

Menstrual Characteristics and Practices of Menstrual Hygiene among the Adolescent Females of a Slum Area in Bidhannagar Municipal Corporation, North 24 Parganas, West Bengal

ADITI SAMANTA[†], JOYEETA THAKUR[‡] & MONALI GOSWAMI*

*Department of Anthropology, University of Calcutta,
35 Ballygunge Circular Road, Kolkata 700019, West Bengal
E-mail: goswami_monali@rediffmail.com*

KEYWORDS: Menstrual characteristics and hygiene. Adolescent girls. Urban Duttabad slum area. Bidhannagar. North 24 Parganas. West Bengal.

ABSTRACT: The present study is an endeavour to understand the menstrual characteristics, knowledge and hygienic practice among the slum adolescent girls of North 24 Parganas, West Bengal. This study was conducted among a group of 90 adolescent girls aged between 16-18 years. A structured schedule was used to collect detailed information about their socio-economic status, menstrual characteristics and knowledge and hygiene practices during menstruation. Mean age at menarche of the participants was 12.52 ± 1.20 and only mother's educational status was found to be a significant predictor ($\beta = -0.27$, $p \leq 0.05$) of age at menarche. Disorders like premenstrual syndrome (PMS) (78.89%) and dysmenorrhea (85.56%) were the major prevalent menstrual problems and PMS was found to have a strong association with dysmenorrhea ($p < 0.001$). Significant association was also observed between some of the socio-economic variables and various menstrual characteristics. The results of this study unwrap a podium to focus on the health issues of the adolescent girls and enforce counselling services, health education, and health care services.

INTRODUCTION

Adolescence is a sensitive period in the life of a girl and has been recognized as a special period which signifies the transition from girlhood to womanhood. Around 21.3% i.e. nearly 1/5th of the total population of India is represented by this population (Dambhare *et al.*, 2012). Attainment of menarche or the onset of menstruation is considered as an important mile stone of adolescence period, which assures normal physical, endocrinal and physiological development (Kanotra *et al.*, 2013). It serves as an intermediate health

outcome that affects the women's wellbeing at later stages of life. The average age at menarche ranges from 12-16 years worldwide (Arteria *et al.*, 2000; Thomas *et al.*, 2001; Gharravi *et al.*, 2009; Tunau *et al.*, 2012; Adesina *et al.*, 2013; Al-Awadhi *et al.*, 2013), whereas in India it is slightly lower and has been reported to be around 12 years (Khadilkar *et al.*, 2006; Chumlea *et al.*, 2003). The age of menarche is determined by general health, genetic, socio-economic and nutritional factors (Attallah, '78; Swenson *et al.*, '87; Ekele *et al.*, '96; Chumlea *et al.*, 2003; Thomas *et al.*, 2001).

Menstrual cycle is a periodic discharge of bloody fluid, from the uterus as a result of cyclic hormonal

[†] Student

[‡] Research scholar

*Assistant Professor, corresponding author

changes that makes pregnancy possible (Itagi and Itagi, 2017; Sherwood *et al.*, 2013). The median duration of a menstrual cycle is 28 days with most cycle lengths between 25 to 30 days (Treloar *et al.*, '67). Menstrual cycles are often irregular during adolescence. Immaturity of the hypothalamic-pituitary-ovarian axis during the early years after menarche often results in anovulation and cycles may be somewhat long; although short cycles of less than 20 days may also occur and by the third year after menarche, 60-80% of menstrual cycles are 21-34 days long, as is typical of adults (Widholm and Kantero *et al.*, '71; Flug *et al.*, '84; WHO, '86; Hickey and Balen, 2003). Most females bleed for 2-7 days during their first menses (Rebar, 2010) but majority of women experience menstrual flow that last three to five days leading to loss of about 30-80 ml of non-clotting blood from the endometrium (Sperroff *et al.*, '99; Mishell, 2001). Studies have shown that the duration of the menstrual discharge is either extremely long or extremely short after menarche, and a woman generally experiences peak discharge on the second day of her period (Matsumoto *et al.*, 1962; WHO, '86).

Menstruation is a normal physiological process, but it may be associated with various symptoms occurring before or during the menstrual flow (Hickey *et al.*, 2003; Verma *et al.*, 2011; Dharampal *et al.*, 2012). A vast majority of adolescent girls in India are suffering from reproductive health morbidities (Agrawal *et al.*, 2007; Balasubramanian, 2005; Sharma *et al.*, 2008). Some of the menstrual characteristics, such as irregularity in the menstrual cycle, premenstrual pain and discomfort, pain and discomfort at the time of menstrual discharge and a heavy menstrual discharge, may affect the general and/or reproductive health of a woman (Harlow, '95; Goodenough *et al.*, '98; Fox, 2004) and also her productivity (Ylikorkala *et al.*, '78; Dagwood, '95; Kjerulff *et al.*, '96; Beek *et al.*, '96; Kaunit, 2000; Dutta, 2006; Ram, 2006; Jaiikhani *et al.*, 2014).

Various factors such as socio-economic status, family size, level of education, environmental conditions, nutritional and health status, and hygiene practice are known to influence the common menstrual problems as well as age of menarche (Mohite *et al.*,

2013). Good hygiene, such as use of sanitary pads and adequate washing of the genital area, is essential during menstruation (Bhattacharjee *et al.*, 2013). Unhygienic practices related to menstruation, like prolonged use of these absorbents (either a piece of cloth or a commercial product) at a stretch, inappropriate laundering of the cloth absorbent and improper perineum care, create an environment for harbouring harmful microorganisms that may affect the urinary tract and also infect the perineum, which in turn can affect the reproductive health of woman (Wasserheit *et al.*, '89; Khanna *et al.*, 2005; Thakre *et al.*, 2011). Adolescent girls will become mothers in the subsequent 5-10 years and these morbidities may affect the well-being of future generations, if these morbidities are not treated early, they could lead to various disabilities and consequently affect their valuable lives (Balasubramanian, 2005).

However, studies on the adolescent girls of an urban slum are scarce and meager. Therefore, the present study is an endeavour to understand the menstrual characteristics, knowledge and hygienic practice and also to find an association between the menstrual characteristics and the socio-economic variables of the adolescent girls of an urban slum of North 24 Paraganas, West Bengal.

MATERIALS & METHODS

The present study cross sectional study was carried out in Duttabad slum area located in Bidhannagar Municipal Corporation in North 24 Paraganas district at West Bengal, India.

The participants constituted a total of 90 adolescent girls of 16, 17 and 18 years age. The participants include Bengali speaking Hindu girls, and girls belonging to Scheduled Castes and Scheduled Tribes. Inclusion criteria of selection of the study participants included unmarried adolescent girls, aged between 10-19 years (following WHO criteria for being an adolescent) and who have attained menarche at least two year prior to the date of interview and the exclusion criteria included those with serious reproductive or other health problems. The participants were selected using a purposive random sampling method. The subjects who volunteered to

participate in the study and also co-operated with the study criteria were included in the sample study.

Prior to data collection, interview schedule was administered on recruited individuals after prior information and with their written consent. Interview schedule included relevant information like age, socio-economic status, menstrual characteristics, menstrual disorders, and knowledge and hygiene practices. The data were collected personally by the first author (AS), through interviews of the volunteered subjects.

Data on socio-economic status of the subject included age, sex, educational and occupational status of the participants and their parents, family expenditure, types of family, number of family members, house type and toilet facilities.

