	56	05.6	
(c) Normal	435	87.7	362	70.7	797	79.1	

Abbreviation: CC, contingency coefficient.
Note: Menstrual characters in italics represent menstrual abnormalities.

light flow cases are significantly higher in adults than in adolescents (►**Table 1**). Chi-square analysis shows a significant association of flow volume attributes with adolescents and adults (chi-square = 44.97) with a contingency coefficient of 0.21.

►**Tables 2** and **3** present the mean distribution of anthropometric variables and related indices in the understudied menstrual conditions of the Poumai adolescents and adults. ANOVA analysis reveals that there is significant variation in the distribution of mean values of weight, WC, HC, BMI, and WHtR in the different attributes of menstrual frequency among the adolescents (►**Table 2**). Post hoc analysis was conducted to identify the pairwise attributes that contribute significance to the overall ANOVA analysis. The analysis reveals that adolescents having infrequent menstrual cycles have significantly higher mean weight (50.45 ± 5.21 kg) than normal adolescents (48.78 ± 5.70 kg). Likewise, infrequent cycled adolescents have significantly higher WC (70.82 ± 5.45 cm) than those with frequent cycles (68.38 ± 6.31 cm). Similarly, those menstrual infrequent adolescents have significantly higher HC (90.99 ± 5.78 cm) and WHtR (0.46 ± 0.04) than those frequent ones (HC 88.62 ± 6.19 cm; WHtR 0.44 ± 0.04). In the case of BMI, infrequent cycled adolescents have significantly higher BMI (21.58 ± 2.17 kg/m^2) than those of frequent cycled (20.37 ± 2.23 kg/m^2) and those of normal cycled adolescents (20.76 ± 2.16 kg/m^2). However, there is no association between anthropometric variables and related indices with the menstrual flow volume.

While in the case of the adults, there is a significant association of menstrual frequency attributes with weight, WC, BMI, WHtR, and WHR, as reflected by ANOVA analysis. Post hoc analysis reveals that infrequent cycled adult women have significantly higher weight (55.74 ± 8.41 kg) than normal adults (53.37 ± 7.66 kg). The infrequent cycled adult women have significant WC (80.94 ± 10.77 cm), BMI (23.80 ± 3.42 kg/m^2), WHtR (0.53 ± 0.07), and WHR (0.87 ± 0.09) than those frequently menstrual women (WC: 74.19 ± 7.88 cm, BMI: 21.34 ± 2.06 kg/m^2, WHtR: 0.48 ± 0.05, WHR: 0.81 ± 0.07)

Table 2 Association of anthropometric variables with menstrual abnormalities among Poumai adolescents

Menstrual abnormalities	Anthropometric variables and indices						
	Height (cm) (mean ± SD)	Weight (kg) (mean ± SD)	WC (cm) (mean ± SD)	HC (cm) (mean ± S D)	BMI (kg/m^2) (mean ± SD)	WHtR (mean ± S D)	WHR (mean ± SD)
Menstrual frequency							
(a) Frequent (F)	154.45 ± 4.81	48.66 ± 6.40	68.38 ± 6.31	88.62 ± 6.19	20.37 ± 2.23	0.44 ± 0.04	0.77 ± 0.06
(b) *Infrequent (I)*	152.97 ± 5.05	50.45 ± 5.21	70.82 ± 5.45	90.99 ± 5.78	21.58 ± 2.17	0.46 ± 0.04	0.78 ± 0.05
(c) *Normal (N)*	153.23 ± 4.69	48.78 ± 5.70	69.64 ± 5.92	89.49 ± 5.63	20.76 ± 2.16	0.45 ± 0.04	0.78 ± .05
F-value	2.09	3.13[a]	3.19[a]	3.53[a]	6.69[b]	5.72[b]	0.32
Post hoc		I&N	F&I	F&I	F&I, I&N	F&I	
Flow volume							
(a) *Heavy*	154.11 ± 4.06	50.03 ± 5.95	70.80 ± 5.31	90.80 ± 6.84	21.04 ± 2.19	0.459 ± 0.03	0.78 ± 0.06
(b) *Light*	151.62 ± 6.25	47.23 ± 8.60	71.51 ± 9.49	89.49 ± 6.15	20.56 ± 3.57	0.47 ± 0.06	0.79 ± 0.06
(c) Normal	153.31 ± 4.80	49.00 ± 5.61	69.50 ± 5.84	89.52 ± 5.62	20.84 ± 2.15	0.45 ± 0.04	0.77 ± 0.05
F-value	1.48	1.37	1.69	1.80	0.30	1.83	0.93

