



Demography India
A Journal of Indian Association of Study of Population
Journal Homepage: <https://demographyindia.iasp.ac.in/>



Cross-sectional Study of Menstrual Hygiene among Adolescent Girls in Uttar Pradesh, India

Manoj Kumar Agarwal¹ and Sunanda Mishra^{2*}

Abstract

The study revolves around assessing menstrual knowledge, management, and practices among adolescent girls alongside identifying possible socio-demographic variables influencing knowledge, menstrual hygiene management, and practices in the selected districts of most populous state of Uttar Pradesh, India. A cross-sectional study of 420 teenage females was undertaken utilising a pre-designed and pre-tested questionnaire. Additionally, logistic regression was used to predict the significant determinants of menstruation knowledge, management, and practice. Results show that majority of females (76.43%) were Hindu, with 51.90% growing up in nuclear families. In all, 58.57% of adolescent girls' mothers are illiterate. The occupational status of the household was found to be a major predictor of menstruation knowledge, but for menarche management, the mother's education and the type of family were found to be significantly associated. Furthermore, the participants' age group, mothers' education, and household employment level were significant predictors of sanitary serviette disposal practices.

Keywords

Adolescent Girls,
Menstrual Hygiene,
Menstrual
Knowledge,
Management

* Corresponding Author

¹Professor, Department of Economics, University of Lucknow, Lucknow-226007, Uttar Pradesh, India. Email: mk.agarwal.lu@gmail.com

² Research Investigator, Population Research Centre, University of Lucknow, Lucknow-226007, Uttar Pradesh, India. Email: sunanda1507@gmail.com

Introduction

Adolescence is the term for the period of development that occurs between childhood and maturity. According to the World Health Organization, the age of adolescence ranges from 10 to 19 years, and it is also considered a crucial time for laying the cornerstone for good health³. Talking about the proportion of adolescent in India we find that the country holds the largest proportion of adolescents in the world (253 million). In other words, we find that every fifth person in India is aged between 10-19 years.⁴ Adolescent years include aspects of biological growth and significant changes in one's social position. (Prof Susan M Sawyer MD 2018). The adolescence age is broadly categorised into three stages which include early adolescence (11-13 years), middle adolescence (14-17 years) and late adolescence (17-19 years) (Salmela-Aro 2011). Throughout these stages, the adolescent not only grows and evolves physically, but also emotionally, psychologically, socially, and mentally. Alongside their growth and development throughout these stages they also face certain challenges that is related to the behaviour, school underachievement, delinquent, mental health, desire for independency, peer pressure etc. (Tara J. Crandon 2022, Richard M. Lerner 1998, Marta Vazquez-Ortiz, et al. 2020)

Adolescence in females is acknowledged as a distinct age that represents the transition from girlhood to womanhood. The onset of menstruation, an important milestone in a girl's life, marks a period of transition. (Dharampal G. Dambhare 2012). Literature

reveals that while the majority of girls in India know about menstruation before menstruation, a significant number do not fully understand the physical process of menstruation (Shabnam Omidvar 2018). In the Indian scenario, the onset of menstruation is shrouded in myths and misconceptions with a long list of do's and don'ts for women (Rajesh Garg 2011). Some of these practices include isolating girls from a range of household chores, social events, not touching other people and objects, not entering temples, etc. (Dipendra S. Thakuri 2021). In addition, what makes the initiation of menstruation more difficult for girls is the lack of communication by parents about healthy practices that should be adopted during menstruation (Parajuli 2016). Given the knowledge and awareness of the rules and practices of menstrual hygiene, the existing social, cultural and religious constraints present a major obstacle on the path to menstrual hygiene management (Rajanbir Kaur 2018). As a result, fear and shame during menstruation are frequent themes among adolescent girls (Ernestina Coast 2019, Parajuli 2016), leading to the adoption of unhygienic behaviours during menstruation (Parajuli 2016). The latest findings of the National Family Health Survey-5 reveals that about 50 percent women aged 15-24 years still use cloth for menstruation protection that is attributed to the lack of awareness and taboo existing around menstruation exposing them to multiple local infection⁵. Findings from a study conducted in Indian setting reveals that the compostable disposable (sanitary pads made out of locally grown material)