Data on menstruation included the date of the first menstruation (menarche), were collected by asking the exact date, if couldn't recall, then the nearest month by recalling the season or some festivals nearest to their onset of menstruation. Menstrual characteristic covered data related to menstrual discharge (scanty, moderate, heavy), days of peak discharge, duration of bleeding, cycle length. Heavy flow was considered as heavy amount of menstrual bleeding (self-assessed). Participants were asked about 'irregular periods' that were defined as menstruation that took place on a monthly basis but at a nonspecific interval of time and 'skipping of cycle' that was if menstrual cycle skips during a particular month or for some months and details were recorded on the basis of last one-year history. Menstrual disorders were determined by premenstrual syndrome and dysmenorrhea. Premenstrual problems were defined as symptoms like abdominal pain, back pain, vomiting, headache, flatulence, feeling of heaviness, breast tenderness, mood swing, irritability etc that they have experienced just a few days before the menstruation started. Dysmenorrhea was described as painful cramping, abdominal pain accompanying menstruation associated with few other symptoms like back pain, nausea, frequent urination, abdominal blotting etc and the intensity of all symptoms were categorized as mild, moderate and severe. The severity of symptoms is usually assessed by the

grade of dysmenorrhea – mild, moderate, and severe – according to their limitation of daily activities and work performance. Mild: Menstruation is painful but normal activities are not affected and have mild pain; Moderate: daily activities are seldom affected and have moderate pain. Severe: activities are gravely affected or clearly inhibited and have severe pain.

Data on knowledge and hygiene practice included knowledge about menstruation before attending menarche and the source of knowledge, types of absorbent used during menstrual discharge, frequency of changing absorbent, cleaning and drying of reused cloth, taking bath, hand washing and cleaning of external genitalia during menstruation.

Linear regression was applied to understand the impact of socio-economic as well as menstrual characteristics on dependent variables like age at menarche, duration of menarche and cycle length. For age at menarche only social categories of the participant, mother's and father's education and occupation were used. For rest of the dependent variables, socio-economic variables like social category, total number of family members, participant's age, participant's education mother's and father's education and occupation, monthly expenditure and menstrual characteristics like age at menarche, duration of bleeding, cycle length, heavy flow, irregularity of periods, nature of discharge, were considered as the independent indicators but only significant indicators were mentioned. A logistic regression (binary) was used to analyse the effects of socio-economic along with menstrual variables on menstrual problems like irregularity, heavy flow and nature of discharge.

The whole data has been collected within the month of March to May, 2017. The analyses of the data were done using the Statistical Package for Social Sciences version 18.0. To analyse the socio-economic status and menstrual characteristics of the participants' descriptive statistics was used for calculating the frequency, percentage and mean of the variables. Significant values of $p \leq 0.05$, $p < 0.01$ and $p < 0.001$ have been considered as the significant levels.

RESULTS

TABLE 1

Socio-economic characteristics of the participants in the study

Socio-economic characteristics of the participants		Frequency (n=90)
<i>Age (in years)</i>	16	31 (34.44)*
	17	31 (34.44)
	18	28 (31.11)
	Mean	16.97±0.18
<i>Social category</i>	General	38 (42.22)
	Schedule Caste	43 (47.78)
	Schedule Tribe	9 (10.00)
<i>Levels of education</i>	Up to upper primary level	19 (21.11)
	Up to secondary level	43 (47.78)
	Higher secondary and above	28 (31.11)
	Mean completed years of education	9.72±1.85
<i>Mother's level of education (n= 83)†</i>	Non-literate	25 (30.12)
	Up to primary level (Class-IV)	27 (32.53)
	Up to upper primary level(Class-VIII)	19 (22.89)
	Up to secondary level(Class-X)	8(9.64)
	Above secondary education	4(4.82)
	Mean of completed years of education	4.11±3.52
<i>Father's level of education (N=83)*</i>	Non-literate	18 (21.69)
	Up to primary level	14 (16.87)
	Up to upper primary level	23 (27.71)
	Up to secondary level	15 (18.07)
	Above secondary education	13 (15.66)
	Mean of completed years of education	6.17±4.36
<i>Working status of the participants</i>	Working	7 (7.78)
	Non working	83 (92.22)
<i>Mother's occupation (N= 83)†</i>	Working	46 (55.42)
	Only homemakers	37 (44.58)
<i>Father's occupation (N= 83)*</i>	Skilled worker	35 (38.9)
	Unskilled worker	4 (4.40)
	Business	23 (25.60)
	Service	21 (23.30)
<i>Types of family</i>	Nuclear	66 (73.33)
	Extended	24 (26.67)
<i>Total number of family members</i>	< 4 persons	8 (8.89)
	4 - 5 persons	72 (80.00)
	> 5 persons	10 (11.11)
<i>Monthly expenditure (in ₹)</i>	5000-10000	66 (73.33)
	10001-15000	18 (20.00)
	>15000	6 (6.67)

† Seven participant's mothers have either passed away or they do not stay with their parents

* Seven participant's mothers have either passed away or they do not stay with their parents

The Table 1 highlights that mean age of the participants was 16.97 ± 0.81 year, and maximum participants belong to the Schedule Castes category (47.78%) followed by the general category (42.22%) and Schedule Tribes category (10.00%).

Most of the families are the nuclear type families (73.33%) and majority of the family (80.0%) consists of 4-5 members. More than half (53.33%) of the participants live in one roomed pucca houses. About 60% houses do not have any toilet facility at their residence and they generally use public toilet constructed by the municipality. Maximum number of families' (73.3%) monthly expenditure falls in between Rs.5000 to 10000. Maximum percentage of participants (47.78%) received up to secondary level of education and mean completed years of education is 9.72 ± 1.85 . 31.33% of the mothers are non-literate but majority of them (33.73%) are educated up to primary level. 21.69% of the fathers did not get any formal education and 27.71% are educated up to upper primary level. Thus, the mean completed years of education for the fathers (6.17 ± 4.36), which is comparatively higher than the mothers (4.11 ± 3.52).

Majority of the participants are non-working (92.22%) students and only 7.78% are working as maids in neighbouring government quarters. Most of the mothers (55.42%) earn for the family and most of the fathers of the participants were found to be engaged either as skilled (41.11%) labourers/workers or in service (27.78%), and some are following small business (25.56%).

TABLE 2
Distribution of the Participants Based on Menstrual Characteristics

Menstrual characteristics of participants	Frequency	
<i>Age at menarche (years)</i>	≤ 10	3 (3.3)
	11	15 (16.7)
	12	26 (28.9)
	13	30 (33.3)
	14	11 (12.2)
	≥ 15	5 (5.60)
	Mean age at menarche (years)	12.52 ± 1.20
	Mean menstrual years	4.44 ± 1.40
<i>Length of cycle (days)</i>	< 20 days	3 (3.33)
	21 - 35 dayse	74 (82.22)
	≥ 36 days	13 (14.44)
	Mean cycle length	31.40 ± 4.08
<i>Duration of menstrual bleeding (days)</i>	3-4 days	39 (43.33)
	5-6 dayse	29 (32.22)
	≥ 7 days	22 (24.44)
	Mean duration of menstrual discharge (days)	5.14 ± 1.55
<i>Menstrual flow during peak discharge / day</i>	Scanty	23 (25.6)
	Moderate	19 (21.1)
	Heavy	48 (53.3)
	Mean number of days of peak discharge	1.86 ± 1.21
<i>Nature of discharge</i>	Bleeding with clot	51 (56.70)
	Bleeding without clot	39 (43.30)
<i>Regularity of cycle</i>	Regular	69 (76.67)
	Irregular	21 (23.33) <i>Contd...</i>

Skipping of cycle	Yes	19 (21.11)
	No	71 (78.89)
Longest time without period (n=19)	2 months	13 (68.42)
	3 months	2 (10.53)
	> 3 months	4 (21.05)

The Table 2 reveals that the mean age of menarche of the participants was found to be 12 ± 1.20 years. About 82.22% of the participants have menstrual cycle length between 21 to 35 days and few of them (14.44%) have cycle length between 36-45 days and the mean cycle length was 31.40 ± 4.08 . The menstrual bleeding of the participants generally last for 3-4 days (43.33%) but almost one fourth (24.4%) of the girls bleed for more than seven days and the mean duration of bleeding was 5.14 ± 1.55 days. The mean number of peak days of discharge was 1.86 ± 1.21 days. Most of the participants experienced heavy flow usually at the second day of their menstrual period. Majority (56.70%) of them experienced their menstrual flow with clots and blood clots generally found maximum on the second day along with the heavy bleeding. Though menstrual irregularities are very common within few after the menarche but majority of the participants had regular menstrual cycle in every month (76.67%), only 21.11% girls have reported that they have missed at least one period in last one year and the longest time they went without period was found to be two months (68.42%).