Abbreviations: BMI, body mass index; F, frequent; HC, hip circumference; I, infrequent; N, normal; SD, standard deviation; WC, waist circumference; WHR, waist-hip ratio; WHtR, waist-height ratio.
Note: Menstrual characters in italics represent menstrual abnormalities.
[a]Significant at 0.05.
[b]Significant at 0.01.

Table 3 Association of anthropometric variables with menstrual abnormalities among Poumai adults

Menstrual abnormalities	Anthropometric variables and indices						
	Height (mean ± SD)	Weight (mean ± SD)	WC (mean ± SD)	HC (mean ± SD)	BMI (mean ± SD)	WHtR (mean ± SD)	WHR (mean ± SD)
Menstrual frequency							
(a) *Frequent (F)*	155.41 ± 5.19	51.53 ± 5.55	74.19 ± 7.88	90.90 ± 3.74	21.34 ± 2.06	0.48 ± 0.05	0.81 ± 0.07
(b) *Infrequent (I)*	153.03 ± 4.84	55.74 ± 8.41	80.94 ± 10.77	93.32 ± 7.84	23.80 ± 3.42	0.53 ± 0.07	0.87 ± 0.09
(c) Normal (N)	153.75 ± 4.74	53.37 ± 7.66	77.02 ± 10.06	92.88 ± 6.49	22.56 ± 2.96	0.50 ± 0.06	0.83 ± 0.08
F-value	2.32	4.88[b]	7.67b	1.05	9.41[b]	9.51[b]	10.50[b]
Post hoc		I&N	F&I, I&N		F&I, I&N	F&I, I&N	F&I, I&N
Flow volume							
(a) *Heavy (H)*	155.06 ± 4.88	55.82 ± 8.28	78.98 ± 10.35	94.29 ± 7.18	23.21 ± 3.20	0.51 ± 0.07	0.84 ± 0.08
(b) *Light (L)*	152.43 ± 5.84	53.35 ± 7.59	79.27 ± 9.56	92.56 ± 6.15	22.94 ± 2.86	0.52 ± 0.06	0.85 ± 0.08
(c) Normal (N)	153.38 ± 4.54	53.29 ± 7.64	77.24 ± 10.33	92.53 ± 6.63	22.64 ± 3.08	0.50 ± 0.07	0.83 ± 0.08
F-value	6.72[b]	4.48[a]	1.68	2.88	1.45	1.31	1.32
Post hoc	H&L	H&N					

Abbreviations: BMI, body mass index; F, frequent; H, high; HC, hip circumference; I, infrequent; L, low; N, normal; SD, standard deviation; WC, waist circumference; WHR, waist-hip ratio; WHtR, waist-height ratio.
Note: Menstrual characters in italics represent menstrual abnormalities.
[a]Significant at 0.05.
[b]Significant at 0.01.

and those normally menstrual women (WC: 77.02 ± 10.06 cm, BMI: 22.56 ± 2.96 kg/m^2, WHtR: 0.50 ± 0.06, WHR: 0.83 ± 0.08). Regarding the characteristics of menstrual flow volume, ANOVA analysis reveals a significant association between height and weight and menstrual flow volume. Further post hoc analysis shows that women with a heavy flow are significantly taller (155.06 ± 4.88 cm) than the ones with a light flow (152.43 ± 5.84 cm) and are significantly heavier (55.82 ± 8.28 kg) than the ones with a normal flow (53.29 ± 7.64 kg).