³https://www.who.int/health-topics/adolescent-health#tab=tab_1

⁴ <https://www.unicef.org/india/what-we-do/adolescent-development-participation>

⁵<https://indianexpress.com/article/lifestyle/health/about-50-per-cent-of-women-aged-15-24-years-still-use-cloth-for-menstrual-protection-latest-national-family-health-survey-report-7911145/>

have limited availability and higher cost whereas the non-compostable disposable (sanitary pads with plastic barriers) with the largest market share are a double edged sword (Rabindra Nath Sinha 2018). While they provide safe and hygienic menstrual health management, they are still out of pocket for a large segment of women.

A number of studies have been undertaken in many regions of the world, demonstrating that socio-demographic characteristics such as mother's education, household type, religion, and caste all have an impact on adolescent girls' understanding and practices related to menstrual hygiene. (Tanvi Nitin Deshpande 2018, Sudeshna Ray 2012 et.al). In this context our study aims to deliberate upon the menstrual knowledge, management, and practices among adolescent girls alongside identifying possible socio-demographic variables influencing menstrual knowledge, management, and practices in our setting.

Material and Methods

Study Design and Sampling

The findings of the study is based upon a cross sectional study that was conducted among 480 adolescent girls in the age group of 13-19 years in selected districts of Uttar Pradesh the interviews conducted during December 2022- January 2023. The districts have been selected by categorizing all the districts of Uttar Pradesh into 2 groups based on NFHS-5 indicator 'proportion of women aged 15-24 years who use hygienic methods of protection during their menstrual period' as '*better performing districts*' (those above the State average) and '*poor performing districts*' (those below the State average). Altogether 4 districts were selected using convenience sampling where 2 districts have been chosen from better performing category and 2 from poor performing category.

The sample size was calculated using the following method:

$$\text{Sample Size (n)} = \frac{z^2 pq * (1 + R) * D \text{ eff}}{d^2}$$

Where,

n = Sample size required

z= z value (1.96 at 5% level of significance)

p= prevalence of hygienic methods of protection during menstrual period =77% (NFHS-5)

q=1-p=23%

R = non-response adjustment (assumed to be 40%)

D eff= Design effect (assumed to be 1.25)

d = margin of error (assumed to be 5%)

$$n = \frac{((1.96)^2 * (0.77) * (0.23)) * (1.40) * (1.25)}{(0.05)^2} = 476$$

n=476 (rounded to 480).

The study was conducted across four districts in Uttar Pradesh: Auriya, Barabanki, Jalaun, and Hardoi. Covering all geographical areas associated with three Primary Health Centers (PHCs), a list of adolescent girls aged 13-19 was obtained from the Health Department, facilitated through Auxiliary Nurse Midwives (ANMs) and Accredited Social Health Activists (ASHAs). Using this list, 120 girls were initially selected through systematic random sampling, accounting for non-response rates and availability of girls who had not attained menarche. A total of 480 adolescent girls were selected, with 442 successfully interviewed, resulting in a response rate of 92.1%. Out of this 442 adolescent girls 22 refused to proceed with the interview, hence the sample size chosen for analysis was 420. The study was reviewed and approved by the Institutional Ethics Committee of SDM College of Medical Sciences and Hospital. (RegNo.ECR/950/Inst/KA/2017/RR2 1(DCGI);EC/NEW/INST/2021/1761(DHR); IORG- 0007404 (HHS, USA)).

Data Collection

A pre-designed and pre-tested questionnaire has been used which includes socio-demographic information like religion, age-group, mother’s education, caste, type of family and the primary occupation of the

household. Furthermore, the questionnaire gauges into personal information like knowledge of menarche before the onset, management of menarche (weather uses a sanitary napkin or cloth) and practices adopted for preparation before disposal of absorbent and method of disposal.