Figure 1 reflects that maximum adolescent girls (78.89%) have reported of having at least few symptoms of Pre-Menstrual Syndrome (PMS) and that they experience these symptoms 3 to 5 days prior to onset of menstrual bleeding. Prevalence of Dysmenorrhea is also maximum among the participants (85.56%), but there are girls who had also totally painless bleeding (14.44%).

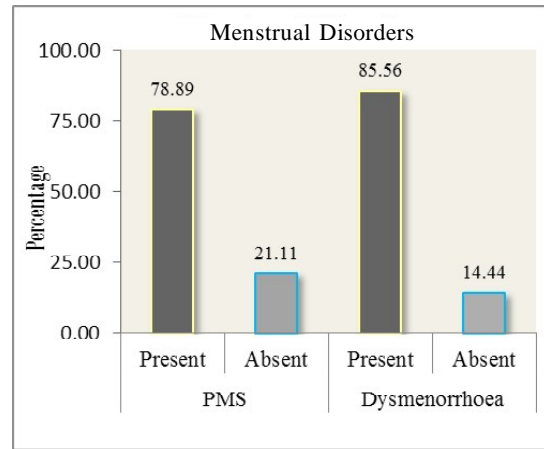


Fig 1: Prevalence of PMS and Dysmenorrhea

TABLE 3

Distribution of the participants based on symptoms of PMS faced by the participant

Pre-Menstrual Syndrome (PMS) symptoms* (N=71)	Total	Mild	Moderate	Severe
Irritation/anxiety	22 (30.99)†	2 (9.09)	10 (45.45)	10 (45.45)
Anxiety	13 (18.31)	2 (9.09)	3 (23.08)	8 (61.54)
Mood swing	21 (29.58)	3 (14.29)	2 (9.52)	16 (76.19)
Insomnia	17 (23.94)	2 (11.76)	8 (47.06)	7 (41.18)
Breast tenderness	2 (2.82)	–	2 (100.00)	–
Fatigue	39 (54.93)	3 (7.69)	17 (43.59)	19 (48.72)
loss of appetite	20 (28.17)	5 (25.00)	3 (15.00)	12 (60.00)
Abdominal bloating	11 (15.49)	–	3 (27.27)	8 (72.73)
joint pain	22 (30.99)	–	10 (45.45)	12 (54.55)
pain in lower abdomen	35 (49.3)	6 (17.14)	15 (42.86)	14 (40.00)
Lower back pain	34 (47.89)	3 (8.82)	11 (32.35)	20 (58.82)

* More than one response; †Figures in parenthesis indicates percentage

Table 3 shows the most prevalent premenstrual symptoms were fatigue (54.93%), pain in lower abdomen (49.30%), lower back pain (47.89%) and joint

pain (30.99%). A noticeable section of the participants also suffered from symptoms like mood swing, anxiety and insomnia.

TABLE 4
Distribution of the participants based on symptoms of dysmenorrhea

Symptoms* (n=77)	Total	Mild	Moderate	Severe
Pain in lower abdomen	61 (79.22)†	12 (19.67)	20 (32.79)	29 (47.54)
Lower back pain	37 (48.05)	–	8 (21.62)	29 (78.38)
Pain in thighs	20 (25.97)	–	7 (35.00)	13 (65.00)
Nausea	15 (19.48)	–	5 (33.33)	10 (66.67)
Frequent urination	37 (48.05)	–	5 (13.51)	32 (86.49)
Pain during or after passing urine	13 (16.88)	–	1 (7.69)	12 (92.31)
Pain when your bladder is full	15 (19.48)	–	7 (46.67)	8 (53.33)
Bloating	14 (18.18)	–	2 (14.29)	12 (85.71)
Breast pain	1 (1.3)	–	1 (100.00)	–
Dizziness	7 (9.09)	–	–	7 (100.00)
Fatigue	25 (32.47)	–	11 (44.00)	14 (56.00)

* More than one response; †Figures in parenthesis indicate percentage

Among the several dysmenorrheal problems, majority of the participants (79.22%) were found to be suffering from pain in lower abdomen during menstruation (Table 4). Lower back pain and frequent urination are second most vital problems faced by the girls, occurring in exactly the same frequency about 48.05%. Fatigue, pain in thighs, nausea, pain when bladder is full, bloating, pain during or after passing urine are the other important symptoms to be found in lesser frequencies.

TABLE 5
Distribution of the participants based on menstrual knowledge and hygiene practice

Menstrual knowledge and hygiene practice	Frequency	Total
<i>Knowledge before menarche</i>		90
Yes	37 (41.11)†	
No	53 (58.89)	
<i>Sources of knowledge</i>		37
Mother	9 (24.32)	
Sister	9 (24.32)	
Friends	23 (62.16)	
Mass media	4 (10.81)	
Others*	6 (16.22)	
<i>Types of absorbent used</i>		90
Sanitary napkins	69 (76.67)	
Cloths	9 (10.00)	
Sanitary napkins with cloths	12 (13.33)	
<i>Change of absorbent in a day</i>		90
Once	6 (6.67)	
Twice - thrice	55 (61.11)	
More than thrice	29 (32.22)	
<i>Reused cloth is washed with</i>		9
Soap and normal water	8 (88.89)	
Soap and lukewarm water	1 (11.11)	
<i>Place of drying of reused cloth</i>		9
Inside house	4 (44.44)	
Outside house in sunlight	5 (55.56)	
<i>Daily bath during menstruation</i>	90 (100.00)	
<i>Number of times of taking bath during menstruation</i>		90
Once	40 (44.44)	
Twice	33 (36.67)	
More than twice	17 (18.89)	
<i>Cleaning of external genitalia during menstruation</i>	90 (100.00)	
<i>Cleaning of external genitalia with</i>		90
Normal water	30 (33.33)	
Soap and water	50 (55.56)	
With antiseptics	10 (11.11)	
<i>Hand washing after changing absorbent</i>	90 (100.00)	
<i>Hand washing with</i>		90
Normal water	4 (4.44)	
Soap and water	86 (95.55)	

* Grandmother, aunt, sister-in-law; †Figures in parenthesis indicate percentage

Table 5 highlights the knowledge and hygiene practices of the adolescent slum girls. Majority of the participants (58.89%) had no knowledge about menstruation before their onset of the menarche. The predominant sources of menstrual knowledge were their friends, (62.16%), also mother and elder sister played a role to transmit their knowledge regarding the menarche.

Maximum participants (76.67%) were found to be using sanitary napkins as absorbent during their menstruation. New and old clothes and cloth and napkins were also used by them but in very less frequency. About 61.11% of the adolescents changed their absorbents 2 to 3 times in a day. The reused

cloth was washed with soap and normal water (88.9%). More than half (56.56%) of the girls generally dry the reused cloths outside the house in sunlight. All the informants used to take bath on a daily basis. More than half of them took bath once a day (55.56%). All of them used to clean their external genitalia while menstruating. More than half of the adolescents (55.56%) used soap to clean the external genitalia. And it was very interesting to find out that around 11.11% of the girls took a special hygienic care during their menstrual days as they use antiseptics or v-wash while cleaning the external genitalia. Everyone were found to wash their hands after changing pads, out of which 84.44% used soap and normal water for hand washing.

