South Asian Journal of Social Sciences
Vol. 1, No. 1, 2025, pp. 77-91 • ISSN: 3108-1339

URL: www.arfjournals.com
https://doi.org/10.47509/SAJSS.2025.v01i01.04

Menstrual Characteristics of Santal Tribal Adolescent Girls of Hooghly District, West Bengal

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To Cite this Article

Mohima Bar, Subir Biswas & Indu Bhaumik (2025). Menstrual Characteristics of Santal Tribal Adolescent Girls of Hooghly District, West Bengal. *South Asian Journal of Social Sciences,* 1: 1, pp. 77-91.

Abstract: *Background:* Menstrual health among tribal adolescents remains an underexplored area in India. In Indian tribal communities, menstrual experiences are influenced by biological factors, deep-rooted cultural beliefs, social restrictions, and limited menstrual health awareness. This study aimed to examine the menstrual characteristics and cultural food restrictions during menstruation among Santal adolescent girls in the Hooghly District of West Bengal. *Methods:* A cross-sectional study was conducted over three months in 2025 across 31 Santal-inhabited villages. A total of 359 adolescent girls (aged 10–18 years) who had attained menarche participated in the study. Data on sociodemographic characteristics, menstrual history, symptoms, and dietary restrictions were collected. Anthropometric measures were analysed using BMI-for-age percentiles, and statistical analyses were performed using SPSS. *Results:* The mean menarcheal age was 12.30 ± 1.22 years, and the mean BMI was 18.62 ± 2.62 kg/m². Regular menstrual cycles were reported by 85.8% of the participants. Dysmenorrhea (51.8%), backache (32.6%), and headache (26.2%) were the most prevalent symptoms. Sour foods were the most frequently restricted food during menstruation. Earlier menarche was significantly associated with longer cycle length and flow duration ($p<0.01$). BMI showed weak positive correlations with age at menarche and dysmenorrhea. *Conclusion:* Santal adolescents generally exhibit regular menstrual cycles and adhere to cultural dietary restrictions. Menstrual characteristics are influenced by early menarche and a higher BMI. This study identifies the need for culturally sensitive menstrual health education and interventions in tribal settings.

Keywords: Adolescents, Eastern India, Menarche, Rural, Santal.

Received : 05 April 2025 • **Revised :** 15 May 2025 • **Accepted :** 26 May 2025 • **Published :** 30 June 2025

Introduction

Menstruation is a fundamental biological process that marks the onset of reproductive maturity in females and is influenced by a combination of genetic, environmental, nutritional, and socio-cultural factors (Patel & Ray, 2020). Adolescence represents a particularly critical stage during which menstrual patterns become established, and any irregularities or distressing symptoms may have significant implications for physical, psychological, and social well-being (Negi et al., 2018). Among tribal communities in India, menstrual experiences are often shaped not only by physiological factors but also by traditional beliefs, restrictions, and limited access to menstrual health education (Mittal et al., 2023). Although menstrual traditions vary considerably across regions and ethnic groups in India, research exploring menstrual experiences within tribal communities remains limited, creating a significant gap in understanding their unique challenges (Murthy et al., 2025).

In many societies, menstruation continues to be surrounded by restrictive norms that position menstruating bodies as impure or inauspicious. Consequently, girls and women are frequently discouraged from participating in religious rituals, domestic duties, or culturally valued activities during their menstrual periods (Garg & Anand, 2015). Such perceptions reinforce the silence surrounding menstrual health and contribute to the broader neglect of menstrual disorders within public health discourse. In several developing countries, including India, issues such as dysmenorrhea, irregular cycles, and other gynaecological concerns often remain underreported and receive inadequate medical attention despite their significant implications for reproductive health (Garg & Kumari, 2012). These challenges are even more pronounced in marginalized and rural communities, where access to accurate information, healthcare services, and safe menstrual hygiene practices is limited.

The Santal community is one of the largest tribal groups in eastern India, predominantly residing in the states of West Bengal, Jharkhand, Odisha, and Bihar (Saren, 2025). Santal adolescents often grow up in socio-economically marginalized settings, where limited healthcare access, inadequate nutrition, and persistent cultural taboos may influence menstrual physiology and perceptions. Previous studies conducted among tribal women have revealed varying menarcheal ages, a high prevalence of dysmenorrhea, and a complex network of menstrual restrictions and practices, suggesting the need for further localized exploration. Studies on menstrual characteristics among Indian tribal adolescents have documented diverse

patterns of cycle length, menstrual symptoms, and cultural restrictions (Kumar et al., 2016; Sharma, 2018; Mahapatra, 2023; Mudi et al., 2023). Such variations highlight the influence of ecological, nutritional, and socio-cultural contexts on menstrual health.