The prevalence of menstrual abnormalities under the menstrual frequency and flow volume against the body adiposity parameters is given in ►**Table 4**. The table reveals that menstrual abnormalities related to frequency do not differ significantly with respect to BMI status among adolescents. In contrast, in the case of adults, menstrual frequency abnormalities are found to be significantly associated with BMI status (chi-square = 25.68 with a contingency coefficient of 0.22). The prevalence of infrequent abnormality among overweight and obese adults is 6.3% and 7%, respectively, while those of frequent abnormality are 0.4% and 0.2%, respectively. Similarly, the prevalence of infrequent abnormality is significantly associated with abdominal obesity (11.7%) as defined by WC ≥ 80 cm among adults (chi-square = 20.96 with a contingency coefficient of 0.20). At the same time, it is not significant in adolescents. The other abdominal obesity parameters, that is, WHtR (as defined by ≥ 0.5) and WHR (as defined by ≥ 0.85), are also found to be significantly associated with menstrual frequent abnormalities in adults, with significantly higher prevalence of infrequent abnormalities, that is, 15.0 and 12.7%, respectively. The association of flow volume abnormalities with body adiposity is not very evident in adolescents and adults, except for WHtR in adolescents, where a significantly high prevalence of heavy flow (8.5%) is observed in adolescents (chi-square = 7.76 with a contingency coefficient of 0.12).

►**Table 5** presents the odd ratio of body adiposity risk to menstrual abnormalities. Being underweight is 1.84 times more likely to have a frequent menstrual cycle, and being underweight, overweight, and obese are 1.07, 1.15, and 1.51 more likely to have an infrequent cycle, though all of them are statistically nonsignificant. Similarly, those with WC ≥ 80 cm, WHtR ≥ 0.5, and WHR ≥ 0.85 are 1.03, 1.51, and 1.14, respectively, times more likely to have an infrequent cycle, though nonsignificant. Those overweight and obese are 1.59 and 1.66 times more likely to have heavy flow; those with WHtR ≥ 0.5 and WHR ≥ 0.85 are 1.34 and 1.08 times more likely to have a heavy flow. Being underweight is 1.78 times more likely to have a light flow, while those having WHtR ≥ 0.5 and WHR ≥ 0.85 are significantly 3.92 and 2.27 times, respectively, more likely to have light menstrual flow.

Discussion

Menstrual dysfunctions or abnormalities are often the common reason for gynecological referral, and they significantly impact women's health conditions and quality of life.[19] As per FIGO 2018, frequent and infrequent menstrual cycles are treated as menstrual abnormalities,[13] although some literature suggests that these abnormalities may be related to a menstrual irregular cycle, such as polymenorrhea and oligomenorrhea.[20] The global prevalence of menstrual irregularities ranged from 14 to 25%.[21,22] In the present study, the prevalence of menstrual irregularities in the form of frequent and infrequent is 8.2% and 19.6%, which is also alarming. The other menstrual abnormality included in the present study is

Table 4 Percentage distribution of menstrual abnormalities against body adiposity measures among the Poumai women

Variables	Menstrual frequency						Flow volume					
	Adolescent			Adults			Adolescent			Adults		
	Frequent	Infrequent	Chi-square (CC)	Frequent	Infrequent	Chi-square (CC)	Heavy	Light	Chi-square (CC)	Heavy	Light	Chi-square (CC)
1. BMI												
(a) Normal (b) Underweight (c) Overweight (d) Obese	10.1 1.2 0.8 0.8	13.7 0.4 1.8 1.4	6.74 (0.12)	2.7 0.4 0.4 0.2	7.6 1.0 6.3 7.0	25.68[a] (0.22)	7.5 0.4 1.4 0.4	2.0 0.2 0.0 0.4	4.88 (0.10)	9.8 0.6 5.5 5.1	4.3 0.4 2.1 1.6	3.64 (0.84)
2. Waist circumference[b]												
(a) < 80 cm	11.5	13.9	2.17	3.1	10.2	20.96[a]	8.7	1.6	5.73	11.9	5.1	3.32
(b) ≥ 80 cm	1.4	3.4	(0.07)	0.6	11.7	(0.20)	1.0	1.0	(0.11)	9.0	3.3	(0.08)
3. Waist-height ratio												
(a) < 0.5	11.5	14.3	1.98	2.3	6.8	19.5[a]	8.5	1.6	7.76[a]	9.8	3.1	3.60
(b) ≥ 0.5	1.4	3.0	(0.06)	1.4	15.0	(0.19)	1.2	1.0	(0.12)	11.1	5.3	(0.08)
4. Waist-hip ratio												
(a) < 0.85	11.9	16.3	0.24	2.5	9.2	15.80[a]	8.9	2.0	5.81	12.7	3.7	3.88
(b) ≥ 0.85	1.0	1.0	(0.02)	1.2	12.7	(0.17)	0.8	0.6	(0.11)	8.2	4.7	(0.09)