TABLE 6
Distribution of adolescent girls according to socio-demographic, menstrual characteristics and disorders, and their association

Indicators		Total (n=90)	PMS		p-value	Dysmenorrhea		p-value
			Present (n=71)	Absent (N=19)		Present (N=77)	Absent (N=13)	
Age of the participants (in years)	16	31	22 (70.97)	9 (29.03)	*0.15	24 (77.42)	7 (22.58)	*0.07
	17	31	28 (90.32)	3 (9.68)		30 (96.77)	1 (3.23)	
	18	28	21 (75.00)	7 (25.00)		23 (82.14)	5 (17.86)	
Mother's level of education (N= 83) [†]	Upper-primary and below	72	59 (81.94)	13 (18.06)	*0.44	65 (90.28)	7 (9.72)	*0.008**
	Above upper-primary	11	8 (72.73)	3 (27.27)		6 (54.55)	5 (45.45)	
Father's level of education (N= 83) [†]	Upper-primary and below	55	48 (87.27)	7 (12.73)	*0.13	49 (89.09)	6 (10.91)	*0.50
	Above Upper-primary	28	20 (71.43)	8 (28.57)		23 (82.14)	5 (17.86)	
Mother's occupation (N= 83) [†]	Working	46	34 (73.91)	12 (26.09)	*0.09	39 (84.78)	7 (15.22)	*1.00
	Only homemakers	37	33 (89.19)	4 (10.81)		32 (86.49)	5 (13.51)	
Father's occupation (N= 83) [†]	Skilled & unskilled worker	39	32 (82.05)	7 (17.95)	*0.007**	33 (84.62)	6 (15.38)	*0.92
	Business	23	15 (65.22)	8 (34.78)		20 (86.96)	3 (13.04)	
	Service	21	21 (100.00)	—		19 (90.48)	2 (9.52)	
Monthly Expenditure (in rupees)	5000-10000	66	54 (81.82)	12 (18.18)	*0.26	53 (80.3)	13 (19.7)	*0.02*
	>10000	24	17 (70.83)	7 (29.17)		24 (100)	—	
Age at menarche (in years)	≤ 11	18	15 (83.33)	3 (16.67)	*0.14	15 (83.33)	3 (16.67)	*1.00
	12 - 14	67	54 (80.6)	13 (19.4)		57 (85.07)	10 (14.93)	
	>15	5	2 (40.00)	3 (60.00)		5 (100)	—	
Duration of menstrual bleeding (in days)	≤ 5 days	55	13 (23.64)	42 (76.36)	*0.46	45 (81.82)	10 (18.18)	*0.21
	> 5 days	35	6 (17.14)	29 (82.86)		32 (82.05)	7 (17.95)	
Heavy flow	Yes	48	39 (81.25)	9 (18.75)	*0.56	42 (87.5)	6 (12.5)	*0.58
	No	42	32 (76.19)	10 (23.81)		35 (83.33)	7 (16.67)	
Irregularity of cycle	Yes	21	19 (90.48)	2 (9.52)	*2.21	21 (100)	—	*0.03*
	No	69	52 (75.36)	17 (24.64)		56 (81.16)	13 (18.84)	
Dysmenorrhea	Present	77	69 (89.61)	8 (10.39)	*0.001***	-	-	
	Absent	13	2 (15.38)	11 (84.62)		-	-	

Figures in parenthesis indicates percentage

[†] Seven participant's mothers have either passed away or they do not stay with their parents

^{††} Seven participant's mothers have either passed away or they do not stay with their parents

^{†††}Fisher's exact test; [‡]Chi square test

* $p < 0.05$, $p < 0.01$ and ** $p < 0.001$

The Table 6 shows an association between the socio-demographic variables and menstrual

characteristics with menstrual disorders like PMS and dysmenorrhea. Result of test of significance shows that

the premenstrual syndrome was found to be statistically associated with only father's occupation ($p < 0.01$), and dysmenorrhea was associated with mother's level of education ($p < 0.01$), monthly expenditure ($p < 0.05$) and irregularity of periods. The PMS was found to have a strong association with dysmenorrhea ($p < 0.001$).

MULTIVARIATE ANALYSES

Table 7 represents only the significant predictors of the dependent menstrual characteristics. It shows that among many socio-economic variables, only mother's educational status was the only significant predictors for age at menarche.

TABLE 7
Linear regression analysis for certain menstrual characteristics

Dependent variables	Significant indicators	Beta (β)	Standard error	p-value
<i>Age at menarche</i>	Mother's educational status	-0.27	0.05	0.05*
<i>Duration of discharge</i>	Father's educational status	-0.30	0.04	0.02*
	Nature of discharge	0.20	0.30	0.04*
	Number of days of peak discharge	0.65	0.13	0.001***
<i>Number of days of peak discharge</i>	Cycle length	-0.38	0.03	0.001***
	Duration of Bleeding	0.63	0.080	0.01***
<i>Cycle length</i>	Participants education	-0.21	0.24	0.04*
	Father's educational status	-0.25	0.12	0.05*
	Monthly expenditure	0.37	0.001	0.001***
	Irregularity of periods	0.42	1.05	0.001***
	Nature of discharge	-0.23	0.84	0.03*
	Number of days of peak discharge	-0.41	0.43	0.001***

* $p < 0.05$ and *** $p < 0.001$

Number of days of peak discharge was found to be a strong predictor ($p < 0.001$) of duration of menstrual bleeding. Similarly, number of days of peak discharge was highly dependent on cycle length ($p < 0.001$) and duration of bleeding ($p < 0.001$). It is also

evident from the table that, family monthly expenditure, irregularity of menstrual periods and number of days of peak discharge had a highly significant impact on cycle length ($p < 0.001$).

TABLE 8
Binary logistic regression showing significant predictors of certain menstrual characteristics

Independent Indicators	(Odds ratio with 95% CI)		
	Irregularity	Heavy flow	Bleeding with clot
<i>Social category</i>	General (r)	Reference group	
	SC	NS	NS
	ST	NS	NS
<i>Age of the participants (in years)</i>	NS	NS	NS
<i>Participant's level of education</i>	2.34 (1.03-5.31)*	NS	NS
<i>Mother's level of education</i>	NS	NS	NS
<i>Father's level of education</i>	NS	0.83 (0.68-1.00)*	NS
<i>Mother's occupation</i>	Homemakers(r)	Reference group	
	Working	NS	0.20 (0.05-0.74)*
<i>Father's occupation</i>	Skilled & unskilled worker(r)	Reference group	
	Business	0.02 (0.01-1.06)*	NS
	Service	1.07 (0.09-65.48)	NS
<i>Types of family</i>	Nuclear	NS	NS
	Extended (r)		6.52 (0.97-43.66)*
			4.47 (0.58-33.37)

Contd.

			Reference group	
<i>Monthly expenditure</i>		NS	NS	NS
<i>Age at menarche</i>		NS	NS	0.502 (0.269-0.934)*
<i>Duration of bleeding</i>		NS	NS	2.314 (1.142-4.687)*
<i>Number of days of peak discharge</i> (0.11-0.85)*			NS	NS 0 . 3 0
<i>Cycle length</i>		2.69 (1.30-5.57)**	NS	0.69 (0.53-0.90)**
<i>Heavy flow</i>	Yes (r)		Reference group	
	No	NS	NA	0 .27(0.07-1.11)*
<i>Nature of discharge</i>	With blood clot (r)		Reference group	
	Without blood clot	0 .004 (0.01-.62)*	NS	NA
<i>Irregularity of periods</i>	Yes (r)		Reference group	
	No	NA	NS	0.07 (0.01-0.64)*

*p< 0.05 and **p< 0.01

NS: not significant; NA: not applicable; r: reference category

Table 8 shows the multiple logistic regression analysis of some menstrual problems with respect to various socio-economic variables and menstrual characteristics of the adolescent girls. Results indicate that participant's level of education, father's occupational status, cycle length and nature of discharge are significantly associated with irregularity of periods. The likelihood of having irregular periods was found to increase with an increase in participants' level of education and cycle length. And those participants whose fathers were involved in business were found more likely to have irregular periods than the girls having father working as either businessman or skilled & unskilled labour. This table also shows that, except of both the parental level of education none of the socio-economic or menstrual characteristics were found to be a significant predictor for heavy flow. The chance of having heavy periods was lower among those girls whose mothers were working than the homemaker mothers. However, nature of discharge was found to be dependent on number of variables like father's occupational status, monthly family expenditure, age at menarche, duration of bleeding, number of days of peak discharge, cycle length and irregularity of periods. Result also shows that the chance of having menstrual period with clot was higher among girls whose fathers were engaged in business and service than the reference category. And the chance of having periods with clot was lower among those girls who did not have heavy flow during menstruation.

