Knowledge and Practice of Menstrual Hygiene Among Female Secondary School Students in Shao, Moro Local Government Area, Kwara State

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ABSTRACT

Introduction: Inadequate menstrual hygiene management (MHM) is associated with reproductive tract infections, school absenteeism, and stigma among young women in resource-limited environments. Information on MHM among rural Nigerian adolescents is scarce.

Objective: To assess the knowledge, attitudes, practices, and determinants of MHM among adolescent female secondary school students in Shao, Moro Local Government Area, Kwara State, Nigeria.

Methods: This descriptive cross-sectional study involved 350 secondary school girls in classes SSS 1-3 from five purposively selected schools in Shao from June to August 2025. The sample size was calculated using Cochran's formula with a 10% non-response rate. Participants were selected via multistage sampling with proportionate allocation across classes. Data were gathered using a pretested, semi-structured interviewer-administered questionnaire available in English and Yoruba. The instrument was validated by public health and obstetrics experts, with a Cronbach's alpha of 0.81 for the knowledge section. Data were analyzed using SPSS version 26.0. Knowledge, attitude, and practice were scored, graded, and categorized. Associations were tested using chi-square at $p<0.05$, and binary logistic regression was conducted to identify independent predictors of good menstrual hygiene practice.

Result: The mean age was 16.97±1.73 years. Overall, 60.6% had adequate knowledge, 40.9% had good practices, and 76.3% had a negative attitude towards MHM. Although 72.9% used absorbent materials, 68.6% used commercially made sanitary pads. In addition, 60% disposed of used pads improperly. Major constraints included lack of toilet privacy (70.9%), inadequate information (64.9%), and cost of sanitary pads (49.4%). Knowledge had a significant correlation with age, religion, birth order, school type, parents' education level, regularity, and duration of menstruation ($p<0.05$). Practice had a significant correlation with guardian, religion, parents' education level, regularity, family history of dysmenorrhea, duration, and pain ($p<0.05$). Binary logistic regression further identified living with parents (AOR = 2.34, 95% CI 1.45–3.78, p = 0.001), tertiary maternal education (AOR = 1.89, 95% CI 1.12–3.19, p = 0.017), regular menstruation (AOR = 2.11, 95% CI 1.23–3.62, p = 0.007), and absence of dysmenorrhea (AOR = 1.76, 95% CI 1.08–2.87, p = 0.024) as independent predictors of good menstrual hygiene practice.

Conclusion: MHM knowledge was moderate, but not consistently translated into safe practice due to infrastructural and financial constraints. It is recommended that the Kwara State Ministry of Education

incorporate menstrual health education into the school curriculum and provide access to proper WASH facilities and affordable sanitary products in all public secondary schools.

Keywords: Menstrual Hygiene; Adolescent Health; Health Knowledge, Practices; Nigeria

INTRODUCTION

Proper Menstrual Hygiene Management (MHM) is a fundamental component of women's health, dignity, and human rights, encompassing access to accurate information, appropriate hygiene products, clean water, sanitation facilities, and a supportive non-stigmatizing environment (World Health Organization (WHO], 2024; Harerimana, McHunu, & Pillay, 2025). Despite its importance, MHM remains a persistent challenge in many low- and middle-income countries, where menstruation is often surrounded by myths, cultural taboos, and inadequate infrastructure (Uzoechi et al., 2023). Globally, over 800 million women menstruate daily, yet approximately 500 million lack access to menstrual products and adequate MHM services (The Lancet Regional Health–Americas, 2022). In Sub-Saharan Africa, only 39% of schools provide menstrual health education, while less than 31% have bins for menstrual waste disposal in girls' toilets, contributing to school absenteeism, health risks, and social stigma (United Nations Children's Fund (UNICEF], 2024; WHO, 2024). A survey in three West African countries found that girls may miss up to 20% of school days due to menstruation-related challenges (Hennegan et al., 2021).

In Nigeria, the situation is similarly concerning, with substantial disparities in menstrual hygiene knowledge and practices among adolescent girls. Many rely on unhygienic materials such as rags, tissue paper, or leaves due to the high cost and limited availability of sanitary pads (Nnennaya, et al., 2021, Ikogho et al., 2025). Cultural and religious stigma further compounds the problem by discouraging open discussion and education about menstruation, leaving many girls unprepared for menarche and prone to misconceptions (Agbede & Ekeanyanwu, 2021; Uzoechi et al., 2023). The lack of adequate sex education in schools also contributes to this information gap, as most curricula fail to adequately prepare girls for menstruation and proper hygienic practices (Mamilla & Goundla, 2019). The use of unsanitary materials, coupled with the absence of proper waste management systems, increases the likelihood of reproductive tract infections and other health concerns (Ikogho & Onoharigho, 2025).

Poor MHM among female secondary school students in Nigeria is associated with significant health, educational, and social consequences. Inadequate hygiene practices increase the risk of reproductive tract infections and urinary tract infections (Al Karmi et al., 2024, Agbede et. al, 2021). The absence of appropriate sanitation infrastructure in educational facilities also contributes to higher levels of school absenteeism (Sharma, et.al, 2024). Literature suggests that Nigerian girls may be absent from class for up to 24% of their school days because of menstruation, largely due to the inability to access menstrual products and sanitation facilities (Onubogu et al., 2024). These absences undermine academic achievement and increase the likelihood of school dropout (Sharma et al., 2024). Knowledge gaps remain widespread, and many held misconceptions rooted in cultural beliefs. The problem is compounded by cultural restrictions and the absence of sex education in the school curriculum, leaving young girls inadequately prepared for their first periods (Mohammed & Larsen-Reindorf, 2020).

This research therefore seeks to examine the knowledge, attitudes, practices, and determinants of MHM among female secondary school students in Shao. By analyzing these elements in a rural setting, the study attempts to fill an important research gap regarding the influences of contextual realities on MHM and provides a basis for effective interventions that lead to positive health, educational, and social consequences. It considers not only the biological aspect but also the psychological and social dimensions of MHM, including menstruation regularity, the psychological state of girls, and family and school conditions. The significance of the study is rooted in its potential to improve health outcomes by reducing infection risks, enhance educational participation through regular school attendance, and challenge menstrual stigma to promote girls' social development. The study's unique contribution lies in documenting menstrual hygiene management in Shao, a semi-urban/rural hub in Moro LGA where agricultural livelihoods, mixed Yoruba/Hausa/Fulani composition, and uneven WASH infrastructure create distinct barriers not captured in urban-focused Nigerian studies. Unlike Kano and Lagos

where access to commercial pads exceeds 80%, Shao's reliance on markets in Ilorin, the state capital, and limited school WASH facilities means cost, privacy, and disposal challenges are more acute. Cultural practices such as the Awonga festival and strong community structures also shape how menstruation is discussed and managed, making peer and family influence more pronounced than in more cosmopolitan settings.