Considering the socio-cultural uniqueness of the Santal community and the absence of comprehensive studies in the eastern region, it is imperative to examine the menstrual characteristics of Santal adolescent girls to contribute to a broader understanding of tribal reproductive health. The present study aims to fill this research gap by examining the age at menarche, menstrual cycle characteristics, common symptoms, and cultural restrictions practiced during menstruation among Santal adolescent girls in the Hooghly District of West Bengal.

Materials and Methods

This cross-sectional study was conducted in Santal-inhabited villages of the Hooghly district in West Bengal, from January to March 2025. Altogether 31 villages (Ajobnagar, Banmalipur, Basantapur, Betar more, Bharamalpur, Bhimpur, Charabagan, Chnarpur, Dararpar, Gobati, Gojar more, Gopalpur, Gopinagar, Harit, Hijuli, Ilipur, Jejur, Jhanjhra, Kashipur, Kelokaba, Khejuriya, Manirampur, Mushapur, Naiti, Nilarpur, Puinan, Rajapara, Rampara, Seiya, Shyamnagar and Sipaigachi) have been selected for the study. The participants were adolescent girls aged 10 to 18 years of Santal by ethnicity and have attained menarche. The final selection of participants was random among the selected villages. A total sample of 384 respondents was targeted; however, the study included 359 samples. Data were collected on socio-demographic information (age), reproductive health history (age at menarche, regularity of menstruation, cycle length, menstrual symptoms etc), anthropometric data (height, weight, BMI) and menstrual food restrictions. BMI classification was based on body mass index-for-age percentiles (2 to 20 years girls) developed by the National Centre for Health Statistics in collaboration with the National Centre for Chronic Disease Prevention and Health Promotion (2000). Data analysis was performed using SPSS.

Results

Table 1 presents the general profile of the 359 participants included in the study. The mean age of the respondents was 15.26 ± 2.14 years, with ages ranging from 10 to 18 years. The mean menarcheal age was recorded as 12.30 ± 1.22 years, with

a range of 10 to 16 years. The mean duration of menarche was 2.95 ± 1.77 years (range 0-7 years). Regarding anthropometric characteristics, the mean height of the participants was 148.94 ± 5.88 cm, and the mean body weight was 41.36 ± 6.60 kg. The mean BMI was 18.62 ± 2.62 kg/m², spanning from 12.9 to 31.7 kg/m², suggesting that the sample consisted primarily of individuals within the normal weight range, although the distribution also included underweight and overweight participants.

Table 1: General Profile of the Participants (N = 359)

Variable	*Mean ± SD*	*Range*
Age (years)	15.26 ± 2.138	10 – 18
Menarcheal Age (years)	12.30 ± 1.219	10 – 16
Duration Since Menarche (days)	2.95 ± 1.770	0 – 7
Height (cm)	148.942 ± 5.876	133.4 – 166.4
Weight (kg)	41.355 ± 6.595	27.3 – 66.4
BMI (kg/m²)	18.621 ± 2.624	12.9 – 31.7

Table 2 summarises the distribution of menstrual cycle characteristics among the participants. The majority of respondents (85.8%) reported having a regular menstrual cycle within the typical range of 21–35 days, whereas 14.2% experienced irregular cycles that were either shorter than 21 days or longer than 35 days. In terms of menstrual flow duration, 81.9% of the girls reported a normal duration of 2–7 days. Hypomenorrhea, defined as flow lasting less than 2 days, was observed in 13.1% of participants, whereas hypermenorrhoea, or prolonged flow exceeding 7

Table 2: Distribution of Menstrual characteristics

Menstrual Characteristic	*Frequency (n)*	*Percentage (%)*
Cycle Length		
Regular (21–35 days)	308	85.8
Irregular (>35 or <21 d)	51	14.2
Duration of Flow		
Hypomenorrhea (<2 days)	47	13.1
Normal (2–7 days)	294	81.9
Hypermenorrhoea (>7 days)	18	5.0
Amount of bleeding		
Light	152	42.3
Medium	137	38.2
Heavy	70	19.2

days, was reported by 5% of the sample. The amount of menstrual bleeding varied among the respondents. Light bleeding was reported by 42.3% of participants, followed closely by 38.2% who experienced medium bleeding. A smaller proportion (19.2%) reported heavy bleeding.