DISCUSSION

The United Nations expert group in 2002 defined slum as those communities characterized by: insecure residential status, poor structural quality of housing, overcrowding, and inadequate access to safe water, sanitation, and other infrastructure. About one billion people of the world population are estimated to be living in slum or squatter settlement (UNDP, 2005). About 15% of the total urban population of India lives in slum areas (Census of India 2011; Upinder, 2013) and in the state of Bengal, 1/3rd of the population of Kolkata inhabited in slums (Bose and Ghosh, 2015). The living conditions in slums are usually unhygienic and due to lack of access to reliable knowledge on menstruation, ignorance, low level of education, malnutrition, poor standard of living and poor access to health care services lead to high morbidities and mortality among the adolescents and women of the reproductive age group (15-45 yrs.) residing in slum area (Mohite *et al.*, 2013; Bhattacharjee *et al.*, 2013).

Adolescence is a time of enormous physical change for young women for the development and maturation of their reproductive system i.e. the onset of menstruation and continuation of menstrual cycle. However, this may cause various menstrual dysfunctions which seem to be a common complaint amongst adolescent girls. The present study examines the menstrual characteristics, menstrual knowledge and hygienic practices and also found an association between the menstrual characteristic variables with the menstrual problems among the adolescent girls.

Menarche is influenced by a number of biological & socio-economic factors (Prado *et al.*, '95) was found to be 12 ± 1.20 years in the present study, which is in agreement with themenarcheal ages studied in the slum areas of Rajasthan by Khanna *et al.* (2005), West Bengal by Dasgupta *et al.* (2008) and Bhattacharjee (2013) and in Maharashtra by Mohite and Mohite (2013).

Chiazze *et al.* ('68) demonstrated that based on length, the greatest variability of the menstrual cycle occurs at the two ends of the life span of fertility, one of which is the 1st few years after menarche. The usual range of normal menstrual cycle length is 21 to 35 days but does vary from a short cycle of 21 days to a long of 37 days (Fehring *et al.*, 2006). In the present study, the intermenstrual interval was reported between 21 to 35 days by maximum percentage of girls which is in concordance with the study of Srivastava *et al.* (2016), Dambhare *et al.* (2012), Lee *et al.* (2006). In the present study, the mean duration of the menstrual discharge was found to be 5.14 ± 1.55 days and the girls mostly had their peak menstrual discharge on the second day. Sanyal (2008) reported similar findings among the Bengali-speaking Hindu girls where the mean duration of menstruation was 5.3 ± 1.32 days.

The study participants of the present study mainly encompassed late adolescence (15-19 years) period (UNICEF, 2011). Thus, majority of them had regular occurrence of the cycle in last one year with very few reported of having irregular periods (23.33%). Menstrual cycle is often irregular during first few years after menarche due to anovulatory cycle but by the age of 17-18 years, menstrual cycles usually become regular (Kanotra *et al.*, 2013). This finding is supported by Mohite *et al.*, 2013; Umeora and Egwuatu, 2008; Patil, 2009; and Begum, 2009; where regularity in menstrual cycle is predominant among the adolescent girls.

The most common problems are dysmenorrhea, premenstrual syndrome (PMS), menstrual irregularities. Several studies proved that PMS is a major entity affecting a large segment of women population. In this study prevalence of pre menstrual syndromes was found to be 78.89%, and the most commonly faced problems are fatigue, pain in lower

abdomen, back of the waist and in joint along with some other psychological symptoms with less frequency. A similar study among the Korean women revealed that the physical symptoms were more prevalent than mental symptoms and most predominant symptoms were joint-muscle-back pain, abdominal pain and irritability. Several studies around the world and India (Sanyal, 2008; Choi *et al.*, 2010; Dambhare *et al.*, 2012; Delara *et al.*, 2013; Jaiikhani *et al.*, 2014) have reported that lower abdominal, back pain, joint-muscle pain and lethargy along with irritability, depression, mood swing were the major complaint among the respondents and lethargy was the major complaint of respondents.

Dysmenorrhea or pain full periods also found to be highly prevalent among the adolescent girls as observed by McKay and Diem ('95), Jayashree *et al.* ('97), Sharma *et al.* (2003), Houston *et al.* (2006), Kumbhar *et al.* (2011) and Mohite *et al.* (2013). In the present study the frequently reported problems of dysmenorrhea are pain in lower abdomen and lower back of the waist and frequent urination which is similar with the findings of Srivastava *et al.* (2016). Along with the menstrual pain other gastrointestinal, psychological and other physical symptoms, associated with dysmenorrhea were also found among the study participants as also reported by Jarret *et al.* ('96), Agarwal and Agarwal ('99) and George and Bhaduri (2002).

Similar with the present study, Sarkar's (2016) did not find any association between PMS and majority of the socio-economic and menstrual indicators, but the aforesaid study along with other two studies conducted in Iran (Delara *et al.*, 2013) and United Arab Emirates (Rizk *et al.*, 2006) found a significant association between PMS and dysmenorrhea. In an another Iranian (Habibi *et al.*, 2015) study mothers' years of formal education was found significantly associated with intensity of primary dysmenorrhea which is in concomitant with the finding of the present study. The present study results reveal that the proportion of dysmenorrhea was maximum in those with irregular menstruation when compared to those with regular menstruation which is in congruence with many study results (Sundel *et al.*, '90; Strinic *et al.*, 2003; Unsal *et al.*, 2012).

The result of the multivariate analysis found

mothers educational status as an independent predictor of daughters' onset of puberty. Similar to the findings of Ray *et al.* (2010), number of days of peak discharge and father's educational status were found to be significant predictors for 'duration of discharge'.

The results of the present study reflect that the daughters of businessmen were at a low risk of having irregular periods than rest of the others whose fathers were involved in labouring job or service. This may be due to better financial conditions of the businessmen who can provide a good nutrition and health care to their daughters. A study conducted in West Bengal (Ray *et al.*, 2010) also demonstrated that the chance of having irregular periods was higher among girls whose fathers were engaged in business and service than any labouring jobs. Similar to the present study, in another study by Sanyal and Ray (2008) found a significant association between occupations of the parents and irregularity in the menstrual cycle.

Adolescents frequently experience wider menstrual cycle (Hillard, 2008) or several consecutive months of amenorrhea (Dangal, 2014) because of hypothalamic, pituitary, endocrine dysfunction; or other genetic defects. 14.44% of the study participants have more than 35 days longer menstrual cycle and study on multivariate analysis revealed that increased in menstrual cycle length may lead to menstrual irregularities of the adolescent girls.

The findings of the present study revealed that the chance of having heavy menstrual bleeding is more among the daughters with non-working mothers. This is because working mother can understand better the menstrual health of their daughter and also can give better financial support. In a cross-sectional study among the adolescent girls of Maharashtra, Quraishi *et al.* (2015) found a significant association between mothers' occupational status and menstrual problems like menorrhagia (excessive or prolonged menstrual bleeding).