Abbreviations: BMI, body mass index; CC, contingency coefficient.
[a]Significant at 0.05.
[b]Cutoff for adolescents are calculated at 90th percentile; only abnormalities frequency are given in percentage.

Table 5 Odd ratio risk of body adiposity to menstrual abnormalities among the Poumai women

Fatness variables	Menstrual frequency				Flow volume			
	Frequent		Infrequent		Heavy		Light	
	OR	CI	OR	CI	OR	CI	OR	CI
1. BMI								
(a) Normal	–	–	–	–	–	–	–	–
(b) Underweight	1.84	0.81–4.19	1.07	0.46–2.49	0.81	0.31–2.12	1.78	0.51–6.27
(c) Overweight	0.46	0.18–1.18	1.15	0.70–1.89	1.59	0.94–2.71	0.76	0.28–1.56
(d) Obese	0.78	0.22–2.79	1.51	0.81–2.79	1.66	0.82–3.36	0.56	0.21–1.52
2. Waist circumference[b]								
(a) <80 cm	–	–	–	–	–	–	–	–
(b) ≥ 80 cm	0.62	0.22–1.73	1.03	0.58–1.81	0.81	0.42–1.53	0.63	0.26–1.53
3. Waist-height ratio								
(a) <0.5	–	–	–	–	–	–	–	–
(b) ≥ 0.5	1.01	0.40–2.56	1.51	0.86–2.67	1.34	0.71–2.51	3.92[a]	1.63–9.42
4. Waist-hip ratio								
(a) <0.85	–	–	–	–	–	–	–	–
(b) ≥ 0.85	0.82	0.35–1.93	1.14	0.70–1.83	1.08	0.63–1.84	2.27[a]	1.05–4.91

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio.
[a]Significant at 0.05.
[b]Cutoff for adolescents are calculated at 90th percentile.

flow volume, where the women experience either heavy or light flow, which deviates from the normal flow pattern. Both heavy and light flow are part of menstrual disorders relating to the deviation of normal flow; heavy flow is also cited as menorrhagia and light flow as hypomenorrhea.[20] Worldwide, the prevalence of heavy menstrual bleeding (heavy flow) is reported to range between 27.2 and 54.0%, as reported by Kocaoz et al.[23] In the present study, 15.4% of the women reported heavy flow, while only 5.6% reported having light menstruation.

In the present study, the distribution of menstrual abnormalities significantly varies in adolescents and adults. Both frequent and infrequent abnormalities are found to be high in adolescents, while in adults, the prevalence of infrequent menstrual is significantly higher, though frequent ones are low. Likewise, both heavy and light flows are significantly high in adults, though a low percentage is observed in adolescents. Irregular menstrual cycles and abnormal bleeding are reported to be common during the initial years after menarche.[24] This could possibly be due to the immaturation of the hypothalamic-pituitary-gonadal axis in the young adolescent.[25] As a result, in the first few years after the commencement of menses, it is common for irregular cycles to occur in adolescents.[26] However, infrequent menstrual cycle among adolescents seems to be more linked with higher anthropometric and adiposity indices mean value, suggesting adiposity is associated with menstrual infrequent. Furthermore, adolescent girls with heavy flows have higher mean weight, suggesting that being overweight could be related to heavy flow.