This context-specific evidence fills a gap for rural Kwara State, where existing literature concentrates on Taraba, Ogun, and Anambra (Uzoechi et al., 2023, Nnennaya et al., 2021, Garba et al., 2018). By linking infrastructural deficits in public schools with social stigma and financial constraints, the findings provide actionable entry points for state-level policy that are grounded in the lived realities of Shao's adolescents. The primary objective of this study is to evaluate the knowledge and practices of menstrual hygiene among female students in selected secondary schools in Shao, Moro Local Government Area, Kwara State. It was hypothesized that there is no significant correlation between sociodemographic factors and the level of knowledge and menstrual hygiene practices among female students in selected secondary schools in Shao, Moro Local Government Area, Kwara State.

REVIEW OF LITERATURE

Theoretical Model

This study is guided by the biopsychosocial model that incorporates a multidimensional approach in evaluating health-related behaviors from a biological, psychological, and social perspective (Bolton & Gillett, 2019). This model is appropriate for studying menstrual hygiene management (MHM) since it considers menstruation as a biological process affected by psychological views and socio-cultural settings. It corresponds to the study's purpose of examining the knowledge and practices of adolescent girls regarding MHM in Shao.

Biological Factors

Menstruation is a physiological process associated with reproductive maturity that initiates following the occurrence of menarche. Biological factors such as age at menarche, menstrual cycle frequency, and dysmenorrhea affect the way adolescent girls understand and practice menstruation. For instance, dysmenorrhea is associated with discomfort and can negatively affect hygienic practices. Poor MHM is associated with increased risk of developing reproductive tract infections (RTIs) and urinary tract infections (UTIs). This demonstrates the biological effects of poor MHM (Nabwera et al., 2021). Consequently, this study will incorporate the biological factors to assess their influence on the menstrual health and hygiene practices of the selected students.

Psychological factors

Psychological factors such as knowledge, attitude, beliefs, and self-efficacy are key drivers of behaviors related to menstrual hygiene. Lack of knowledge is associated with the emergence of many myths, such as the belief that menstruation is a taboo, curse, and punishment, which results in poor health practices (Belayneh & Mekuriaw, 2019). Self-efficacy, which can be described as the level of confidence individuals have regarding the management of menstruation, is also important in achieving success in MHM. For instance, research conducted in Ilorin, Kwara state, showed that before education was introduced, only 33.5% of adolescent girls possessed sufficient knowledge (Hunter et al., 2022). The study intends to determine the psychological determinants affecting MHM among students through the evaluation of their knowledge, attitudes, and self-efficacy.

Social Factors

Social determinants have a profound impact on MHM especially in rural areas like Shao, as behavior is affected by cultural and social factors in addition to available resources. For example, culture may stigmatize and discourage any discussions about menstruation, whereas poverty might make it difficult for girls to access affordable products used to maintain their hygiene and instead opt for cheaper substitutes such as rags and tissue papers. The school setting can also act as a social determinant of MHM, whereby factors such as access to water,

sanitation, and menstrual education affect MHM (Sharma et al., 2024). Within the setting of Shao, this study will examine the role of family, peers, culture, and school determinants in MHM.

Empirical Framework

Knowledge of Menstrual Hygiene

There is evidence of a variation in the knowledge of menstrual hygiene among adolescent schoolgirls in different developing countries. Nnennaya et al. (2021) studied 297 adolescent schoolgirls in Taraba State, Nigeria, and noted that 76.1% of the girls knew about menstruation before the onset of menarche, while 69.7% had good knowledge of menstrual hygiene. The most common sources of information for these girls included mothers (48.1%), teachers (17.8%), and friends (13.8%). On the other hand, Belayneh and Mekuriaw (2019) showed that 68.3% of 791 adolescent schoolgirls aged 10 to 19 years in southern Ethiopia lacked knowledge on menstruation since 51.8% viewed the menstrual cycle as a disease, and 50.2% considered it a lifelong problem. Only 27.7% of these girls learned about menstruation before menarche, while mothers (38.3%) and peers (16.3%) were the primary sources of information. A higher level of awareness was seen in secondary school students of Yogyakarta, Indonesia, in whom Amalia and Diniyah (2023) found 91.6% good knowledge, 8.3% adequate knowledge, and 0% insufficient knowledge. According to Panda et al. (2024), in Odisha, India, "46.9% of 921 females aged between 10 and 49 years never got information about menstrual cycle before their menarche, with mothers as the major source (74.3%), others being family member (8.9%), friends (7.8%), sister (4.7%), and teachers (4.2%)". Similarly, in Nigeria, Uzoechi et al. (2023), in their systematic review, point out that misconceptions persist among teenage girls regarding the notion that menstruation occurs due to evil spirits and can be stopped via rituals.

Attitudes towards Menstrual Hygiene

There are very negative attitudes towards menstrual hygiene in Sub-Saharan Africa, especially in Nigeria, which are influenced by culture and lack of knowledge about menstrual hygiene (Uzoechi et al., 2023). According to Aluko et al. (2024), in the comparative cross-sectional survey in Southwest Nigeria conducted in 2022, 42.6% of the girls were afraid of managing their menstruation hygienically due to fear of leakage and/or staining. Aluko et al. (2024) further added that among all the girls participating in the survey, the ones from private schools had more positive attitudes since 58.3% used pads during their menstruation, while those in public schools were 45.2%. Nnennaya et al. (2021) revealed that in the state of Taraba in Nigeria, even if 76.1% of girls knew about menstruation before their first period, still only 69.7% knew adequately about menstruation hygiene, which is due to incomplete information. There have been many such instances reported from other places in Nigeria where females think that evil spirits caused their periods, affecting their personal hygiene practices (Uzoechi et al., 2023). For instance, Agbede and Ekeanyanwu (2021) stated that only 28.7% of females were aware of menstrual hygiene practices in Ogun State, Nigeria. In Southern Ethiopia, Belayneh & Mekuriaw (2019) found that 51.8% of respondents associated menstruation with disease while 50.2% regarded it as a continuous event, influenced by cultural norms that discourage public discussion and create anxiety. Similarly, Harerimana et al. (2025) found that female students from high schools in South Africa felt embarrassed because of the lack of adequate sanitary facilities in their institutions. In Sub-Saharan Africa, the scarcity of menstrual hygiene education offered in only 39% of schools is one reason behind such negative attitudes (Uzoechi et al., 2023).

Menstrual Hygiene Practices

There is considerable diversity in menstrual hygiene practices among secondary school students in Sub-Saharan Africa due to financial and infrastructure challenges (Uzoechi et al., 2023). According to Anbesu and Asgedom (2023), the pooled prevalence of good menstrual hygiene management (MHM) practices among Sub-Saharan African secondary school girls is 45%, with Nigeria having 36%, which is relatively lower than Ethiopia (45%) and Ghana (48%). However, Nnennaya et al. (2021) revealed that about 57.58% of adolescent female students from Taraba State, Nigeria, practiced good MHM, although 42.8% used sanitary pads, while others used clean cloth (30.0%), old cloth (10.8%), toilet paper (8.8%), and cotton wool (7.7%). In addition, Uzoechi et al. (2023) observed that in West Africa, only 4.7% of Nigerian students practiced adequate MHM at schools, which

involved the use of sanitary pads and adequate sanitation facilities, while 45% practiced MHM using reusable and washable materials (42.2%). In South Ethiopia, Belayneh and Mekuriaw (2019) observed that 60.3% of adolescent girls practiced poor MHM practices, wherein 33.9% did not use sanitary pads, 42.4% used commercially made sanitary pads, and 23.7% used locally made products like dry cloth and sponge. However, 69.5% of the students maintained cleanliness in their private parts using water and soap (Belayneh & Mekuriaw, 2019).