The menstrual cycles within few years after menarche may be prolonged with menstrual blood clots (Gumanga and Kwame-Aryee, 2012). Like many other studies (Gumanga and Kwame-Aryee, 2012; Hasanein and Diab, 2015) majority of the study

participants complained of blood clots during menstrual bleeding. In the present study among other significant indicators heavy flow was found to be a significant indicator of menstrual blood clot.

In the traditional Indian society menstruation is still regarded as something unclean or dirty and considers it as taboo and discourages open discussion on these issues (Singh *et al.*, 1999; Dasgupta *et al.*, 2008; Shanbhag *et al.*, 2012). There is gross substantial lacuna in the knowledge about menstrual preparedness and management among adolescent girls (Ray and Dasgupta, 2012). Alike to the present study, enormous research studies have revealed this gap and they showed that there was a low level of awareness about menstruation among the girls when they first experienced it (Chaudhari, '98; Sharma *et al.*, 2003; Singh *et al.*, 2006; Ray and Dasgupta, 2012; Srivastava *et al.*, 2016). The manner in which a girl learns about menstruation and its associated changes may have an impact on her response to the event of menarche (Rao *et al.*, '98) as well as menstrual practice. It is interesting to note that the good hygiene practices are prevalent among the respondent of the present study during their menstruation. Though the Government has the provision to supply sanitary napkins to the adolescent girls but most of the girls who studies in govt. schools do not receive sanitary napkins from their schools on a regular basis due to shortage of supply. However, majority of the study participants purchase it from the shop and maintain a good hygiene practice. Several studies from different parts of India showed similar findings (Thakre *et al.*, 2011; Jogdand and Yerpude, 2011; Kamaljit *et al.*, 2012; Dutta *et al.*, 2012; Bhattacharyya *et al.*, 2015; Arumugam *et al.*, 2014; Mohite 2016). Hence it is presumed that school teachers, knowledgeable mother and exposure to the mass media like television had played a great role towards spreading the knowledge of good hygiene practice.

CONCLUSIONS

The present study reveals the menstrual characteristics, knowledge and hygiene practices and the prevalence of menstrual problems like PMS and dysmenorrhoea among the slum adolescent girls of North 24 parganas. Majority of the girls have reported to have regular e menstrual cycles. A significant

association was observed between the menstrual characteristics and some socio-economic variables. Though the knowledge on menstruation prior to menarche was not upto the mark but a good menstrual hygiene practice was ubiquitous among the adolescent girls. The result of the study further exemplifies that there were some socio-economic variables which were found to be significant predictors of certain menstrual characteristics. The potential limitations of the study include lack of data on diet and nutritional anthropometry and also life style factors which would have provided more comprehensive results. Nevertheless, many numbers of study participants also could have been included for better statistical results. However, the results of this study unwrap a podium to focus on the health issues of the adolescent girls. This study will help health practitioners and health providers to understand the present menstrual health scenario of the adolescent girls and render counselling services, health education, and health care to both the preadolescent and adolescent girls.

REFERENCES CITED

- Adesina, A. F. and O. Peterside 2013. Age at menarche and body mass index (BMI) among adolescent secondary school girls in Port Harcourt, Nigeria. *IOSR J Dent Med Sci*, 3(5):41-46.
- Agarwal, A. and A. K. Agarwal 1999. Menstrual problems and anxiety. *J. Ravishankar Uni.*, 11:43-49.
- Agrawal, S., A. Fatma, C. M. Singh 2007. A study of knowledge and attitude of adolescent girls towards reproductive health and related problems. *Indian J. Prev. Soc. Med.*, 38(1, 2): 36-41.
- Al-Awadhi, N, N. Al-Kandari, T. Al-Hasan, D. AlMurjan, S. Ali and A. Al-Taiar 2013. Age at menarche and its relationship to body mass index among adolescent girls in Kuwait. *BMC Public Health*, 13(1):29:1-7.
- Arteria, M. D. and M. Hennerberg 2000. Why did they lie? Socio-economic bias in reporting menarcheal age. *Ann Hum Biol.*, 27(6):561-9.
- Arumugam, B., S. Nagalingam, P. Mahendra, P. Ravi and R. Ganeshan 2014. Menstrual hygiene practices: Is it practically impractical? *Int. J. Community Med. Public Health*, 4(4):472-476.
- Attallah, N. L. 1978. Age at menarche of school girls in Egypt. *Ann. Hum. Biol.*, 5(2):185-189.
- Balasubramanian, P. 2005. Health needs of poor unmarried adolescent girls: A community-based study in Rural Tamil Nadu. *Indian J. Popul. Educ.*, 6(1):18-33.
- Beek, J. S. 1996. *Puberty and Dysmenorrhea Treatment: Novice's Gynecology*. Williams and Wilkins: Philadelphia.
- Begum, J., A. M. Hossain, S. A. Nazneen 2009. Menstrual pattern and common menstrual disorders among students in Dinajpur Medical College, Dinajpur. *Med. Col. J.*, 2(2): 37-43.
- Bhattacharyya, M., P. Sen, S. Hazra, R. N. Sinha and S. Sahoo 2015. A study of menstrual hygiene among adolescent school girls in a slum area of Kolkata. *National Journal of Community Medicine*, 6(2):345-348.
- Bhattacharjee, S., K. Ray, R. Biswas and M. Chakraborty 2013. Menstruation: experiences of adolescent slum dwelling girls of Siliguri city, West Bengal, India. *Journal of Basic and Clinical Reproductive Sciences*, 2(2): 85-91.
- Chaudhari, R. H. 1998. Socio-economic demographic and reproductive health profile of adolescents in the SAARC countries. *Paper presented in South Asia Conference on Adolescents; New Delhi, India*.
- Chiazze, L., F. T. Brayer, J. J. Macisco, M. P. Parker and B. J. Duffy 1968. The length and variability of the human menstrual cycle. *JAMA*, 203(6):89- 92.
- Choi, D., D. Y. Lee, P. Leher, I. S. Lee and S. H. Kim and L. Dennerstein 2010. The impact of premenstrual symptoms on activities of daily life in Korean women. *J. Psychosom. Obstet. Gynaecol.*, 31(1):10-15.
- Chumlea, W. C., C. M. Schubert, A. F. Roche, H. E. Kulin, P. A. Lee, J. H. Himes and S.S. Sun 2003. Age at menarche and racial comparisons in US girls. *Pediatrics*, 111(1):110-113.
- Dagwood, M. Y. 1995. 'Dysmenorrhea'. *J. Reprod. Med.*, 30(3):154-167.
- Dambhare, D. G., S. V. Wagh and J. Y. Dudhe 2012. Age at menarche and menstrual cycle pattern among school adolescent girls in central India. *Glob. J. Health Sci.*, 4(1):105-111.
- Dangal, G. 2004. Menstrual disorders in adolescents. *J NEPAL MED ASSOC*, 43(153): 152-163.
- Dasgupta, A. and M. Sarkar 2008. Menstrual hygiene: How hygienic is the adolescent girl? *Indian J. Community Med.*, 33(2):78-80.
- Davies, J. and R. A. Kadir 2012. Endometrial haemostasis and menstruation. *Rev Endocr.Metab. Disord.*, 13(4):289-299.
- Delara, M., H. Borzuei, A. Montazeri 2013. Premenstrual disorders: Prevalence and associated factors in a sample of Iranian adolescents. *Iranian Red Crescent Medical Journal*, 15(8): 695-700.
- Dutta, A., N. Manna., M. Dutta., J. Sarkar., B. Baur and S. Dutta 2012. Menstruation and menstrual hygiene among adolescent girls of West Bengal, India: A school based comparative study. *Global Journal of Medicine and Public Health*, 1(5):50-57.

