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Epidemiological Study of Menstrual Health and Associated Sociodemographic Factors among School-Going Adolescent Girls Aged 12–16 Years in Rural Coastal Andhra Pradesh

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Abstract

Background: Menstrual health is a critical component of adolescent well-being, yet substantial disparities persist in low-resource settings where awareness, infrastructure, and support systems remain inadequate. This study assessed menstrual health patterns and examined the association of menstrual problems, including premenstrual syndrome (PMS), with sociodemographic factors among school-going adolescent girls in rural coastal Andhra Pradesh. **Methods:** A cross-sectional epidemiological study was conducted among 155 adolescent girls aged 12–16 years selected using simple random sampling in Tuni Mandal, Kakinada District, Andhra Pradesh. Data were collected using a pre-tested questionnaire capturing sociodemographic characteristics, menstrual history, hygiene practices, and menstrual disorders. Descriptive statistics and stratified analyses were used. **Results:** The mean age at menarche was 12.25 years (SD = 1.90). Irregular menstrual cycles were reported by 76.8% of participants, PMS by 58.7%, painful periods by 25.8%, and heavy discharge by 14.2%. Higher prevalence of menstrual problems was observed among girls from low-income households and among those whose parents were illiterate. **Conclusion:** We identified a substantial burden of menstrual problems among adolescent girls in rural coastal Andhra Pradesh. Sociodemographic disadvantage appears to be an important contextual determinant, underscoring the need for school-based menstrual hygiene interventions and community-level strategies to strengthen parental awareness and support.

Keywords: Adolescent girls, Menstrual health, Premenstrual syndrome, Rural population, Sociodemographic factors

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Introduction

Adolescence represents a significant developmental period marked by rapid physiological, psychological, and social transitions, during which the establishment of regular menstrual cycles in girls forms a key component of reproductive maturation.[1] Menstrual health in girls is increasingly recognized as an integral aspect of adolescent wellbeing, influencing educational participation, psychosocial stability, and overall quality of life. In many low- and middle-income contexts, menstrual health challenges intersect with nutritional vulnerability, limited awareness, and sociocultural constraints, placing adolescents at heightened risk of unmet needs and related morbidities.[2,3] Ensuring menstrual health during early adolescence among girls is therefore essential not only for reproductive health outcomes but also for facilitating healthy transitions into adulthood.[4] Menstrual health in girls is increasingly recognized as an integral aspect of adolescent wellbeing, influencing educational participation, psychosocial stability, and overall quality of life, particularly in low- and middle-income countries where structural and social inequities persist.[3,5]

Menstrual disorders, including irregular cycles, dysmenorrhea, heavy menstrual bleeding, and premenstrual syndrome (PMS), are highly prevalent among adolescent girls and contribute to both physical discomfort and functional limitations. PMS, in particular, encompasses a cluster of emotional, behavioral, and somatic symptoms that emerge during the luteal phase and can significantly disrupt schooling, concentration, and daily activities.[6,7] Evidence from India and other resource-constrained settings indicates that adolescent girls frequently normalize menstrual discomfort due to cultural beliefs and idioms. For instance, in some communities, expressions that equate menstruation to a test of womanhood or resilience discourage help-seeking. This normalization or lack of knowledge and support often results in the under-recognition and inadequate management of menstrual disorders; recent Indian evidence indicates low rates of medical consultation for such issues.[8-11] These conditions, if unaddressed, can adversely affect academic performance, attendance, and psychosocial well-being during the formative years of schooling among adolescent girls.[2,12,13]

Building on this, sociodemographic determinants play a crucial role in shaping menstrual experiences and health outcomes among adolescent girls in rural Indian contexts. Parental education, household income, family structure, and place of residence are consistently associated with menstrual hygiene practices, awareness levels, and the occurrence of menstrual

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problems.[3,8,10] In many rural and coastal regions, infrastructural limitations, such as inadequate sanitation facilities, a lack of private spaces for menstrual management, and limited access to sanitary products, further exacerbate menstrual challenges.[10,14-16] Cultural taboos and restrictive norms surrounding menstruation continue to impede open communication and timely support-seeking, disproportionately affecting girls from socioeconomically disadvantaged households. Understanding these determinants is essential for designing culturally appropriate, community-responsive menstrual health interventions. Parental education, household income, and access to water, sanitation, and hygiene facilities have been consistently associated with menstrual hygiene practices and menstrual health outcomes among adolescent girls in rural and peri-urban settings.[1,7,8,12]