Factors Influencing Menstrual Hygiene Practices

Several socio-economic and cultural factors affect menstrual hygiene behavior among female secondary school students in Sub-Saharan Africa, especially Nigeria (Uzoechi et al., 2023). According to Onubogu et al. (2024), high costs (36%), shame for buying pads (24.6%), shortage (18.5%), and ignorance of proper usage (16.8%) were some major challenges facing rural Anambra, Nigeria. Cultural belief systems also impact attitudes and misconceptions, whereby mothers were found to be the major informants – 48.1% of female secondary school students in Taraba State received information from their mothers, followed by teachers (17.8%) and friends (13.8%) (Nnennaya et al., 2021). Nevertheless, the validity of the information may not be adequate due to illiteracy and cultural beliefs held by mothers (Nnennaya et al., 2021). Only 27.7% of girls in the southern part of Ethiopia had been educated before menarche, where the mother and peers were the predominant source, suggesting that education was provided through non-formal means (Belayneh & Mekuriaw, 2019). Other risk factors associated with poor MHM practice include rural location, low levels of education, and belonging to the lowest socio-economic status (SES) quintile (Belayneh & Mekuriaw, 2019; Uzoechi et al., 2023), while poor MHM practices are prevalent among 78.6% of the population in Ethiopia (Belayneh & Mekuriaw, 2019; Uzoechi et al., 2023). Poor access to WASH infrastructure continues to be a key limitation in MHM practices (Tseole et al., 2022).

Conceptual Framework

This study rests on the assumption that the MHM behaviors of adolescent girls are influenced by several interconnected aspects, including knowledge, attitude, practice, and socio-environmental setting. As the literature review indicates, adequate knowledge of menstruation and MHM constitutes a key prerequisite for proper and safe menstrual behavior of girls. Lack of knowledge or misconception may lead to harmful practices, stigma, and a host of other issues that have negative effects on girls' health and education.

Attitude plays an important role in translating knowledge into practice. Girls' positive attitudes towards menstruation facilitate MHM, whereas their negative attitudes, reinforced by cultural taboos and stigmas, hamper the implementation of good MHM practices.

Practice, in its turn, which includes the use of proper menstrual hygiene products and facilities and safe disposal, determines the health consequences, such as reproductive tract infections. Finally, school environmental factors are recognized as important enabling factors. Access to clean water and sanitation facilities promotes MHM and increases attendance. On the other hand, poor infrastructure and the absence of menstrual education contribute to poor practice.

In addition, socio-demographic and situational moderators such as age, schooling, education of parents, and cultural beliefs also affect the relationship between knowledge, attitude, and practice. Education has proved to be beneficial in changing attitudes and knowledge levels towards improving the level of practice in the context of MHM.

Among all these constructs, the independent variable is knowledge and attitude, whereas practice is the dependent variable; the socio-cultural context of the school is an important moderator in this study. The biopsychosocial paradigm suggests that behaviors, including MHM, are products of biological, psychological, and sociological processes interacting with each other.

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METHODOLOGY

Study Design and Setting

The descriptive cross-sectional study was carried out in Shao, Moro Local Government Area (LGA), Kwara State, Nigeria. Shao is an ancient Yoruba city and the second largest in Moro Local Government Area (LGA), Kwara State, Nigeria. It is located about 12 kilometers northeast of Ilorin, the capital of Kwara State, Nigeria, and act as the focal point of socio-economic activity in the LGA. The population in the city is estimated at 60,000-70,000 inhabitants. The surrounding area is mainly rural, and agriculture is the primary livelihood. There are tropical savanna conditions characterized by mean annual temperatures of 34 °C, wet and dry seasons, and an average rainfall amount of 1,302 millimeters annually. The humidity level averages 70% with 88 dry days yearly. The soil fertility makes it possible to grow crops such as yams, maize, cassava, peanuts, and rice.

The educational system in Moro LGA is relatively developed as there are 156 government-funded primary schools located in various parts of the LGA. Secondary education is available in Shao, Tepatan, and Elekoyangan communities. There is a Bartholomew College of Health Technology in Shao that provides diplomas in various health disciplines. Students from the area do pursue tertiary education at Kwara State University, Malete, University of Ilorin, Ilorin, Kwara State College of Education, Ilorin and in other private tertiary education institutions in the state. The secondary schools in Shao have basic facilities for accessing water and sanitation. However, there are disparities in accessing clean water, private toilets, and menstrual hygiene management, among others, in secondary schools, especially the public schools.

The health services in Shao and the broader Moro LGA are delivered by a number of primary health centers, a general hospital in Bode Saadu, and private clinics, although there are few private health care facilities. Culturally, Shao is diverse in terms of ethnicity, with Yoruba being the primary language spoken followed by Hausa and Fulani languages. Some of the cultural activities practiced include festivals such as the Awonga festival and the traditional Alagbe Acrobatic Dance. The historical sites in the LGA include the wreckage of Mungo Park and Jebba Bridge. Menstrual hygiene management is becoming increasingly important as a public health issue in the region. Due to the cultural environment and inadequate health education, there is little knowledge about proper menstrual hygiene practices among adolescents. There is a heavy reliance on makeshift absorbents because sanitary pads are expensive and unavailable. In addition, menstrual health education is poorly implemented in schools, where it is only offered occasionally and inadequately. These issues may have adverse consequences for attendance at school and poor academic achievement for adolescent females. The semi-urban nature of Shao and the mixed educational facilities in place make the study location appropriate for examining the knowledge and practices of menstrual hygiene practices among female secondary school students.

Study Population and Eligibility Criteria

The study population involved females attending both public and private secondary schools in Shao town, located in Moro Local Government Area, Kwara State, Nigeria. The study participants were drawn from Senior Secondary School classes 1 to 3 (SS1 to SS3). This age category has been chosen since adolescence usually occurs among people at this age.

Eligible study participants included female secondary school students above 15 years old who were in attendance at the schools during the time of data collection and agreed to join the study by giving informed assent. However, for students younger than 18 years, the researcher additionally obtained parental consent. The selection of this age group was done to maintain consistency with the WHO definition of adolescence.

The students who were less than 15 years old or above 19 years old, or who had been absent from school for more than two weeks before the survey because of sickness, vacation, or any other reason, were disqualified. Moreover, students having any kind of medical condition affecting their menstrual cycle, such as hormonal imbalance or pregnancy, were not selected for the research. This helped in ensuring that the sample represented the actual target audience of adolescents and that the information gathered was valid.