Table 3 presents the distribution of menstrual symptoms reported by participants. Dysmenorrhea was the most commonly experienced, with 51.8% of respondents reporting menstrual pain. Backache was also frequently noted, affecting 32.6% of participants, and 26.2% reported experiencing headaches during menstruation. Symptoms related to general physical discomfort were also evident, as 23.4% of the girls reported weakness or fatigue during menstruation. Less commonly reported symptoms included breast tenderness (19.2%) and nausea or vomiting, which affected 5% of the sample. Notably, 21.4% of the participants indicated that they experienced no symptoms during their menstrual cycle.

Table 3: Menstrual Symptoms reported by Participants

Symptom	*Frequency*	*Percentage (%)*
Dysmenorrhea (pain)	186	51.8
Headache	94	26.2
Backache	117	32.6
Weakness/Fatigue	84	23.4
Nausea/Vomiting	18	5.0
Breast Tenderness	69	19.2
No Symptoms	77	21.4

Table 4 describes the food restrictions reported by the participants during menstruation. The most frequently restricted food category was sour items, avoided by 58.8% of respondents, indicating a strong cultural preference or belief associated with avoiding sour foods during menstruation. Other commonly restricted food types included fried foods (13.3%) and spicy foods (8.2%). A smaller proportion of participants avoided items such as burnt foods (9.3%), leafy greens (2.2%), fish (2.9%), flesh meats (3.6%), and eggs (3.6%). Very low avoidance was reported for foods such as onion, garlic, salted foods, sweet foods, papaya, sugar, and oily foods (each 0.4%–2.2%). The table shows that a substantial number of girls followed certain dietary restrictions.

Table 4: Restrictions of food during Menstruation Reported by Participants

Food	*Frequency*	*Percentage*
Sour	153	58.8
Fried	37	13.3
Burn	26	9.3
Cold	3	1.1
Fish	8	2.9
Flesh	10	3.6
Egg	10	3.6
Onion	1	0.4
Garlic	1	0.4
Leafy greens	6	2.2
Salted	1	0.4
Spicy	23	8.2
Sweet	6	2.2
Papaya	1	0.4
Sugar	1	0.4
Oily	1	0.4

Table 5 shows the association between menarcheal age and various menstrual characteristics. Participants were grouped into those who attained menarche before age 13 years (<13 years) and those who attained menarche at or after age 13 years (≥13 years). A significant difference was observed in cycle length, with girls in the <13 years menarche group showing a longer mean cycle length (29.06 ± 3.56 days) compared to those in the ≥13 years group (28.10 ± 2.78 days) ($t = 2.744$, $p = 0.006$). Similarly, the duration of menstrual flow was significantly longer among girls with early menarche (4.83 ± 1.63 days) than among those with late menarche (4.38 ± 1.50 days) ($t = 2.661$, $p = 0.008$). These findings suggest that an earlier menarche may be associated with slightly longer and more variable menstrual patterns. In contrast, no significant association was found between menarcheal age and the presence of dysmenorrhea ($\chi^2 = 1.008$, $p = 0.315$). The proportion of girls reporting dysmenorrhea was similar across both groups (46% in the < 13 years group and 48.6% in the ≥ 13 years group). Likewise, the amount of menstrual bleeding did not differ significantly between the two groups ($\chi^2 = 0.743$, $p = 0.689$). Light, medium, and heavy bleeding were distributed in comparable proportions across both categories of menarcheal age.

Table 5: Association between Menstrual Characteristics and Menarcheal Age

Menstrual Variable	*<13 yrs (n=211)*	***≥13 yrs (n=148)***	***t-test/ χ^2 (p-value)***
Cycle Length (days)	29.06 ± 3.561	28.10 ± 2.782	2.744 (0.006)
Duration of Flow (days)	4.83 ± 1.627	4.38 ± 1.503	2.661 (0.008)
Dysmenorrhea			
Yes	114 (46.0)	72 (48.6)	1.008 (0.315)
No	97 (54.0)	76 (51.4)	
Amount of bleeding			
Light	89 (42.2)	63 (42.6)	0.743 (0.689)
Medium	78 (37.0)	59 (39.9)	
Heavy	44 (20.9)	26 (17.6)	