Despite a growing emphasis on adolescent girls' reproductive health in India, there remains a paucity of community- and school-based epidemiological evidence from rural coastal Andhra Pradesh, particularly regarding the interplay between sociodemographic factors and menstrual health outcomes. Most available studies are locality-specific or restricted to urban populations, limiting their generalizability to rural and semi-urban settings where infrastructural gaps and socioeconomic barriers remain pronounced. However, community- and school-based epidemiological evidence from rural coastal Andhra Pradesh remains limited, particularly regarding the association between sociodemographic factors and menstrual health outcomes, highlighting the need for context-specific public health evidence.

Addressing this evidence gap is crucial for informing targeted interventions, policy development, and school-based health programs. The present study was therefore undertaken to assess menstrual health patterns and to examine the association between menstrual problems, including PMS, and sociodemographic factors among school-going adolescent girls aged 12–16 years in rural coastal Andhra Pradesh.

Materials and Methods

Study design and setting

This study employed a cross-sectional epidemiological design and was conducted among school-going adolescent girls in Tuni Mandal, a coastal region of Kakinada District, Andhra Pradesh. The study area comprises predominantly rural settlements with limited menstrual hygiene infrastructure and diverse sociodemographic backgrounds.

Study population and sampling

The target population consisted of school-going adolescent girls aged 12–16 years who had resided in the study area for at least 6 months. Tuni town was excluded from the sampling frame. Five villages were randomly selected from 20 in the mandal. Each selected village had one high school, all of which were included in the study. From each school, approximately 30 adolescent girls were selected using simple random sampling. A total of 155 participants were enrolled. Inclusion criteria were (i) girls aged 12–16 years and (ii) willingness to provide written assent along with parental consent. Exclusion criteria included the presence of any gross abnormalities or irregular school attendance.

Data collection tool

Data were collected using a pre-tested, standardized questionnaire administered through face-to-face interviews. The instrument captured information on sociodemographic characteristics (age, class, parental education and occupation, household income, and place of residence), menstrual history (age at menarche, cycle duration), menstrual hygiene practices, school-level facilities, and the presence of menstrual problems, including skipped menstruation, irregular cycles, dysmenorrhea, heavy discharge, and PMS. The questionnaire also included items on awareness, reactions to menarche, and sources of menstrual information. Only variables relevant to the study objectives were analyzed in the present manuscript.

Study variables

Outcome variables included the presence of menstrual problems (irregular periods, skipped menstruation, painful periods, and heavy discharge) and PMS. Key exposure variables were parental educational status, parental occupation, household income, and other sociodemographic factors. Menstrual characteristics and hygiene-related practices were assessed as descriptive variables.

Statistical analysis

Data were coded and analyzed using the Statistical Package for the Social Sciences version 20.0. Continuous variables were summarized using means and standard deviations, while categorical variables were expressed as frequencies and percentages. Associations between sociodemographic factors and menstrual problems were examined descriptively using stratified frequency distributions.

Ethical considerations

The study protocol was reviewed and approved by the Departmental Developmental Committee overseeing research involving human participants. Parental consent and participant assent were obtained before data collection, and confidentiality of all respondents was maintained throughout the study.

Results

Sociodemographic characteristics

The detailed sociodemographic profile of the study population is presented in Table 1. A total of 155 adolescent girls aged 12–16 years participated in the study. The age distribution was skewed toward mid-adolescence, with 33% in the 14-year age group and 22% in the 16-year age group. Nearly one-third were enrolled in the 9th standard, and most participants resided in rural areas (72.9%), with substantial socioeconomic disadvantage observed across the study population. Parental education levels were generally low: 55% of fathers and 63% of mothers had only primary education, while 16% of fathers and 27% of mothers were illiterate. Fathers were primarily engaged in artisan (28.4%) or labor (26.5%), whereas 68% of mothers were homemakers. Household income levels indicated substantial socioeconomic disadvantage, with 78% categorized as low income.