Sample size determination

The minimum sample size for this study was determined using Cochran's formula as follows:

$$n = Z^2pq / d^2$$

Where n is the minimum sample size if the population is greater than 10,000, Z is the standard normal deviate at 95% confidence level, which is 1.96, p is the estimated proportion of students with good knowledge of menstrual hygiene from a previous study = 69.7% = 0.697 (Nnennaya et al., 2021*)*, q = (1 – p) = 0.303, and d is the margin of error of 5%. With the inclusion of 10% for non-response rate, the estimated sample size was calculated to be 323, which was adjusted to 350 for increased power. Hence, a final sample size of 350 was used for this study.

Sampling technique

A multistage sampling technique was used for this study comprising of the following stages:

Stage 1: Selection of Secondary School

Simple random sampling technique was used to select five (5) secondary schools in Shao, Moro LGA. The selected schools were GDSS, Shao, MCSSS, Shao, Omega College, Shao, ECWA SSS, Shao, and Adventist SSS, Shao.

Stage 2: Selection of Classes:

From the selected secondary schools, a simple random sampling by balloting without replacement was used to select two classes each in SS1 and SS2, and three classes in SS3. Proportionate allocation of sample size was done for the selected classes based on their student population sizes to maintain representativeness.

Stage 3: Selection of Students

A systematic sampling was used to select the respondents in each of the selected classes, using the class register as the sampling frame. The sampling interval was calculated by dividing the total number of students in each class by the proportionate sample size allocated to the class. The first participant was chosen through simple random sampling by balloting, and thereafter, respondents were selected at equal intervals until the desired sample size for each class is obtained.

Instrument and Method of Data Collection

A pretested, validated, semi-structured interviewer-administered questionnaire was used for this study. The questionnaire was developed using information obtained from relevant literature and previous studies, and it comprises of five sections:

Section A: Socio-demographic information

Section B: Knowledge regarding menstrual hygiene among female secondary school students

Section C: Menstrual hygiene practices among female secondary school students

Section D: Attitudes towards menstrual hygiene among female secondary school students

Section E: Factors influencing menstrual hygiene practices among female secondary school students

The content validity of the questionnaire was established through review by a public health expert and an obstetrician and Gynaecologist. The questionnaire was written in English and translated into Yoruba, which is the local language of the majority of the students, for ease of administration. The completed questionnaires were

back-translated into English for analysis. A pretest of the instrument was carried out among 35 female secondary school students (representing 10% of the projected sample size) at Government Day Secondary School, Karuma, Ilorin East Local Government Area, Kwara State, and the reliability of the full questionnaire was measured using Cronbach's alpha, which was found to be 0.81. The goal of the pretest was to evaluate the structure, accuracy, language clarity, respondent comprehension, and ease of administration of the instrument. The responses and feedback obtained during the pretest phase informed necessary adjustments to refine the questionnaire and eliminate ambiguities. The pretested questionnaire was analyzed, and necessary corrections were made before it was used for the main study.

The data collection was carried out by six trained research assistants, who were each assigned to cover one class at a time for the conduct of face-to-face interviews with the students. Before data collection began, each respondent was briefed on the purpose, scope, and voluntary nature of the study. Students who could complete the questionnaire on their own (especially those in higher classes of SS2 and SS3) were encouraged and guided to do so. The data collection lasted for a period of four weeks from June to August 2025, with each research assistant taking about 15-20 minutes to complete the filling of the questionnaire for one respondent.

Data Management and Analysis

The returned questionnaires were then sorted, classified, and checked for completeness. Incomplete questionnaires were not included in the analysis process. Data were entered, cleaned, and analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize sociodemographic characteristics, knowledge, attitude, and practice scores. Knowledge, attitude, and practice were categorized as good/adequate or poor/inadequate based on mean and cutoff scores.

Bivariate analysis was performed using chi-square tests to examine associations between sociodemographic and menstrual characteristics and the outcomes of knowledge, practice, and attitude. Binary logistic regression model was used to identify independent predictors of good menstrual hygiene practice. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were reported, and statistical significance was set at $p<0.05$. Model fit was assessed using the Hosmer-Lemeshow test. The scoring and grading of variables were done as follows:

Knowledge of Menstrual Hygiene

Knowledge was assessed using a set of structured items with a 3-point response scale: Yes = 1, No = 0, I don't know = 0. Each correct response was awarded one mark, while incorrect responses and "I don't know" were scored zero. The total knowledge score was converted to a percentage for each respondent. Knowledge was categorized as good if the score was ≥50% and poor if <50%.

Attitude Toward Menstrual Hygiene

Attitude was assessed using dichotomous statements, with positive attitudes scored as one and negative attitudes as zero. The total attitude score was summed and converted to a percentage. Attitude was classified as positive if the score was ≥60% and negative if <60%.

Practice of Menstrual Hygiene

Practice was measured using dichotomous items with responses coded as Yes = 1 and No = 0. Each appropriate practice was awarded one mark, while inappropriate practices were scored zero. The total score was expressed as a percentage. Practice was graded as good (≥80%), fair (60–79%), and poor (<60%). This three-tier grading reflects varying levels of adherence to recommended menstrual hygiene practices.

RESULTS

In this study, three hundred and fifty questionnaires were distributed to the respondents, all of which were completed and returned, giving a response rate of 100%.

Sociodemographic Characteristics of respondents

Table 1 showed that the mean age of the participants was 16.97±1.73 years, whereby most of the participants were adolescents who ranged between 15 and 18 years old (78.9%). Most of the respondents lived with their parents (71.1%), while others either lived with relatives or other people. Religion was mainly Islamic (60%) followed by Christian (36.6%) and traditional (3.4%). With respect to birth order, most of the students were middleborn (42.3%), while firstborns comprised about one-third (32%). The majority of the respondents attended public schools (71.4%). Parental education levels were fairly high since almost half of the fathers (48.9%) and over two-thirds of the mothers (41.7%) had higher education. Almost two-thirds of the respondents belonged to monogamous families (66%). About half of the female students (53.4%) began menarche between 12 and 15 years old, and about eighty percent of them had regular menstrual cycles. Most of the participants had a family history of dysmenorrhea (55.7%), and about two-thirds had menstrual cramps (68.6%). Duration of menstruation among the respondents was four to five days (50.3%).