Variables used for Menstrual Hygiene knowledge and practices

Variable	Description	Coding
Knowledge regarding menarche	Had knowledge about menarche before attaining menarche.	Yes = 1, No = 0
Management of menarche	Type of menstrual product used by the respondent:	
	- Uses sanitary napkin	Yes = 1, No = 0
	- Uses cloth	Yes = 1, No = 0
Practices related to disposal	Disposal practices of menstrual waste, classified as either proper or improper:	
	- Proper Disposal (coded as 1):	1 = Proper Disposal
	- Does not throw in toilet	
	- Gives to garbage collecting vehicle	
	- Puts in specially designed container	
	- Does not burn the material	
	- Does not bury the material	
	- Does not throw in open area	
	- Improper Disposal (coded as 0):	0 = Improper Disposal
	- Throws in toilet	
	- Does not give to garbage collecting vehicle	
	- Does not put in specially designed container	
Preparation Before Disposal	- Burns the material	
	- Buries the material	
	- Throws in open area	
	Preparation of menstrual waste before disposal, classified as either proper or improper:	
	- Proper Preparation (coded as 1):	1 = Proper Preparation
	- Wraps with newspaper	
	- Wraps with sanitary napkin cover	
	- Puts in biodegradable bag	
- Puts in plastic bag		
- Improper Preparation (coded as 0):	0 = Improper Preparation	
- Throws as is		
- Others		

Statistical Analysis

Appropriate bivariate and multivariate statistical technique were used to determine the knowledge, management and practices adopted for disposal owing to menarche. Further logistic regression was used to

predict the significant predictors of knowledge, management and practices adopted for disposal. The general form of regression model for the outcome variable has been given as:

$$\text{Logit}(\pi_i) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e_i$$

Outcome Variable: π_i : probability of respondents having knowledge/practising appropriate management during menarche/adopting suitable methods for disposal.

Independent variable:

- X_1 = religion
- X_2 = age group of participants
- X_3 = mother's education
- X_4 = caste
- X_5 = type of family
- X_6 = occupational status

Where α is the intercept and β 's are the slope parameter

Results

76.43% of the 420 adolescent girls belong to the Hindu religion along with 61.19% belonging to the other backward classes. 51.90% of the adolescent girls in the

sample were from nuclear families. The majority of the teenage girls (52.38%) were between the ages of 13 and 15. Mothers of 58.57% of the teenage girls were found to be illiterate, while just 9.05% of the mothers had a higher educational status. The adolescent girl's household's occupational status was cultivation (37.86%), followed by the breadwinner employed as an agricultural or non-agricultural coolie (34.76%) [Table 1].

The analysis related to logistic regression used to predict the probability for knowledge and management of menarche adjusted for socio-demographic profile suggest that the predicted probability of having the knowledge of menarche before the onset of it was more for adolescent girls belonging to Hindu religion (0.19) as compared to Muslims (0.13).

Table 1 Socio-demographic Profile of the adolescent girls

	Frequency (n=420)	Percentage
Religion		
Hindu	321	76.43
Muslim	99	23.57
Age Group		
13-15 years	220	52.38
16-19 years	200	47.62
Mothers Education		
Illiterate	246	58.57
Primary Education	55	13.10
Secondary Education	81	19.29
Higher and above	38	9.05
Caste		
Scheduled caste	66	15.71
Scheduled tribe	37	8.81
Other backward class	257	61.19
General/Forward	60	14.29
Type of Family		
Nuclear	218	51.90
Joint	202	48.10
Occupational Status		
Cultivation	159	37.86
Agri/Non Agri Coolie	146	34.76
Business Related	58	13.81
Salaried Employment	29	6.90
Other	28	6.67

Source: Survey Data

Among the caste category the predicted probability was higher for adolescent girls belonging to Scheduled Tribe (0.23) and General caste category (0.21). Considering

the type of family, the sample population that grew up in joint family set up depicted a higher predicted probability (0.19) of having knowledge about Menarche before its onset.

Table 2 Predicted probability for knowledge and management of Menarche adjusted for Socio-demographic profile.