Table 1: Sociodemographic characteristics among school-going adolescent girls aged 12–16 years in Rural Coastal Andhra Pradesh (*n*=155)

Variable	*n*	*%*
Age (years)		
12	19	12.3
13	22	14.2
14	51	32.9
15	29	18.7
16	34	21.9
Class		
6th	11	7.1
7th	20	12.9
8th	20	12.9
9th	47	30.3
10th	23	14.9
11th	34	21.9
Parent's education		
Father		
Higher Education	10	6.5
Secondary Education	36	23.2
Primary Education	85	54.8
Illiterate	24	15.5
Mother		
Higher Education	7	4.5
Secondary Education	10	6.5
Primary Education	97	62.5
Illiterate	41	26.5
Parent's occupation		
Father		
Job	19	12.3
Artisan	44	28.3
Farmer	26	16.8
Labor	41	26.5
Business	25	16.1
Mother		
Job	5	3.2
Artisan	13	8.4
Farmer	15	9.7
Labor	17	11.0
Homemaker	105	67.7
Area of residence		
Urban	42	27.1
Rural	113	72.9
Socioeconomic status		
Low	121	78.0
Middle	24	15.5
High	10	6.5

Menstrual characteristics

The distribution and descriptive statistics of age at menarche are summarized in Table 2. The mean age at menarche was 12.25 years (SD = 1.90), with values clustered between 11 and 15 years. This distribution is consistent with published estimates from Indian adolescent cohorts and suggests a timely menarche within expected biological ranges.

Prevalence of menstrual problems

The prevalence of major menstrual problems among participants is shown in Table 3. A high burden of menstrual morbidities was observed. Irregular menstrual cycles were reported by 77% of participants, indicating a predominant disturbance in cycle regularity during early-to-mid adolescence. PMS was reported by 59% of girls, suggesting widespread premenstrual symptomatology with potential functional implications. Dysmenorrhea (25.8%), heavy menstrual discharge (14.2%), and skipped menstruation (7.1%) were also observed. The co-occurrence of PMS and irregular cycles in more than half of the sample suggests overlapping symptom patterns that may share underlying physiological or psychosocial determinants with PMS and irregular cycles, constituting the most prevalent conditions.

Table 2: Descriptive statistics for age at menarche among school-going adolescent girls aged 12–16 years in Rural Coastal Andhra Pradesh (*n*=155)

Variable	*N*	*Minimum*	*Maximum*	*Mean*	*Standard deviation*
Age at Menarche	155	11	15	12.25	1.90

Table 3: Prevalence of menstrual problems among school-going adolescent girls aged 12–16 years in Rural Coastal Andhra Pradesh (*n*=155)

Variable	*n*	*%*
Skipped menstruation		
Yes	11	7.1
No	144	92.9
Irregular periods		
Yes	119	76.8
No	36	23.2
Premenstrual syndrome		
Yes	91	58.7
No	64	41.3
Painful periods		
Yes	40	25.8
No	115	74.2
Heavy discharge		
Yes	22	14.2
No	133	85.8

Associations between sociodemographic factors and menstrual problems

Stratified distributions of menstrual problems according to parental education and household income are presented in Table 4.

Sociodemographic gradients were evident across menstrual health outcomes. Girls whose mothers were illiterate showed a higher prevalence of irregular periods (84.1%) compared with those whose mothers had secondary or higher education. A similar pattern was observed for paternal education, with irregular cycles highest among girls whose fathers were illiterate (100%). These differences indicate a potential inverse association between parental education and menstrual cycle irregularity.

PMS prevalence remained consistently high across lower educational strata (87.5% with illiterate fathers; 61.4% among girls with illiterate mothers), while being comparatively lower among those with parents who had secondary or higher education. This pattern suggests that parental education may have a protective effect, possibly by improving awareness, communication, or household support for menstrual health.

Household income was also an important determinant. Girls from low-income families exhibited a higher prevalence of irregular periods (89.3%), PMS (71.1%), painful periods (28.9%), and heavy discharge (17.4%) compared with girls from middle- and high-income households. These trends imply a socioeconomic gradient wherein economic disadvantage may limit access to menstrual

Table 4: Association of menstrual problems with parental education and income among school-going adolescent girls aged 12–16 years in Rural Coastal Andhra Pradesh (*n*=155)