Table 1: Sociodemographic characteristics of female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Sociodemographic Characteristics		Frequency	Percentage (%)
Age group (years)	15-18	276	78.9
	19-22	74	21.1
	Mean±SD	16.97 ± 1.73	
Who are you living with	Parent	249	71.1
	Relative	71	20.3
	Other	30	8.6
Religion	Islam	210	60.0
	Christianity	128	36.6
	Traditional	12	3.4
Birth order:	First born	112	32.0
	Middle born	148	42.3
	Last born	56	16.0
	Only born	34	9.7
Secondary school	Public school	250	71.4
	Private school	100	28.6
Father’s educational status:	No education	44	12.6
	Primary	42	12.0
	Secondary	93	26.6
	Tertiary	171	48.9
Mother’s educational status:	No education	60	17.1
	Primary	47	13.4
	Secondary	97	27.7
	Tertiary	146	41.7

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Family type	Monogamous	231	66.0
	Polygamous	119	34.0
Age at first menstruation	Below 12 years	98	28.0
	12-15 years	187	53.4
	Above 15 years	65	18.6
Regularity of menstruation	Regular	280	80.0
	Irregular	70	20.0
Family history of dysmenorrhea (severe pain during menstruation)	Yes	195	55.7
	No	155	44.3
Duration of menstrual flow	Less than 4 days	103	29.4
	4-5 days	176	50.3
	6-7 days	42	12.0
	More than 7 days	29	8.3
Do you experience pain during menstruation:	Yes	240	68.6
	No	110	31.4

Knowledge regarding menstrual hygiene

Menstrual hygiene knowledge was relatively positive (Figure 1) because close to two-thirds of the study participants had an overall good knowledge of menstrual hygiene (60.6%). The majority of them were able to identify menstruation as a physiological process peculiar to females (78.6%), and most people acknowledged that menstruation is not a lifelong experience (60%). There were still some misconceptions, such as those that linked menstruation to pregnancy (61.1%). Only one out of five respondents knew that menstrual bleeding originates from the uterus (22.6%). On the other hand, more than half of them associated menstrual bleeding with hormones (54.3%). As for menstrual cycles and duration of menstrual bleeding, about 51.1% of respondents had erroneous beliefs regarding the average menstrual cycle, stating that it is between 15-20 days long, while only 44.6% stated the correct period from 21-35 days long. Regarding the duration of menstrual bleeding, 40.9% answered with the normal range of 4-5 days. as shown in Table 2.

Table 2: Knowledge of menstrual hygiene among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Knowledge Variables		Frequency	Percentage (%)
Is menstruation a normal physiological phenomenon that is unique to females?	Yes	275	78.6
	No	75	21.4
Is menstruation a lifelong process?	Yes	140	40.0
	No	210	60.0
Is menstruation a sign of conception?	Yes	214	61.1
	No	136	38.9
Has menstruation got a foul smell?	Yes	155	44.3

	No	195	55.7
Is menstruation not a pathological condition?	Yes	203	58.0
	No	147	42.0
What is the source of menstrual bleeding?	Abdomen	20	5.7
	Bladder	22	6.3
	Uterus	79	22.6
	Vagina	229	65.4
What is the cause of menstrual bleeding?	Hormonal	190	54.3
	Curse	18	5.1
	Diseases	43	12.3
	Others	99	28.3
What is the normal duration of the menstrual cycle?	15-20 days	179	51.1
	21-35 days	156	44.6
	>35 days	15	4.3
What is the normal duration of menstrual bleeding?	0-3 days	94	26.9
	4-5 days	143	40.9
	6-7 days	74	21.1
	>7 days	39	11.1
How much is the menstrual blood loss during one menstrual cycle?	<20 ml	120	34.3
	20-80 ml	192	54.9
	> 80 ml	38	10.9
When a girl has emotional and physical symptoms before or during her period, is it called premenstrual syndrome (PMS)?	Yes	272	77.7
	No	78	22.3
Do many girls have cramps during their period, especially in the first few days?	Yes	266	76.0
	No	84	24.0
Should girls be excused from sporting activities during their periods?	Yes	226	64.6
	No	124	35.4
Should sanitary pads be used and regularly changed during menstruation?	Yes	298	85.1

	No	52	14.9
Should external genitalia be cleaned properly during menstruation?	Yes	292	83.4
	No	58	16.6
Should sanitary pads be disposed of in a dustbin by wrapping them with paper?	Yes	171	48.9
	No	179	51.1

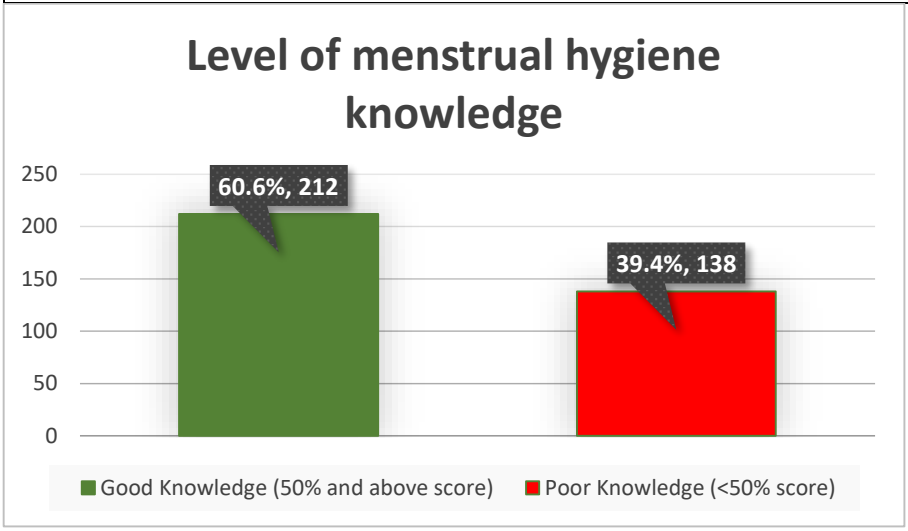

Figure 1: Overall level of menstrual hygiene knowledge among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Practices of menstrual hygiene among respondents

The level of menstrual hygiene practice was moderate, though with some deficiencies. Figure 2 illustrates that over one-third (143; 40.9%) of the study subjects exhibited good menstrual hygiene practice, almost one-third (34.3%) had average practice, while slightly above one-quarter (24.9%) exhibited poor practice. In Table 3, it can be seen that most participants used absorbent materials during menses (72.9%), and most changed pads and clothes more than thrice a day (70%). They maintained good hygiene since most washed their genitals frequently (85.7%) and bathed each day using soap (83.7%). Consistent use of commercial sanitary pads was exhibited by more than two thirds (68.6%) of the students, but more than half (60%) still dispose used sanitary pads on the floor instead of dustbins. Most subjects cleaned clothes using soap (81.1%) and sun dried their clothes (64.3%).

Table 3: Menstrual hygiene practices among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Practice variables	Yes n (%)	No n (%)
Do you always use absorbent materials during your menstrual flow?	255 (72.9)	95 (27.1)
Do you always use commercially made sanitary pads during your menstruation period?	240 (68.6)	110 (31.4)
Do you change pads or clothes more than three times a day during menstruation?	245 (70.0)	105 (30.0)
Do you use clean clothes and wash with soap and water during your menstrual bleeding?	284 (81.1)	66 (18.9)
Do you commonly dry sanitary clothes in sunlight?	225 (64.3)	125 (35.7)

Do you frequently clean your external genitalia during menstruation?	300 (85.7)	50 (14.3)
Do you dispose of the pads by wrapping them with paper?	156 (44.6)	194 (55.4)
Do you wash/bathe daily with soap during menstruation?	293 (83.7)	57 (16.3)
Do you always clean external genitalia with water and soap during menstruation?	271 (77.4)	79 (22.6)
Do you dispose used sanitary pads in a dustbin?	140 (40.0)	210 (60.0)