Socio Demographic Profile	Knowledge about menarche		Management			
	Predictive Probability	95% C.I	Uses Sanitary napkin Predictive Probability	95% C.I	Uses Cloth Predictive Probability	95% C.I
Religion						
Hindu	0.19	(0.14-0.24)	0.64	(0.59-0.70)	0.34	(0.28-0.39)
Muslim	0.13	(0.05-0.20)	0.43	(0.31-0.54)	0.44	(0.33-0.55)
Age Group of Participants						
13-15 years	0.17	(0.12-0.22)	0.66	(0.59-0.73)	0.31	(0.24-0.37)
16-19 years	0.18	(0.12-0.24)	0.57	(0.49-0.64)	0.37	(0.29-0.44)
Mothers Education						
Illiterate	0.17	(0.12-0.21)	0.54	(0.48-0.61)	0.42	(0.35-0.48)
Primary Education	0.23	(0.12-0.34)	0.54	(0.40-0.68)	0.40	(0.27-0.54)
Secondary Education	0.20	(0.11-0.29)	0.67	(0.57-0.78)	0.26	(0.16-0.36)
Higher and above	0.12	(0.02-0.21)	0.90	(0.80-1.01)	0.09	(0.01-0.19)
Caste						
Scheduled caste	0.20	(0.10-0.30)	0.56	(0.42-0.69)	0.36	(0.23-0.49)
Scheduled tribe	0.23	(0.09-0.37)	0.69	(0.53-0.85)	0.27	(0.12-0.42)
Other backward class	0.15	(0.11-0.20)	0.58	(0.52-0.65)	0.40	(0.33-0.47)
General/Forward	0.21	(0.10-0.32)	0.62	(0.48-0.76)	0.26	(0.14-0.38)
Type of Family						
Nuclear	0.16	(0.10-0.21)	0.59	(0.52-0.67)	0.30	(0.23-0.36)
Joint	0.19	(0.13-0.25)	0.58	(0.51-0.67)	0.43	(0.36-0.51)
Occupational Status						
Cultivation	0.16	(0.11-0.22)	0.60	(0.52-0.69)	0.33	(0.25-0.41)
Agri/Non Agri Coolie	0.17	(0.11-0.23)	0.50	(0.41-0.59)	0.47	(0.39-0.56)
Business Related	0.22	(0.11-0.34)	0.74	(0.62-0.87)	0.27	(0.14-0.39)
Salaried Employment	0.20	(0.05-0.35)	0.74	(0.58-0.90)	0.28	(0.11-0.45)
Other	0.13	(0.01-0.26)	0.51	(0.31-0.71)	0.25	(0.08-0.42)

Source: Authors Calculation

Analysis was also done to explore the management of menarche by associating it with the socio-demographic profile of the respondent. The management of menarche is assessed by exploring the type of absorbent used to manage menstruation. It was found that 59.52% of the sample used sanitary napkins as an absorbent whereas 36.43%

used cloth. The remaining 5% sample was such who either refused to answer or had not attained menarche. A significant association was found between the mother’s educational status and the use of sanitary napkins and cloth. The predictive probability of using sanitary napkins was higher among

adolescent girls whose mothers has an educational status of higher and above (0.90) whereas the predicted probability for the use of cloth was higher among adolescent girls whose mothers were illiterate. The occupational status of the household to which the sample population belonged to, also played an important role in the type of management during menarche by the adolescent girls. For instance, adolescent girls belonging to business class and salaried employed personals depicted a higher probability of using sanitary napkins (0.74), whereas the sample belonging to households involved in cultivation (0.47) or working as an agriculture/non-agriculture coolie (0.33)

depicted a higher probability of using cloth as an absorbent.

Furthermore, an attempt was made to find the association between the socio-demographic background and the practices related to the disposal of absorbents (Table 3). In case of both the absorbents used viz. sanitary napkins and cloths, they were being used only once hence in order to ascertain this parameter the survey questions were bifurcated into two categories in one we have attempted to explore the practices adopted before the disposal and then proper disposal. The good practices related to preparation before disposal include wrapping with a newspaper, wrapping in a sanitary napkin cover and put it in a biodegradable bag.