- Dutta, S. and S. Ray 2006. Menstrual health problems and hygienic practices among the adolescent girls of rural and peri-urban areas of West Bengal. *J. Fam. Wel.*, 52(2):73-85.
- Ekele, B. A., E. U. Udoeyop and J. A. Otubu 1996. Age at menarche amongst school girls in a high altitude Nigerian town. *West Afr. J. Med.*, 15(3): 170-172.
- Fehring, R. J., M. Schneider and K. Raviele 2006. Variability in the phases of the menstrual cycle. *J. Obstet. Gynecol. Neonatal Nurs.*, 35(3): 1-19.
- Flug, D., R. H. Largo and A. Prader 1984. Menstrual patterns in adolescent Swiss girls: a longitudinal study. *Ann. Hum. Biol.*, 11(6):495-508.
- Fox, S. I. 2004. *Human Physiology*. 9th ed. McGraw-Hill: New York.
- George, A. and A. Bhaduri 2002. Dysmenorrhea among adolescent girls “ symptoms experienced during menstruation. *Health Promotion Educ.*, 17(4).
- Gharravi, A. M. 2009. Menstrual cycle patterns of college students in Gorgan-Northeast of Iran: Identify its association with sociodemographic factors. *Erciyes Med J*, 31(4):331- 338.
- Goodenough, J., R. A. Wallace and B. McGuire 1998. *Human Biology: Personal, Environmental and Social Concerns*. Saunders College Publishing: New York.
- Government of India, 2011. *Census of India*, Government of India, New Delhi.
Available at: http://www.censusindia.gov.in/2011/census/population_enumeration.html.
- Gumanga, S. K. and R. A. Kwame-Aryee 2012. Menstrual characteristics in some adolescent girls in Accra, Ghana. *Ghana Med. J.*, 46(1): 3-7.
- Habibi, N., M. S. L. Huang, W. Y. Gan, R. Z., and S. M. Safavi 2015. Prevalence of primary dysmenorrhea and factors associated with its intensity among undergraduate students: a cross-sectional study. *Pain ManagNurs*, 16(6): 855-861.
- Harlow, S. D. 1995. *What We Do and Do Not Know About the Menstrual Cycle; Or Questions Scientists Could Be Asking*. The Population Council: New York.
- Hasanein, N. Md. M. and Samar S. E. M. Diab 2015. Menstrual disorders and hygienic self care practices among adolescent girls in preparatory year at Al-Jouf University. *Journal of Nursing and Health Science*, 4(3):46-54.
- Hickey, M. A. Balen 2003. Menstrual disorders in adolescence: investigation and management. *Hum. Reprod. Update.*, 9(5): 493-504.
- Hillard, P. J. A. 2008. Menstruation in adolescents: What's normal? *Medscape J. Med* 10(12): 295.
- Houston, A. M., A. Abraham, Z. Huang and L. J. D'Angelo 2006. Knowledge, attitudes, and consequences of menstrual health in urban adolescent females. *J. Pediatr. Adolesc. Gynecol.*, 19(4):271-275.
- Itagi, C. and S. Itagi 2017. Menstrual Problems of Late Adolescents. *Int. J. Pure App. Biosci.*, 5(3): 206-211.
- Jaikhani, S. M. K., J. D. Naik, M. S. Thakur, S. D. Langre and V. O. Pandey 2014. Patterns & problems of menstruation amongst the adolescent girls residing in the urban slum. *Scholars Journal of Applied Medical Sciences*, 2(2A):529-534.
- Jarret, M., C. K. Cain, H. M. Kemper and L. R. Levy 1996. Relationship between gastrointestinal and dysmenorrhoeic symptoms at menses. *Res. Nurs. Health*, 19(1):45-51.
- Jayashree, R. and V. Y. Jayalakshmi 1997. Socio-cultural dimensions of menstrual problems. *Health Educ. South East Asia*, 12:21-26.
- Jogdand, K. and P. Yerpude 2011. Community based study on menstrual hygiene among adolescent girls. *Indian J. Matern. Child Health*, 13(3):1-6.
- Kamaljit, K., B. Arora, G. K. Singh and N. S. Neki 2012. Social beliefs and practices associated with menstrual hygiene among adolescent girls of Amritsar Punjab, India. *Journal International Medical Sciences Academy*, 25(2):69-70.
- Kaunitz, A. M. 2000. Menstruation: choosing whether... and when. *Contraception*, 62(6):277-284
- Khadilkar, V. V., R. G. Stanhope and V. Khadilkar 2006. Secular trends in puberty. *Indian Pediatr.*, 43(6): 475-478.
- Khanna, A., R. S. Goyal and R. Bhaswar 2005. Menstrual practices and reproductive problems: A study of adolescent girls in Rajasthan. *J. Health Manag.*, 7(1):91-107.
- Kjerulff, K. H., B. A. Erickson and P. W. Langenberg 1996. Chronic gynaecological conditions reported by US women: Findings from the National Health Interview Survey, 1984 to 1992. *Am. J. Public Health*, 86(2):195-199.
- Kumar, A. and K. K. Kumari 2008. Age at menarche, motherhood and fertility among women in Thiruvananthapuram, Kerala. *Demography India*, 37(1): 37-46.
- Kumbhar, S. K., M. Reddy, B. Sujana, R. K. Reddy, D. K. Bhargavi, and C. Balkrishna 2011. Prevalence of dysmenorrhea among adolescent girls (14-19 yrs) of Kadapa district and its impact on quality of life: A cross sectional study. *National Journal of Community Medicine*, 2(2): 265-268.
- Kural, M. R., N. N. Noor, D. Pandit, T. Joshi and A. Patil. 2015. Menstrual characteristics and prevalence of dysmenorrhea in college going girls. *J. Family Med. Prim. Care*, 4(3): 426-431.
- Lee, H. K., P. C. Chen, K. K. Lee and J. Kaur 2006. Menstruation among adolescent girls in Malaysia: A cross-sectional school survey. *Singapore Med. J.*, 47(10): 869-874.