Table 6 presents the correlation matrix showing the relationships between age, BMI, age at menarche (AAM), and selected menstrual characteristics, including cycle regularity (CR), cycle duration (CD), and dysmenorrhea (DYS). Several significant correlations were observed. Age showed a strong positive correlation with AAM ($r = 0.561$, $p < 0.01$). Age also exhibited a moderate positive correlation with BMI ($r = 0.284$, $p < 0.01$), indicating that older adolescents tended to have higher BMI values. A negative correlation was found between age and cycle duration ($r = -0.273$, $p < 0.01$), suggesting that the cycle duration becomes slightly shorter with increasing age. BMI demonstrated a weak but significant positive correlation with AAM ($r = 0.123$, $p < 0.05$), implying a small tendency for a higher BMI to be associated with a later onset of menarche. BMI was also positively associated with dysmenorrhea ($r = 0.105$, $p < 0.05$), indicating that adolescents with a higher BMI were slightly more likely to report menstrual pain. AAM did not show meaningful correlations with cycle regularity, cycle duration, or dysmenorrhea, suggesting that the timing of menarche does not substantially influence these menstrual parameters in this study sample. Cycle regularity was significantly negatively correlated with cycle duration ($r = -0.283$, $p < 0.01$), indicating that irregular cycles tended to be longer. Cycle duration was positively associated with dysmenorrhea ($r = 0.142$, $p < 0.01$), suggesting that longer menstrual cycles may be linked to a greater likelihood of experiencing pain. Dysmenorrhea showed no significant correlation with age, AAM, or cycle regularity, but as noted, had a weak association with BMI and cycle duration.

Table 6: Correlation Matrix between menstrual characteristics and BMI

	Age	*BMI*	*AAM*	*CR*	*CD*	*DYS*
Age	1	0.284**	0.561**	0.093	-0.273**	-0.030
BMI	0.284**	1	0.123*	-0.036	0.040	0.105*
AAM	0.561**	0.123*	1	0.019	-0.088	-0.007
CR	0.093	-0.036	0.019	1	-0.283**	0.002
CD	-0.273**	0.040	-0.088	-0.283**	1	0.142**
DYS	-0.030	0.105*	-0.007	0.002	0.142**	1

Discussion

This study investigated menstrual characteristics among Santal adolescent girls in the Hooghly District, and to the best of our knowledge, this is the first published work on menstruation among the Santal community in West Bengal. The descriptive profile (mean age: 15.26 years) places the participants within the mid-adolescent range, which is consistent with other rural and tribal adolescent cohorts across India. The observed mean age at menarche (12.30 years) falls within the lower–mid range commonly reported for Indian tribal and rural populations. Previous researches indicate that the mean age at menarche generally ranges between 9 and 16 years, depending on nutritional, socioeconomic, and regional factors (Diaz, 2006). The present finding is slightly lower than the regional mean for Eastern India, reported as 13.21 years (Meher & Sahoo, 2024), suggesting an earlier pubertal onset among Santal girls in Hooghly. A study reported a mean menarcheal age of 11.4 years among Santal girls in Jharkhand (Chatterjee et al., 2005); however, this value may not accurately reflect broader trends, likely due to the limited sample size of the study. In comparison, Deb (2009) found a mean age of 12.35 years among Assamese and Bengali girls, while Deo and Gattarji (2004) reported 12.24 years. Bhaumik and Biswas (2024) documented a mean age at menarche of 12.99 years among Kisan and Nagesia tribe of West Bengal. Similarly, Gautam et al. (2008) observed a mean menarcheal age of 13.27 years among Baiga women. Mane et al. (2012) reported mean ages of 13.05 years and 13.13 years for Kanjarbhat and Lamani girls, respectively, with an overall mean of 13.09 years. Tyagi et al. (1983) recorded ages at menarche of 12.80 years among Oraon girls and 12.76 years among Munda girls living in the same ecological zone. More recently, Das and Mohapatra (2024) reported a mean age of 13.2 years among Munda women in the Jajpur District of Odisha. These comparisons indicate that the current study's findings are largely consistent with those reported for Eastern Indian tribal populations. The relatively

lower mean age at menarche among Santal girls in Hooghly may reflect region-specific variations in nutrition, lifestyle, or environmental conditions influencing pubertal timing.