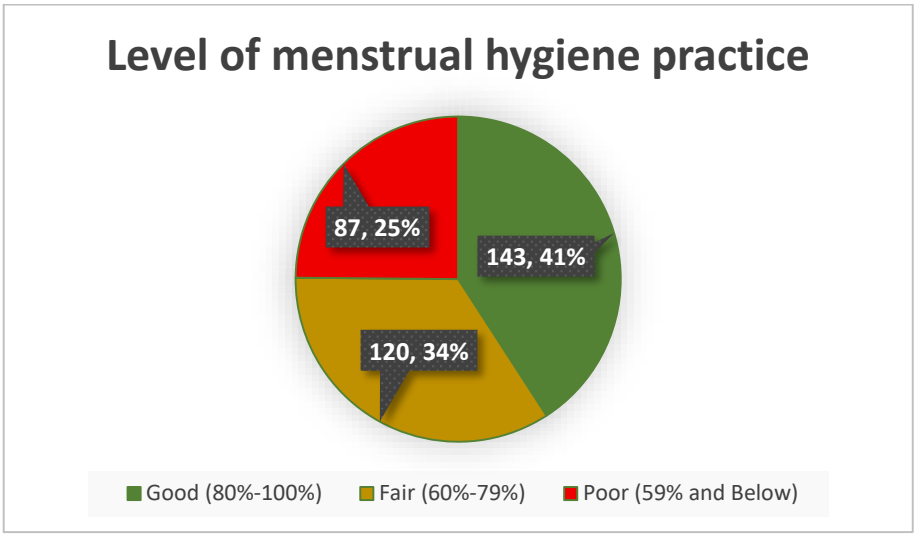

Figure 2: Overall level of menstrual hygiene practice among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Attitudes towards menstrual hygiene among respondents

Perceptions regarding menstrual hygiene tended to be negative (Figure 3). The majority of participants demonstrated a negative attitude towards menstrual hygiene (76.3%). Nevertheless, slightly more than half the participants believed they could manage their menstrual hygiene well when in school (61.1%). Similarly, more than half believed their education on menstrual hygiene was adequate (66.9%). Nonetheless, there were indications of social and psychological barriers. More than half felt uneasy talking to peers or teachers about menstruation (52%) and changing menstrual hygiene products at school (58.3%). Additionally, nearly half of them were either ashamed or embarrassed to buy or carry menstrual products (48.3%). Less than half found their teachers approachable enough for matters concerning menstrual hygiene (53.1%) as seen in Table 4.

Table 4: Attitudes towards menstrual hygiene among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Attitude Statement	Agree n (%)	Disagree n (%)	Undecided n (%)
I feel confident in managing my menstrual hygiene effectively at school.	214 (61.1)	121 (34.6)	15 (4.3)
I feel comfortable discussing menstrual hygiene with my friends or teachers.	129 (36.9)	182 (52)	39 (11.1)

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I believe it is normal to miss school due to discomfort or lack of menstrual hygiene resources.	179 (51.1)	134 (38.3)	37 (10.6)
I feel embarrassed or shy about buying or carrying menstrual hygiene products.	169 (48.3)	147 (42.0)	34 (9.7)
Learning about menstrual hygiene in school has helped me feel more prepared to manage my periods.	234 (66.9)	86 (24.6)	30 (8.6)
I have access to enough information about different menstrual hygiene products (e.g., pads, tampons, menstrual cups)	246 (70.3)	79 (22.6)	25 (7.1)
I feel comfortable changing menstrual hygiene products during school hours.	111 (31.7)	204 (58.3)	35 (10.0)
I feel that my teachers are approachable when I need help or advice about menstrual hygiene	186 (53.1)	138 (39.4)	26 (7.4)

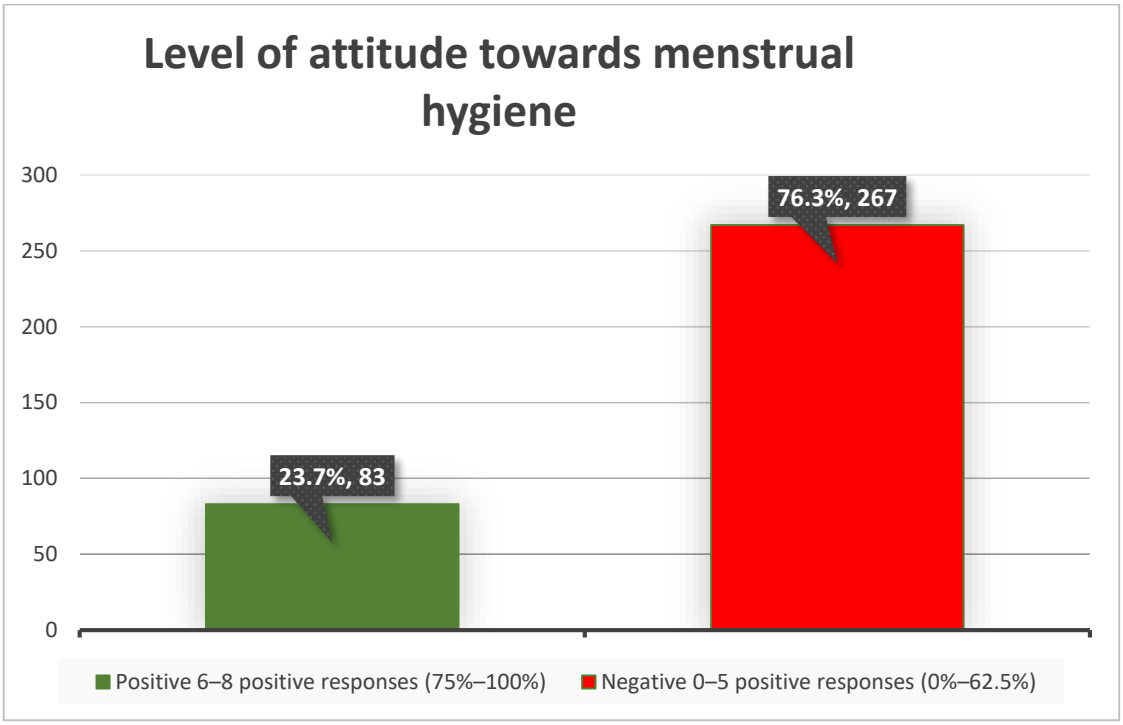

Figure 3: Overall level of attitude towards menstrual hygiene among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Factors influencing menstrual hygiene practices

Table 5 shows that several socio-environmental variables have been identified as being obstacles to MHM among girls. Lack of privacy in school toilets was cited by most participants as being problematic in managing menstruation (70.9%), while the majority also reported lack of appropriate toilets in schools as posing challenges to MHM (70%). Health education classes proved useful to most participants in terms of promoting MHM (70.3%). Family beliefs have played an important role in MHM, since half the sample reported that such beliefs affect their menstrual practices (61.1%), while also more than half indicated that shame makes them reluctant to seek assistance or advice (61.1%). More than half the sample was affected by friends' beliefs regarding menstruation (53.4%). For most girls, financial problems have hindered their MHM practices because of the costs associated with sanitary pads (49.4%). Almost two-thirds of participants lack proper information on menstruation (64.9%).