Table 3 Predicted probability for Disposal of absorbent adjusted for Socio-demographic profile.

<i>Socio Demographic Profile</i>	Proper preparation before disposal		Proper Disposal	
	<i>Predictive Probability</i>	<i>95% C.I</i>	<i>Predictive Probability</i>	<i>95% C.I</i>
Religion				
Hindu	0.63	(0.57-0.69)	0.41	(0.35-0.47)
Muslim	0.42	(0.30-0.53)	0.28	(0.18-0.38)
Age Group of Participants				
13-15 years	0.64	(0.57-0.71)	0.46	(0.39-0.53)
16-19 years	0.51	(0.44-0.59)	0.29	(0.23-0.36)
Mothers Education				
Illiterate	0.52	(0.46-0.59)	0.33	(0.27-0.40)
Primary Education	0.50	(0.36-0.64)	0.29	(0.16-0.41)
Secondary Education	0.59	(0.47-0.70)	0.49	(0.37-0.61)
Higher and above	0.90	(0.79-1.01)	0.58	(0.40-0.76)
Caste				
Scheduled caste	0.54	(0.41-0.68)	0.35	(0.22-0.47)
Scheduled tribe	0.60	(0.43-0.77)	0.41	(0.24-0.58)
Other backward class	0.57	(0.50-0.64)	0.36	(0.29-0.43)
General/Forward	0.65	(0.52-0.79)	0.46	(0.32-0.61)
Type of Family				
Nuclear	0.58	(0.50-0.66)	0.34	(0.27-0.42)
Joint	0.58	(0.50-0.66)	0.41	(0.33-0.49)
Occupational Status				
Cultivation	0.58	(0.50-0.67)	0.38	(0.30-0.47)
Agri/Non Agri Coolie	0.51	(0.42-0.59)	0.36	(0.28-0.44)
Business Related	0.74	(0.62-0.86)	0.60	(0.46-0.74)
Salaried Employment	0.74	(0.58-0.90)	0.50	(0.30-0.69)
Other	0.38	(0.18-0.57)	0.06	(0.02-0.15)

Source: Authors Calculation

All the three components have been coded as favourable to generate the practices adopted before disposal variables. Similarly, the good practices for disposal after preparation include giving it to the garbage collecting vehicle and pitting it in a specially designed container. A similar exercise has been followed to generate this variable. The results pertaining to these variables have been presented in the supplementary table.

The results related to predicted probability shows a higher probability for the sample of the age group between 13-15 years to adopt good practices for preparation before disposal (0.64) and proper disposal after preparing (0.46). The mother's education was found to be a significant predictor as respondents whose mothers were having an educational qualification of higher and above were found to be properly preparing the absorbent before disposal (0.90) and then properly disposing it off (0.59). The occupational status was also a significant predictor in this regard as respondents adopting good practice for preparation and disposal depicted a higher probability in case where they belonged to business related or service class household.

Discussion

The current study reveals several key socio-demographic parameters influencing menstrual hygiene knowledge, management, and practices. The mean age of the sample respondents in this study is comparable to other studies' findings (Rajni Dhingra 2009, D Sapkota 2014, Subash B. Thakre 2011). Our study found that only 18.3% of sample respondents knew about menstruation before menarche, which is consistent with earlier research (Shanbhag D 2012, Anand 2015, Subhash B. Thakre 2011). This might be because menstruation is still regarded a taboo, and

because most mothers of the adolescent girls, who are allegedly the first source of information about menstruation, were illiterate, the taboos remain relatively deeply ingrained in the a mindset and are further passed on to adolescents. Studies indicate that, for many girls and women in India, managing the psychological and practical challenges of menstruation is difficult, which can adversely affect their self-esteem, confidence, and overall well-being (Prasad, Dwivedi and Shetye 2024). Since most of the adolescent girls interviewed were school going, the lack of information about menstruation can also be attributed to a lack of health education and awareness programmes in schools. According to a research carried out by Gomathy Parasuraman in Tamil Nadu in 2022, the total score on knowledge significantly ascended once health education was introduced in school.