Variable	*Mothers Educational Status*								*Father's Educational Status*								*Income*					
	Illiterates		*Primary*		*Secondary*		*Higher*		*Illiterates*		*Primary*		*Secondary*		*Higher*		*Low*		*Middle*		*High*	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Skipped menstruation																						
Yes	5	10.9	4	4.2	2	20.0	0	0	4	16.7	4	4.7	3	8.3	0	0	7	5.8	3	12.5	1	10.0
No	36	89.1	93	95.8	8	80.0	7	100	20	83.3	81	95.3	33	91.7	10	100	114	94.2	21	87.5	9	90.0
Irregular periods																						
Yes	37	84.1	70	72.2	8	80.0	4	100	24	100	64	75.3	26	72.2	2	20.0	108	89.3	7	29.2	4	40.0
No	4	15.9	27	27.8	2	20.0	3	0	0	0	21	24.7	10	27.8	8	80.0	13	10.7	17	70.8	6	60.0
Premenstrual syndrome																						
Yes	27	61.4	57	58.8	6	60.0	1	25.0	21	87.5	49	57.6	20	55.6	1	10.0	86	71.1	3	12.5	2	20.0
No	14	38.6	40	41.2	4	40.0	6	75.0	3	12.5	36	42.4	16	44.4	9	90.0	35	28.9	21	87.5	8	80.0
Painful periods																						
Yes	12	27.3	24	24.7	4	40.0	0	0	8	33.3	24	28.2	8	22.2	0	0	35	28.9	3	12.5	2	20.0
No	29	72.7	73	75.3	6	60.0	7	100	16	66.7	61	71.8	28	77.8	10	100	86	71.1	21	87.5	8	80.0
Heavy discharge																						
Yes	6	13.6	15	15.5	1	10.0	0	0	5	20.8	12	14.1	5	13.9	0	0	21	17.4	1	4.2	0	0
No	35	86.4	82	84.5	9	90.0	7	100	19	79.2	73	85.9	31	86.1	10	100	100	82.6	23	95.8	10	100

hygiene products, school-level facilities, or healthcare support, cumulatively increasing vulnerability to menstrual morbidity.

These stratified distributions demonstrate consistent gradients across parental education and household income categories, suggesting potential associations that warrant further inferential testing. Overall, the direction and magnitude of these stratified findings suggest that parental illiteracy and low socioeconomic status may be important contextual predictors of PMS and other menstrual problems among adolescent girls in this setting.

Discussion

This study provides important insights into menstrual health patterns and the prevalence of menstrual disorders among school-going adolescent girls in rural coastal Andhra Pradesh. The high proportion of girls reporting irregular cycles and PMS underscores the need to prioritize adolescent menstrual health as a core component of reproductive and public health programming. Globally, adolescence is recognized as a vulnerable period during which reproductive maturity coincides with psychosocial transitions, making young girls particularly susceptible to menstrual disturbances, poor cycle literacy, and emotional distress.[1,6,12] Evidence from regions across South Asia, Africa, and Latin America consistently shows that menstrual disorders impair school attendance, concentration, and daily functioning, reaffirming the implications identified in this study.[4,6,10,17,18]

The mean age at menarche observed (12.25 years) aligns closely with global and Indian data, which generally range between 12 and 13 years[4,7,9,15] whereas it is lower than that reported in a study among secondary school girls in a semi-urban area of Ondo state, Southwest Nigeria.[17] However, the prevalence of irregular cycles in this population (about 77%) appears higher than estimates from several international school-based studies that typically report prevalence between 30 and 55%.[6,12,13,17] While irregular cycles are expected in the first few years post-menarche due to anovulatory cycles and hormonal immaturity, such a high prevalence may also reflect nutritional stress, psychosocial pressures, suboptimal menstrual hygiene conditions, or inadequate awareness. PMS prevalence (about 59%) is likewise comparable to estimates reported from Southeast Asia, the Middle East, and parts of Europe, where prevalence often ranges between 40 and 70% among adolescents,[1,3,6,7] while low prevalence rate (about 25%) was reported from a study among secondary school students in a semi-urban area of Southwest Nigeria.[17]

Delving deeper into the causes, PMS arises from a complex interplay of hormonal fluctuations, serotonergic dysregulation, stress response pathways, and heightened sensitivity to cyclical physiological changes. Adolescents may be particularly susceptible due to developmental neuroendocrine variability and increased academic and social pressures.[2,6,19-21] Global studies indicate that a lack of awareness, cultural silence surrounding menstruation, and limited access to coping strategies exacerbate PMS-related distress. The significant proportion of girls reporting PMS in this study suggests potential impacts on concentration, emotional regulation, and school functioning, warranting targeted interventions. PMS is understood to result from a complex interaction of cyclical hormonal fluctuations, neuroendocrine sensitivity, and psychosocial stressors, with adolescents being particularly vulnerable due to developmental transitions and academic pressures.[2,6,10,22,23]