Table 5: Perceived factors influencing menstrual hygiene practices among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Factors statements	Agree n (%)	Disagree n (%)	Undecided n (%)
The cost of sanitary pads affects whether one use them.	173 (49.4)	136 (38.9)	41 (11.7)
Family's beliefs about menstruation influence how menstruation is managed	214 (61.1)	104 (29.7)	32 (9.1)
Lack of proper toilets at school makes it hard for female student to maintain hygiene during their period	245 (70.0)	67 (19.1)	38 (10.9)
There is lack of adequate information about how to take care of oneself during menstruation	227 (64.9)	96 (27.4)	27 (7.7)
Friends' opinions affect how menstruation is handled by female student.	187 (53.4)	131 (37.4)	32 (9.1)
Female students feel embarrassed to ask for help or advice about menstrual hygiene.	214 (61.1)	107 (30.6)	29 (8.3)
Health education classes at school have helped female students improve their menstrual hygiene practices.	246 (70.3)	78 (22.3)	26 (7.4)
Lack of privacy in school restrooms makes it difficult to manage my menstrual hygiene.	248 (70.9)	68 (19.4)	34 (9.7)

Relationship between the sociodemographic characteristics and the Overall Level of Knowledge related to Menstrual Hygiene

From Table 6, the results indicate that the level of knowledge about menstrual hygiene had a significant relationship with a number of sociodemographic variables. The age, religion, birth order, secondary school type, education levels of both parents, consistency of periods, and period duration were found to have a statistically significant relationship with the level of knowledge. Private secondary school students, those whose parents were educated at the tertiary level, and students with consistent menstrual periods had more knowledge. The null hypothesis was consequently rejected.

Table 6: Association between the sociodemographic characteristics and the overall level of knowledge of menstrual hygiene among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Sociodemographic variables		Level of knowledge			
		Good n (%)	Poor n (%)	χ^2	p-value
Age group (years)	15-18	179 (64.9)	97 (35.1)	10.03	0.002*
	19-22	33 (44.6)	41 (55.4)		
Who are you living with	Parent	158 (63.5)	91 (36.5)	3.0	0.223

	Relative	38 (53.5)	33 (46.5)		
	Other	16 (53.3)	14 (46.7)		
Religion	Islam	131 (62.4)	79 (37.6)	6.65	0.036 *
	Christianity	78 (60.9)	50 (39.1)		
	Traditional	3 (25.0)	9 (75.0)		
Birth order:	First born	73 (65.2)	39 (34.8)	10.69	0.014 *
	Middle born	94 (63.5)	54 (36.5)		
	Last born	33 (58.9)	23 (41.1)		
	Only born	12 (35.3)	22 (64.7)		
Secondary school	Public school	140 (56.0)	110 (44.0)	7.66	0.006 *
	Private school	72 (72.0)	28 (28.0)		
Father's educational status:	No education	23 (52.3)	21 (47.7)	17.64	<0.0001
	Primary	14 (33.3)	28 (66.7)		
	Secondary	62 (66.7)	31 (33.3)		
	Tertiary	113 (66.1)	58 (33.9)		
Mother's educational status:	No education	30 (50.0)	30 (50.)	18.69	<0.0001
	Primary	19 (40.4)	28 (59.6)		
	Secondary	58 (59.8)	39 (40.2)		
	Tertiary	105 (71.9)	41 (28.1)		
Family type	Monogamous	149 (64.5)	82 (35.5)	4.4	0.036 *
	Polygamus	63 (52.9)	56 (47.1)		
Age at first menstruation	Below 12 years	58 (59.2)	40 (40.8)	5.29	0.071

	12-15 years	122 (65.2)	65 (34.8)		
	Above 15 years	32 (49.2)	33 (50.8)		
Regularity of menstruation	Regular	186 (66.4)	94 (33.6)	20.11	<0.0001
	Irregular	26 (37.1)	44 (62.9)		
Family history of dysmenorrhea (severe pain during menstruation):	Yes	113 (57.9)	82 (42.1)	1.27	0.155
	No	99 (63.9)	56 (36.1)		
Duration of menstrual flow	0-3 days	54 (52.4)	49 (47.6)	15.69	0.001*
	4-5 days	123 (69.9)	53 (30.1)		
	6-7 days	24 (57.1)	18 (42.9)		
	More than 7 days	11 (37.9)	18 (62.1)		
Do you experience pain during menstruation:	Yes	148 (61.7)	92 (38.3)	0.38	0.307
	No	64 (58.2)	46 (41.8)		

*Significant at $p < 0.05$; χ^2 = Chi-square; df=3

Relationship between the sociodemographic characteristics and Overall Menstrual hygiene practice

From Table 7 findings, it is evident that menstrual hygiene behavior was statistically affected by guardian of the respondents, religious affiliation, education level of parents, regularity of menstruation, family history of dysmenorrhea, duration of flow, and occurrence of menstrual pain. Respondents who lived with their parents, whose parents had an education level, had regular menstrual cycles without excessive bleeding, and did not suffer from menstrual pain had higher compliance rates. The null hypothesis was therefore rejected, indicating that sociodemographic characteristics affect menstrual hygiene behavior.

Table 7: Association between the sociodemographic characteristics and Overall Menstrual hygiene practice among female secondary school students in Shao, Moro LGA,

Kwara State (N=350)

Sociodemographic variables		**Level of practice**				
		Good n (%)	Fair n (%)	Poor n (%)	χ^2	p-value
Age group (years)	15-18	116 (42.0)	98 (35.5)	62 (22.5)	4.02	0.134

	19-22	27 (36.5)	22 (29.7)	25 (33.8)		
Who are you living with	Parent	113 (45.4)	90 (36.1)	46 (18.5)	25.37	<0.001
	Relative	23 (32.4)	24 (33.8)	24 (33.8)		
	Other	7 (23.3)	6 (20.0)	17 (56.7)		
Religion	Islam	90 (42.9)	78 (37.1)	42 (20.0)	11.91	0.018
	Christianity	51 (39.8)	39 (30.5)	38 (29.7)		
	Traditional	2 (16.7)	3 (25.0)	7 (58.3)		
Birth order	First born	47 (42.0)	44 (39.3)	21 (18.8)	12.36	0.054
	Middle born	65 (43.9)	48 (32.4)	35 (23.6)		
	Last born	21 (37.5)	20 (35.7)	15 (26.8)		
	Only born	10 (29.4)	8 (23.5)	16 (47.1)		
Secondary school	Public school	108 (43.2)	79 (31.6)	63 (25.2)	3.06	0.217
	Private school	35 (35.0)	41 (41.0)	24 (24.0)		
Father’s educational status	No education	16 (36.4)	12 (27.3)	16 (36.4)	48.91	<0.001
	Primary	9 (21.4)	7 (16.7)	26 (61.9)		
	Secondary	43 (46.2)	42 (45.2)	8 (8.6)		
	Tertiary	75 (43.9)	59 (34.5)	37 (21.6)		
Mother’s educational status	No education	21 (35.0)	16 (26.7)	23 (38.3)	50.26	<0.001
	Primary	9 (19.1)	11 (23.4)	27 (57.4)		
	Secondary	53 (54.6)	35 (36.1)	9 (9.3)		
	Tertiary	60 (41.1)	58 (39.7)	28 (19.2)		
Family type	Monogamous	100 (43.3)	79 (34.2)	52 (22.5)	2.49	0.288
	Polygamus	43 (36.1)	41 (34.5)	35 (29.4)		