In terms of menstrual management, 59.52% of the sample in our study used sanitary napkins as an absorbent, whereas 36.43% used cloth. Similar findings are seen in the literature, where sanitary pad use is on the rise (Neupane MS 2020, Gorah KY 2020). This is related to the occupational status of the households as adolescent girls are mostly dependent upon their parents to buy them sanitary napkins. Owing to this adolescent girls from business and service class are more likely to use sanitary pads assuming a higher income bracket. In India, a bundle of 10 sanitary napkins costs around 30-40 INR (0.39-0.52 USD), which is too expensive for the majority of households. The inability of underprivileged women to purchase sanitary items is one of the reasons they utilise rags/clothes (Aditya Singh 2022, Shamsudeen Mohammed 2020). Implementing strategies to promote education, improve media access, and

enhance household wealth can significantly facilitate the adoption of menstrual hygiene practices. Crucial initiatives include reducing the cost of sanitary napkins and increasing their accessibility, particularly in rural areas, to address geographical disparities across the country (Sourav Biswas 2024). Besides the economic aspect, the increased usage of sanitary napkins is ascribed to the difficulties in washing and drying cloths due to a lack of place to dry them in open areas (Anna Maria van Eijk 2016).

Talking about the practices adopted by the adolescent girls prior to the disposal and at the time of disposal, our study reveals that mothers knowledge, type of family and occupational status of the household are significant factors that promote the adoption of good practices regarding the disposal of the absorbants. Our findings are consistent with studies done by (Shabnam Omidvar 2010, Shekhar Chauhan 2021). The appropriate disposal of sanitary materials is as essential as other indications of menstrual hygiene management. Unsanitary disposal of sanitary materials in rivers, ponds, or even under the soil may raise the risk of infection with Hepatitis and HIV because sanitary products drenched in the blood of an infected girl/woman may contain these Bacteria and viruses (Alam 2022). Our study found that 40% of the girls did proper preparation before disposing the absorbant like wrapping it with newspaper, wrapping it in sanitary napkins cover and putting it in biodegradable bag. On the other hand 55.95% sample adolescent girls adopted good practices for disposal like giving it to the garbage collecting vehicle and putting it in a especially designed container. Similar methods of disposal have been reported by many studies (Neha Choudhary 2019, Pradeep Senapathi 2018, Shoor 2017).

One of the major reasons behind not practicing proper disposal of menstrual products is the lack of practical guidance on the usage and disposal of menstrual products. (Suzanne J. Block 2022)

Thus to improve the menstrual hygiene management among adolescent girls, it is essential to integrate robust monitoring and evaluation mechanisms within current policies. These policies should be drafted in a manner that it addresses intersectional inequalities by considering factors such as gender, socioeconomic status, disability, and ethnicity, ensuring inclusivity and responsiveness to diverse needs. Across Uttar Pradesh and India, collaborative efforts from government programs, non-governmental organizations, and community-based initiatives have reduced these disparities, promoting more equitable and accessible menstrual hygiene practices for adolescent girls (Doli Roy 2024).

Conclusion

Menstruation is a vital indicator of reproductive health and development, hence menstrual hygiene is a crucial concern. Our study reveals that the knowledge about menstruation before attaining menarche among the sample adolescent girls was found to be quite low. However majority of the sample surveyed used sanitary napkins as absorbants. In case of most of the sample population, good practices were adopted with regard to preparation before disposal and disposal after preparation. The awareness of menstruation was largely determined by the mother's education and the household's occupational position. In terms of practices adopted during menstruation, the kind of family and the employment position of the households had a critical impact in influencing the adolescent females to adopt appropriate practices

before and during absorbant disposal. Owing to the findings reported in the survey it is suggested that much emphasis accelerating menstruation awareness activities at the school level as it plays critical role in preparing girls to adopt and be aware of appropriate menstruation hygiene knowledge and practices.

Conflict of Intrest

No conflict of intrest.