Studies suggest that being obese has a significantly higher risk of menstrual irregularity and abnormalities.[22,27] It is known that menarche occurs in the setting of a maturing hypothalamic-pituitary-ovarian axis. The cycles could be irregular or might be nonovulatory because of poor premature regulation of the hormonal interactions among hypothalamic, pituitary, and gonadal hormones.[28] It is known that gaining body weight and increasing adipose tissue can perturb the balance of steroid hormones such as androgens, estrogen, and sex hormone-binding globulin (SHBG), and changes in SHBG lead to changes in the release of androgens and estrogens in the target tissues.[29] Higher testosterone levels have been associated with polycystic ovary syndrome, which is related to ovulatory dysfunction and menstrual abnormalities. Clinical studies have also shown elevated total and free androgen levels and depressed SHBG in obese women with amenorrhea, suggesting that testosterone and SHBG may play an important role in the development of menstrual abnormalities in obese women.[30] As the aromatization of androgens to steroids increases by the increase in adipose tissue, it leads to changes in globin hormone levels binding to sex hormones, which result in impaired regulation of the menstrual cycle.[31]

In adults, the association of obesity, through anthropometric and body adiposity variables, with menstrual abnormalities is evident. Women with frequent and infrequent cycles have significantly higher mean values of WC, BMI, WHtR, and WHR, which determines general and abdominal obesity. Likewise, those with heavy and light menstrual flow also have significantly higher anthropometric mean values

than the normal ones. Supporting this observation in the anthropometric variables, the prevalence of menstrual abnormalities is significantly elevated in those women having abdominal obesity cutoff (WC $\geq$ 80 cm, WHtR $\geq$ 0.5, and WHR $\geq$ 0.85) and obese women with high BMI > 25 kg/m^2. In adolescents and adults, those with higher body adiposity indicators are more likely to have menstrual abnormalities, which is more significant with those with abdominal obesity, as indicated by WHtR and WHR, who is more than two times more likely to do so to have a heavy flow. In support of many studies, the present study has reported and concluded that obesity impacts menstrual abnormalities.

Limitations and Uniqueness of the Study

The present study has a few strengths and limitations. One possible limitation could be the data sensitivity where the participants spend time disclosing their menstrual health. Moreover, the information on menstrual characteristics is completely based on the information they provided, and there was no technical test to confirm the abnormalities. However, instead of this limitation, the study was one of its first attempts to highlight the menstrual health issues among Poumai women. Furthermore, the study also provides information on the possible effects of obesity on menstrual abnormalities, especially among adult women. This study could pave the direction for future research in understanding menstrual abnormalities holistically from biosocial factors, including lifestyle and social environment, hormones and genetics, that the present study could not incorporate.

Conclusion

The present study highlights the disparity in the prevalence of menstrual abnormalities among Poumai adolescents and adults. Menstrual abnormalities among adolescents could be due to hormonal immaturation. However, it is a matter of concern as it could affect growth, development, and reproductive health. Even though many factors contribute to menstrual cycle abnormalities, the study showed that obesity was considerably associated with an ascending age. It can be concluded that general and abdominal obesity, in particular, could be a detrimental factor for menstrual abnormalities.

Further, the study indirectly hints at the importance of controlling obesity through changing lifestyle to manage the healthy menstrual cycle. Health education focusing on reproductive health should highlight the importance of maintaining a proper BMI and other obesity measures, as it predisposes them to a higher risk of menstrual disorders. Given the ever-increasing prevalence of obesity and its association with gynecologic conditions, there is a great need to promote health education focusing on menstrual health and nutrition.

Authors' Contributions

P.S.V.P. contributed to conception, literature search, data collection, analysis, and manuscript drafting and S.Y.M. to conceptual development, designing, and drafting of the manuscript. All the authors have read and approved the final version of the manuscript.

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Conflict of Interest

None declared.

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