The observed associations between menstrual problems and parental illiteracy highlight the role of household-level determinants in shaping menstrual experiences. International research consistently demonstrates that higher maternal education is linked with improved menstrual hygiene practices, timely recognition of menstrual disorders, and better communication between girls and caregivers.[9,13,15,18,19] In contrast, daughters of parents with low education often rely on peers for menstrual information, face greater stigma, and may normalize severe symptoms. The strong gradients observed in this study, such as a higher prevalence of irregular cycles and PMS among adolescent girls of illiterate parents, mirror these global patterns and reinforce the need for family-inclusive menstrual health strategies.[24-26]

Beyond education, socioeconomic disadvantage also emerged as an important factor. Worldwide, girls from low-income households experience greater barriers to menstrual hygiene management (MHM), including restricted access to sanitary products, inadequate private spaces for changing, limited water availability, and poor waste disposal systems. In rural and coastal settings, these infrastructural limitations are often compounded by seasonal livelihood instability and inadequate school sanitation systems.[7,8,14,15] The finding that menstrual problems were more prevalent among girls from low-income households is consistent

with global evidence linking economic constraints to increased menstrual morbidity, heightened risk of reproductive tract infections, and reduced school participation during menstruation. International and Indian studies consistently demonstrate that lower parental education and socioeconomic disadvantage are associated with poorer menstrual awareness, suboptimal hygiene practices, and increased menstrual morbidity among adolescent girls.[8,12,13,19,27-29]

From a policy perspective, the findings underscore the urgent need to strengthen school-based MHM systems. International recommendations from the WHO, UNICEF, and UNESCO emphasize that schools should provide safe, functional toilets, private changing areas, access to water, and appropriate waste disposal facilities. However, many rural Indian schools, including those in coastal Andhra Pradesh, lack the essential components of MHM infrastructure, a gap mirrored globally where only two in five schools provide menstrual health education and less than one in three have disposal bins.[30-34] Interventions such as subsidized or free sanitary pads, school-level MHM guidelines, teacher sensitization, and the integration of menstrual education into the curriculum have led to measurable improvements in menstrual health outcomes in comparable settings. Global guidance emphasizes that the availability of functional toilets, water supply, private changing spaces, and appropriate disposal facilities in schools is central to effective MHM, yet these remain inadequate in many rural schools across South Asia.[2,3,7-11,13-15,24-26]

At the community level, policies aimed at enhancing parental literacy, particularly among mothers, and economic support may indirectly improve menstrual health by fostering supportive environments for adolescent girls. Strengthening mother-daughter communication, promoting awareness of PMS and menstrual disorders, and reducing social taboos surrounding menstruation can contribute to early recognition and appropriate management of symptoms. In addition, adolescent-friendly health services, such as counselling units, school health clinics, and outreach programs, can provide confidential support and referral pathways.

The study has certain limitations. The absence of inferential statistical testing limits the ability to quantify the strength of associations. The cross-sectional design restricts causal inference, and the use of self-reported data may introduce recall or social desirability bias. Despite these constraints, the study contributes meaningful evidence from a rural coastal region where menstrual health data are limited and offers a foundation for targeted health interventions.

Overall, the findings highlight substantial unmet menstrual health needs among adolescent girls in rural coastal Andhra Pradesh and underscore the interplay of biological, sociocultural, and infrastructural determinants. Addressing these gaps through integrated school- and community-based initiatives, supported by policy-level commitments, is essential to improving adolescent reproductive health outcomes and supporting girls' educational and psychosocial development.

Conclusion

This study highlights the considerable burden of menstrual disorders among school-going adolescent girls in rural coastal Andhra Pradesh. Parental illiteracy and low household income are associated with a higher prevalence of menstrual problems, underscoring the influence of social and economic determinants on adolescent health. Addressing these disparities requires a combination of school-based menstrual hygiene improvements, strengthened health education, and supportive community engagement. Enhancing parental awareness, improving sanitation and access to menstrual products, and integrating menstrual health into adolescent health initiatives may reduce menstrual morbidity and support healthier developmental trajectories in underserved rural settings.

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