References

- Aditya Singh, Mahashweta Chakrabarty, Shivani Singh, Rakesh Chandra, Sourav Chowdhury. 2022. "Menstrual hygiene practices among adolescent women in rural India: a cross-sectional study." *BMC Public Health*.
- Alam, Md. Abu Tal Ha and Md. Zakiul. 2022. "Menstrual hygiene management practice among adolescent girls: an urban-rural comparative study in Rajshahi division, Bangladesh." *BMC Womens Health*.
- Anand, Enu, Jayakant Singh, Sayeed Unisa. 2015. "Menstrual hygiene practices and its association with reproductive tract infections and abnormal vaginal discharge among women in India." *Sexual & Reproductive Healthcare* 6 249-254.
- Anna Maria van Eijk, M Sivakami, Mamita Bora Thakkar, Ashley Bauman, Kayla F Laserson, Susanne Coates, Penelope A Phillips-Howard. 2016. "Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis." *BMJ Open*.
- Beeva Boruah, Annamika Hakmaosa, Sudipta Hajong. 2022. "A study on the knowledge and practices of menstrual hygiene among the adolescent girls of Nagaon, Barpeta District, Assam." *J Family Med Prim Care*. 5918-5923.
- D Sapkota, D Sharma, H P Pokharel, Shyam Sundar Budhathoki, Vijay Kumar Khanal. 2014. "Knowledge and practices regarding menstruation among school going adolescents of rural Nepal." *Journal of Kathmandu Medical College* 122-128.
- Dharampal G. Dambhare, Dr., Sanjay V. Wagh, Dr., and Jayesh Y. Dudhe. 2012. "Age at Menarche and Menstrual Cycle Pattern among School Adolescent Girls in Central India." *Global Journal of Health Science*.
- Doli Roy, Nuruzzaman Kasemi, Manik Halder, Malasree Majumder. 2024. "Factors Associated with Exclusive Use of Hygienic Methods during Menstruation among Adolescent Girls (15-19 Years) in Urban India: Evidence from NFHS-5." *Heliyon*.
- Gomathy Parasuraman, Vinodhini Vijay, S Balaji, B Nisha, Ruma Dutta, Timsi Jain and P Anantha Eshwar. 2022. "Impact of health education intervention on menstruation and its hygiene among urban school-going adolescent girls in Thiruvallur, Tamilnadu." *J Family Med Prim Care*.
- Gorah KY, Haruna EA, Ufwil JJ. 2020. "Knowledge, Attitudes and Practices of Menstrual Hygiene Management of Female Students in Bokkos Local Government Area of Plateau State, Nigeria." *KIU J Soc Sci* 365-74.
- Neha Choudhary, Manoj K. Gupta. 2019. "A comparative study of perception and practices regarding menstrual hygiene among adolescent girls in urban and rural areas of Jodhpur district, Rajasthan." *Journal of Family Medicine and Primary Care*.
- Neupane MS, Sharma K, Bista AP, Subedi S, Lamichhane S. 2020. "Knowledge on menstruation and menstrual hygiene practices among adolescent girls of selected schools." *PubMed* 69-73.
- Pradeep Senapathi, Hemant Kumar. 2018. "A comparative study of menstrual hygiene management among rural and urban adolescent girls in Mangaluru, Karnataka." *International Journal of Community Medicine and Public Health*.
- Prasad, Rajnish R., Hemant Dwivedi, and Mrunal Shetye. 2024. "Understanding challenges related to menstrual hygiene management: Knowledge and practices among the adolescent girls in urban slums of Jaipur, India." *Journal of Family Medicine and Primary Care*.
- Prof Susan M Sawyer MD, Peter S Azzopardi, Dakshitha Wickremarathne, Prof George C