Cycle regularity was high in the present sample, with 85.8% of the girls reporting cycle lengths within the 21–35-day range. High rates of regular menstrual cycles are commonly observed among older adolescents (>15 years) as cyclicity tends to stabilize in the years following menarche (Ray et al., 2010; Pramanik et al., 2015). Tribal populations, however, often exhibit slightly lower rates of regularity, particularly when study samples include younger post-menarcheal girls or when definitions of irregularity differ across studies. For instance, Das and Mohapatra (2024) reported that 60.4% of Munda girls have regular monthly cycles. Mahapatra (2023) found that 74.8% of girls exhibited regular menstrual cycles. Similarly, Dambhare et al. (2011) reported that 69.52% of adolescent girls had cycle lengths within the 21–35-day range, whereas Omidvar et al. (2018) found that 73.1% of South Indian girls experienced regular cycles. Kanotra et al. (2013) documented an even higher prevalence, with 92.88% of Maharashtrian girls demonstrating regular menstrual patterns.

In terms of menstrual flow duration, 62.7% of women were reported to have menstrual bleeding lasting less than five days, while 7.8% experienced flow exceeding five days among the Munda tribe (Das & Mohapatra, 2024). Dambhare et al. (2011) observed that 97.15% of Central Indian girls had a normal duration of menstrual flow ranging from 2 to 7 days, with only 1.6% experiencing flow shorter than 2 days and 1.25% reporting flow lasting more than 8 days. In comparison, within the current sample, 81.9% of Santal girls exhibited a normal duration of menstrual flow. Hypomenorrhea, defined as menstrual bleeding lasting less than two days, was observed in 13.1% of participants, whereas hypermenorrhoea, or prolonged bleeding exceeding seven days, was reported by 5% of the sample.

The present study found a statistically significant association between earlier menarche (<13 years) and slightly longer mean cycle length and duration of flow. Girls with menarche <13 years had a mean cycle length of 29.06 ± 3.56 days and mean flow of 4.83 ± 1.63 days, versus 28.10 ± 2.78 days and 4.38 ± 1.50 days in the ≥13 years group. Prior work suggests that early menarche can be associated with greater menstrual variability during adolescence and, in some settings, longer or heavier flow, possibly because of a prolonged period of anovulatory cycles during adjustment after early menarche and differences in endocrine maturation linked to

childhood growth and adiposity (Zhang et al., 2017; Tyagi, 1983). These findings echo several tribal and rural studies that report early matures experiencing distinct menstrual patterns during adolescence, although the effect sizes are typically small and context-dependent.

Dysmenorrhea was reported by 51.8% of participants, making it the most frequently observed menstrual symptom in the present study. This prevalence lies within the mid-range reported among Indian adolescents, where estimates vary widely from approximately 40% to 80%, depending on the study design, assessment methods, and population characteristics (Samal, 2025). Comparable findings have been reported among rural central Indian girls, with Dambhare et al. (2011) noting a prevalence of 45.61%. In contrast, Ray et al. (2010) documented a much lower prevalence of 15.08% among rural girls in West Bengal, while Mahapatra (2023) observed dysmenorrhea in 28.88% of tribal girls in Odisha. In the present analysis, dysmenorrhea showed a small positive correlation with body mass index (BMI) and longer cycle duration, suggesting that higher adiposity and extended bleeding may modestly increase the likelihood or intensity of menstrual pain. In addition to dysmenorrhea, 26.2% of the participants reported experiencing headaches during menstruation. This prevalence is considerably higher than that reported by Ray et al. (2011), who found headaches in only 3.6% of rural girls in West Bengal. Regional variations are notable: Kumar et al. (2016) observed 42.6% prevalence among girls in Punjab, Wasnik et al. (2015) reported 6.6% in Maharashtra, Omidvar et al. (2016) found 12.2% in South India, and Mahapatra (2023) recorded 33.3% among tribal girls in Odisha. Regarding other menstrual symptoms, Mahapatra (2023) documented fatigue in 68.88% of the participants, breast tenderness in 48.88%, and nausea or vomiting in 17.77%. In comparison, the present study found a lower prevalence, with 19.2% of girls reporting breast tenderness and 5% experiencing nausea or vomiting. These values are comparable to the findings of Kumar et al. (2016), who reported that 4.5% of Punjabi girls experienced nausea or vomiting, and Omidvar et al. (2016), who reported an 8.1% prevalence in South India.