- Mandal, R., A. P. Sarkar and S. Ghorai 2015. A study on premenstrual syndrome among adolescent girl students in an urban area of West Bengal. *Int. J. Reprod. Contracept. Obstet. Gynecol.*, 4(4):1012-1015.
- Matsumoto, S., Y. Nogami, S. Ohkuri 1962. Statistical studies on menstruation: A criticism on the definition of normal menstruation. *Gunma J. Med. Sci.*, 11:294-318.
- McKay, L. and E. Diem 1995. Concerns of adolescent girls. *J. Pediatr. Nurs.*, 10(1):19-27.
- Mishell, D. R. 2001. Abnormal uterine bleeding. In: M. A. Stenchever, W. Droegenmueller, A. L. Herbst and D. R. Mishell (eds.), *Comprehensive Gynecology*, pp. 1079-1099. Mosby: St. Louis.
- Mohite, R. V. and V. R. Mohite 2013. Common menstrual problems among slum adolescent girls of western Maharashtra, India. *Journal of Krishna Institute of Medical Science University*, 2(1):89-97.
- Patil, S. N. 2009. Health problems amongst adolescent girls in rural area of Ratnagiri district of Maharashtra, India. *J. Clin. Diagn. Res.*, 3(5):1784-1790.
- Prado, C., R. Martinez, E. Perez-de landozabal 1995. Menarcheal age as an indicator of socio-economic level in emigrants. *J. Hum. Ecol.*, 4: 157-171.
- Quraishi, S.R., V. B. Waghachavare, A. D. Gore and G. B. Dhumale 2015. Are menstrual problems associated with the mental health? A cross sectional study among the Graduation college girls. *The International Medical Journal Malaysia*, 14(2):53-60.
- Ram, R., R. Bhattacharya, S. K. Bhattacharya, B. Baur, T. Sarkar, A. Bhattacharya and D. Gupta 2006. Reproductive tract infection among female adolescents. *Indian J. Community Med.*, 31(1):32-33.
- Rao, S., S. Joshi and A. Kanade 1998. Height velocity, body fat and menarcheal age of Indian girls. *Indian Pediatr.*, 35(7):619-628.
- Ray, S. and A. Dasgupta 2012. Determinants of menstrual hygiene among Adolescent girls: A multivariate analysis. *National Journal of Community Medicine*, 3(2): 294-301
- Ray, S., S. K. Mishra, A. G. Roy and B. M. Das 2010. Menstrual characteristics: A study of the adolescents of rural and urban West Bengal, India, *Ann. Hum. Biol.*, 37(5): 668-681.
- Rebar, R. W. 2010. Evaluation of amenorrhea, anovulation, and abnormal bleeding. Chap 4. In: R. W. Rebar (ed.), *Female Reproductive Endocrinology*. South Dartmouth, MA: MDText.com, Inc. (<http://www.endotext.org/female/female4/femaleframe4.htm>).
- Rizk, D. E., M. Mosallam, S. Alyan and N. Nagelkerke 2006. Prevalence and impact of premenstrual syndrome in adolescent schoolgirls in the United Arab Emirates. *Acta. Obstet. Gynecol. Scand.*, 85(5): 589-598.
- Sanyal, S. and S. Ray 2008. Variation in the menstrual characteristics in adolescents of West Bengal. *Singapore Med. J.*, 49(7): 542-550.
- Sarkar, A. P., R. Mandal and S. Ghorai 2016. Premenstrual syndrome among adolescent girl students in a rural school of West Bengal, India. *International Journal of Medical Science and Public Health*, 5(03): 408-411.
- Sawhney, U. 2013. Slum population in India: Extent and policy response. *International Journal of Research in Business and Social Science*, 2 (9): 47-56.
- Shalini, K. K., V. B. Bangal and D. P. Bhavthankar 2013. Menstrual pattern and problems among rural adolescent girls. *International Journal of Biomedical and Advance Research*, 04(8): 551-554
- Shanbhag, D., R. Shilpa, N. D'Souza, P. Josephine, J. Singh and B. R. Goud 2012. Perceptions regarding menstruation and practices during menstrual cycles among high school going adolescent girls in resource limited settings around Bangalore city, Karnataka, India. *International J. of Collaborative Research on Internal Medicine and Public Health*, 4(7): 1353-1362.
- Sharma, M. and S Gupta 2003. Menstrual pattern and abnormalities in the high school girls of Dharan: A cross sectional study in two boarding schools. *Nepal Med. Coll. J.*, 5(1):34-36.
- Sharma, P., C. Malhotra, D. K. Taneja and R. Saha 2008. Problems related to menstruation among adolescent girls. *Ind. J. Paed.*, 75(2): 125- 129.
- Sheetu, M. K. J., J. D. Naik, M. S. Thakur, S. D. Langre and V. O. Pandey 2014. Patterns & problems of menstruation amongst the adolescent girls residing in the urban slum. *Sch. J. App. Med. Sci.*, 2(2A):529-534.
- Sherwood, L. 2013. *Human Physiology: From Cells to Systems*, pp. 735-794. (8th ed.). Cengage: Belmont, California.
- Singh, A. J. 2006. Place of menstruation in the reproductive lives of women of rural north India. *Indian J. Community Med.*, 31(1): 10-14.
- Singh, M. M., R. Devi and S. S. Gupta 1999. Awareness and health seeking behaviour of rural adolescent school girls on menstrual and reproductive health problems. *Indian J. of Med. Sci.*, 53(10):439-443.
- Sperroff, L., R. H. Glass and N. G. Kase 1999. Regulation of the menstrual cycle. In: *Clinical Gynaecologic Endocrinology and Infertility*, pp.201-246. Lippincott Williams and Wilkins: Philadelphia.
- Srivastava, P., A. Varoda and R. Venugopal 2016. Menstrual cycle pattern among adolescent school girls in Chhattisgarh. *Int. J. Indian Psychol.*, 3(10):91-98.
- Strinic, T., D. Bukovic and L. Pavelic 2003. Anthropological and clinical characteristics in adolescent women with dysmenorrhea. *Coll. Antropol.*, 27(2):707-711.
- Sundell, G., I. Milsom and B. Andersch 1990. Factors influencing the prevalence and severity of dysmenorrhea in young women. *Br. J. Obstet. Gynaecol.*, 97(7):588-594.
- Swenson, I. and B. Havens 1987. Menarche and menstruation: A review of the literature. *J. Comm. Hlth. Nurs.*, 4(4): 199 - 210.

- Thakre, S. B. S. S. Thakre, M. Reddy, N. Rathi, K. Pathak and S. Ughade 2011. Menstrual hygiene: Knowledge and practice among adolescent school girls of Saoner, Nagpur District. *J. Clin. Diagn. Res.*, October, 5(5): 1027-1033.
- Thomas, F., F. Renaud, E. Benefice, T. de Meeüs and J. F. Guegan 2001. International variability of ages at menarche and menopause: Patterns & main determinants. *Hum. Biol.*, 73(2): 271-290.
- Treloar, A. E., R. E. Boynton, B. G. Behn and B. W. Brown 1967. Variation of the human menstrual cycle through reproductive life. *Int. J. Fertil.*, 12(1 Pt 2): 77-126.
- Tunau K. A., A. N. Adamu, M. A. Hassan, Y. Ahmed and B. A. Ekele 2012. Age at menarche among school girls in Sokoto, Northern Nigeria. *Ann. Afr. Med.*, 11(2):103-107.
- Umeora, O. U. J. and V. E. Ekwuatu 2008. Menstruation in rural Igbo women of South East Nigeria: Attitudes, beliefs and practices. *Afr. J. Reprod. Health.*, 12(1): 109-115.
- UN Children's Fund (UNICEF), 2011. Adolescence, an Age of Opportunity: The State of the World's Children 2011. Available at: https://www.unicef.org/adolescence/files/SOWC_2011_Main_Report_EN_02092011.pdf (Accessed on 12th July, 2018)
- United Nations Development Programme. 2005. *UN Millennium Project "Investing in Development: A Practical Plan to Achieve the Millennium Development Goals"*. Earthscan, 2005: London.
- UN-HABITAT-United Nations Human Settlements Programme. Defining slums: Towards an operational definition for measuring slums. 2002. Background Paper 2, Expert Group Meeting on Slum Indicators, October. Nairobi, United Nations.
- Unsal, A., M. Tozun, U. Ayranci and O. Orsal 2012. Connection between dysmenorrhea and depression among a group of Turkish high school female students. *Pak. J. Med. Sci.*, 28(3): 424-427.
- Verma, P. B., C. M. Pandya, V. A. Ramanuj and M. P. Singh 2011. Menstrual pattern of adolescent school girls of Bhavnagar, Gujarat. *Natl. J. Integr. Res. Med.*, 2(1): 38-40.
- Wasserheit, J. N., J. R. Harris, J. Chakraborty, B. A. Kay and K. J. Mason 1989. Reproductive tract infections in family planning populations in rural Bangladesh: A neglected opportunity to promote MCH-FP programs. *Stud. Fam. Plann.*, 20(2): 69-80.
- Widholm, O. and R. L. Kantero 1971. A statistical analysis of the menstrual patterns of 8,000 Finnish girls and their mothers. *Acta. Obstet. Gynecol. Scand. Suppl.*, 14:(Suppl. 14):1-36.
- World Health Organization 1986. World Health Organization task force on adolescent reproductive health. World Health Organization multi-center study on menstrual and ovulatory patterns in adolescent girls. II. Longitudinal study of menstrual patterns in the early postmenarcheal period, duration of bleeding episodes and menstrual cycles. *J. Adolesc. Health*, 7(4):236-244.
- Ylikorkala, O. and M. Y. Dagwood 1978. New concepts in dysmenorrhea. *Am. J. Obstet. Gynecol.*, 130(7):833-847.