- Patton. 2018. "The age of adolescence." *The Lancet Child & Adolescent Health* 223-228.
- Rabindra Nath Sinha, Bobby Paul. 2018. "Menstrual Hygiene Management in India: The Concerns." *Indian Journal of Public Health*.
- Rajni Dhingra, Anil Kumar & Manpreet Kour. 2009. "Knowledge and Practices Related to Menstruation among Tribal (Gujjar) Adolescent Girls." *Studies on Ethno-Medicine*.
- Salmela-Aro, Katariina. 2011. "Stages of Adolescence." *Encyclopedia of Adolescence* 360-368.
- Shabnam Omidvar, Khyrunnisa Begum. 2010. "Factors influencing hygienic practices during menses among girls from south India- A cross sectional study." *International Journal of Collaborative Research on Internal Medicine & Public Health* 411-423.
- Shamsudeen Mohammed, Roderick Emil Larsen-Reindorf. 2020. "Menstrual knowledge, sociocultural restrictions, and barriers to menstrual hygiene management in Ghana: Evidence from a multi-method survey among adolescent schoolgirls and schoolboys." *PLOS ONE*.
- Shanbhag D, Shilpa R, D'Souza N, Josephine P, Singh J, Goud BR. 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 Journal of Collaborative Research on Internal Medicine & Public Health* 1353-1362.
- Shekhar Chauhan, Pradeep Kumar, Strong Pillar Marbaniang, Shobhit Srivastava, Ratna Patel, Preeti Dhillon. 2021. "Examining the predictors of use of sanitary napkins among adolescent girls: A multi-level approach." *PLOS ONE*.
- Shoor, Purva. 2017. "A study of knowledge, attitude, and practices of menstrual health among adolescent school girls in urban field practice area of medical college, Tumkur." *Indian Journal of Health Sciences and Biomedical Research KLEU*.
- Sourav Biswas, Asraful Alam, Nazrul Islam, Ranjan Roy & Lakshminarayan Satpati. 2024. "Understanding period product use among young women in rural and urban India from a geospatial perspective." *Scientific Reports*.
- Subhash B. Thakre, Sushama S. Thakre, Monica Reddy, Nidhi Rathi, Ketaki Pathak, Suresh Ughade. 2011. "Menstrual Hygiene: Knowledge and Practice among Adolescent School Girls of Saoner, Nagpur District." *Journal of Clinical and Diagnostic Research* 1027-1033.
- Sudeshna Ray, Aparajita Dasgupta. 2012. "Determinants of Menstrual Hygiene Among Adolescent Girls: A Multivariate Analysis." *National Journal of Community Medicine*.
- Suzanne J. Block, Michael K. Hauer, Alex Ezeh, Suruchi Sood. 2022. "Menstrual management among adolescent girls in Uttar Pradesh, India: An examination of interpersonal and mediated communication as delivery mechanisms for practical guidance." *Sec. Adolescent Reproductive Health and Well-being*.
- Tanvi Nitin Deshpande, Supriya Satish Patil, Supriti Balaram Gharai, S. R. Patil and P. M. Durgawale. 2018. "Menstrual hygiene among adolescent girls - A study from urban slum area." *J Family Med Prim Care*. 1439-1445.

Supplementary Table

Management of Menarche, Proper Disposal and Preparation done before disposing absorbents.

Particulars	Place of residence		ALL
	Rural	Urban	
Management of Menarche			
Uses sanitary Napkins	56.2	69.4	59.6
Uses Cloth	39.3	26.9	36.4
Ways of disposing used sanitary napkins			
Throw In Open Area	56.3	39.5	51.2
Throw In Toilet	0.6	0.0	0.4
Give To Garbage Collecting Vehicle	4.5	2.6	4.0
Put In Specially Designed Container	65.9	72.4	67.9
Burn	1.7	0.0	1.2
Bury The Napkins	0.6	1.3	0.8
Other	2.3	0.0	1.6
No Response	0.6	2.6	1.2
Preparation done before disposing sanitary napkins			
Throw as it is	5.7	0.0	4.0
Wrap with newspaper	63.6	61.8	63.1
Wrap sanitary napkin cover	15.3	18.4	16.3
Put it in biodegradable bag	3.4	6.6	4.4
Put it in plastic bag	9.1	11.8	9.9
Other	1.1	0.0	0.8
No Response	1.7	1.3	1.6