The distribution of menstrual bleeding amount in the present sample was light in 42.3%, medium in 38.2%, and heavy in 19.2% of participants, indicating that while the majority of Santal adolescent girls experienced light-to-moderate flow, nearly one-fifth reported heavy bleeding. This represents a nontrivial minority that warrants both clinical attention and increased community awareness regarding menstrual health (Pramanik et al., 2015). In comparison, Ramraj et al. (2021)

reported that among Indian adolescent girls, 10% experienced light flow, 59% medium flow, and 31% heavy flow, while Yaliwal et al. (2020) found 9.8% with light, 75.4% with medium, and 12.2% with heavy bleeding. These findings suggest that the proportion of heavy menstrual flow in the current study was moderately higher than that observed by Yaliwal et al. (2020) but lower than the national estimates reported by Ramraj et al. (2021).

Cultural practices and dietary restrictions during menstruation were prominent in the present Santal sample. Most participants (58.8%) avoided sour foods, while fewer refrained from fried, spicy, burned, or certain protein-rich foods. Such menstrual dietary taboos are widely documented across Indian communities, although their content and prevalence vary by region, tribe, and cultural context. These practices often stem from locally held beliefs regarding digestion, bodily heat, and blood balance during menstruation (Mittal, 2023). Comparable findings have been reported in other regions of India. Goel et al. (2023) found that 65.6% of adolescent girls in Haryana avoided sour foods, 26.75% avoided spicy foods, and 8.9% abstained from non-vegetarian items during menstruation. Similarly, Asmat et al. (2020) observed that 54% of tribal adolescent girls in Kargil believed that consuming cold or sour foods during menstruation could cause abdominal or vaginal cramps. Sharma et al. (2018) reported that as many as 76.6% of adolescent girls in North India practiced some form of food restriction during their menstrual period. Menstrual food taboos remain pervasive among Indian adolescents, reflecting the intersection of traditional health beliefs and menstrual cultural norms.

The correlation matrix further elucidated the interrelationships among the menstrual and anthropometric variables in the present sample. Age showed a strong positive correlation with age at menarche and a moderate correlation with BMI, reflecting the expected adolescent growth and maturation patterns (Pramanik et al., 2015). Similar findings have been reported by Khatoon et al. (2011), who noted that BMI influences the timing of menarche. In contrast, Belavaneki and Kour (2022) found no significant association between menarcheal age and sociodemographic or anthropometric factors, highlighting the variability in this relationship across populations. Cycle regularity was negatively correlated with cycle duration, indicating that irregular cycles tended to be longer. Additionally, a longer menstrual flow duration was positively correlated with the prevalence of dysmenorrhea. BMI demonstrated a weak but positive association with dysmenorrhea, consistent with previous research suggesting a modest relationship between adiposity and menstrual

pain, though this association remains inconsistent across different settings (Samal, 2025; Mukherjee, 2024). Takata et al. (2023) similarly reported a significant association between BMI and dysmenorrhea, in line with the present findings, although their study also identified a relationship between age and dysmenorrhea that contrasts with the current results. Furthermore, Aktas et al. (2023) found that the prevalence of primary dysmenorrhea was significantly correlated with age, age at menarche, and BMI, reinforcing the multifactorial nature of menstrual pain in adolescents.

Conclusion

The present study provides important insights into the menstrual characteristics, symptoms, and related cultural practices among Santal adolescent girls in the Hooghly District of West Bengal. The findings indicate that early menarche is associated with a significantly longer cycle length and duration of menstrual flow, suggesting that the age at menarche may influence subsequent menstrual patterns. Dysmenorrhea emerged as the most commonly reported symptom, consistent with patterns observed in other tribal and rural populations across India. The persistence of food restrictions, particularly the avoidance of sour foods, reflects the enduring cultural beliefs surrounding menstruation within the Santal community. Analyses further revealed significant associations between menstrual cycle duration, BMI, and age, underscoring the interrelationship between nutritional status and menstrual health. Throughout this study, it was observed that menstrual characteristics among many tribal communities in India remains underreported, and detailed data on the Santal population are particularly scarce. Therefore, the authors recommend that future research should expand to include diverse tribal groups, with focused investigations on the Santals, to build a more comprehensive understanding of biological variation, sociocultural influences, and menstrual health disparities among India's tribal populations.

Acknowledgements

The authors extend their heartfelt appreciation to all the participants, their families, and the village community for their cooperation, particularly given the challenges of a busy agricultural season during which the data were collected. We are also grateful to the local teacher whose guidance in locating the Santal hamlets and whose continual assistance greatly facilitated the progress of this study.

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