Age at first menstruation	Below 12 years	49 (50.0)	30 (30.6)	19 (19.4)	6.43	0.17
	12-15 years	67 (35.8)	66 (35.3)	54 (28.9)		
	Above 15 years	27 (41.5)	24 (36.9)	14 (21.5)		
Regularity of menstruation	Regular	121 (43.2)	102 (36.4)	57 (20.4)	15.18	0.001
	Irregular	22 (31.4)	18 (25.7)	30 (42.9)		
Family history of dysmenorrhea	Yes	92 (47.2)	60 (30.8)	43 (22.1)	7.29	0.026
	No	51 (32.9)	60 (38.7)	44 (28.4)		
Duration of menstrual flow	0-3 days	62 (60.2)	21 (20.4)	20 (19.4)	50.6	<0.001
	4-5 days	63 (35.8)	78 (44.3)	35 (19.9)		
	6-7 days	16 (38.1)	12 (28.6)	14 (33.3)		
	More than 7 days	2 (6.9)	9 (31.0)	18 (62.1)		
Do you experience pain during menstruation	Yes	106 (44.2)	91 (37.9)	43 (17.9)	18.78	<0.001
	No	37 (33.6)	29 (26.4)	44 (40)		

*Significant at $p < 0.05$; χ^2 = Chi-square; df=3

Relationship between the sociodemographic characteristics and attitude towards menstrual hygiene

According to Table 8, attitude towards menstrual hygiene showed significant association with the guardian of the respondent, type of family, regularity of menstruation, and family history of dysmenorrhea. Respondents staying with their parents, hailing from monogamous families, having regular cycles, and lacking family history of dysmenorrhea were likely to exhibit a more positive attitude towards menstrual hygiene. Therefore, the null hypothesis was rejected.

Table 8: Association between the sociodemographic characteristics and attitude towards menstrual hygiene among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Sociodemographic Characteristics			**Level of Attitude**			
			Positive n (%)	Negative n (%)	χ^2	p-value
Age group (years)	15-18		64 (23.2)	212 (76.8)	0.2	0.379
	19-22		19 (25.7)	55 (74.3)		
Who are you living with	Parent		70 (28.1)	179 (71.9)	9.42	0.009

	Relative	10 (14.1)	61 (85.9)		
	Other	3 (10.0)	27 (90.0)		
Religion	Islam	55 (26.2)	155 (73.8)	2.77	0.251
	Christianity	27 (21.1)	101 (78.9)		
	Traditional	1 (8.3)	11 (91.7)		
Birth order	First born	28 (25.0)	84 (75.0)	3.52	0.319
	Middle born	35 (23.6)	113 (76.4)		
	Last born	16 (28.6)	40 (71.4)		
	Only born	4 (11.8)	30 (88.2)		
Secondary school	Public school	58 (23.2)	192 (76.8)	0.13	0.41
	Private school	25 (25.0)	75 (75.0)		
Father's educational status	No education	8 (18.2)	36 (81.8)	3.71	0.295
	Primary	6 (14.3)	36 (85.7)		
	Secondary	25 (26.9)	68 (73.1)		
	Tertiary	44 (25.7)	127 (74.3)		
Mother's educational status	No education	14 (23.3)	46 (76.7)	5.57	0.134
	Primary	5 (10.6)	42 (89.4)		
	Secondary	27 (27.8)	70 (72.2)		
	Tertiary	37 (25.3)	109 (74.7)		
Family type	Monogamous	64 (27.7)	167 (72.3)	5.98	0.014
	Polygamous	19 (16.0)	100 (84.0)		
Age at first menstruation	Below 12 years	22 (22.4)	76 (77.6)	0.71	0.702
	12-15 years	43 (23.0)	144 (77.0)		
	Above 15 years	18 (27.7)	47 (72.3)		
Regularity of menstruation	Regular	74 (26.4)	206 (73.6)	5.7	0.01
	Irregular	9 (12.9)	61 (87.1)		
Family history of dysmenorrhea	Yes	35 (17.9)	160 (82.1)	8.09	0.003
	No	48 (31.0)	107 (69.0)		
Duration of menstrual flow	0-3 days	28 (27.2)	75 (72.8)	2.82	0.42
	4-5 days	43 (24.4)	133 (75.6)		
	6-7 days	8 (19.0)	34 (81.0)		
	More than 7 days	4 (13.8)	25 (86.2)		
Do you experience pain during menstruation	Yes	58 (24.2)	182 (75.8)	0.086	0.44
	No	25 (22.7)	85 (77.3)		

*Significant at $p < 0.05$; χ^2 = Chi-square; df=2

Predictors of good menstrual hygiene practice.

Table 9 shows the results of the binary logistic regression analysis examining factors independently associated with good menstrual hygiene practice. Living with parents was a significant independent predictor, with students living with parents being 2.34 times more likely to practice good menstrual hygiene compared to those not living with parents (AOR = 2.34, 95% CI 1.45–3.78, p = 0.001). Tertiary maternal education was also significantly associated with good practice. Students whose mothers had tertiary education had 1.89 times higher odds of good menstrual hygiene practice than those whose mothers had secondary education or below (AOR = 1.89, 95% CI 1.12–3.19, p = 0.017).

Regular menstruation and absence of dysmenorrhea were significant biological predictors. Students with regular menstrual cycles were 2.11 times more likely to practice good menstrual hygiene (AOR = 2.11, 95% CI 1.23–3.62, p = 0.007), and those without dysmenorrhea had 1.76 times higher odds (AOR = 1.76, 95% CI 1.08–2.87, p = 0.024). School type was not a significant predictor after adjustment (AOR = 1.32, 95% CI 0.92–1.89, p = 0.120). The model demonstrated good fit based on the Hosmer-Lemeshow test (p = 0.43).

Table 9. Binary logistic regression analysis of factors associated with good menstrual hygiene practice among female secondary school students in Shao, Moro LGA, Kwara State (N=350)

Variable	Category	AOR	95% CI	p-value
Guardian	Living with parents	2.34	1.45–3.78	0.001*
Guardian	Not living with parents	Ref	-	-
Maternal education	Tertiary	1.89	1.12–3.19	0.017*
Maternal education	Secondary or below	Ref	-	-
School type	Private	1.32	0.92–1.89	0.120
School type	Public	Ref	-	-
Menstrual regularity	Regular	2.11	1.23–3.62	0.007*
Menstrual regularity	Irregular	Ref	-	-
Dysmenorrhea	Absent	1.76	1.08–2.87	0.024*
Dysmenorrhea	Present	Ref	-	-

AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference category. The reference category has an odds ratio of 1.00 and is not tested.

Model adjusted for guardian, maternal education, school type, menstrual regularity, and dysmenorrhea. Hosmer-Lemeshow test p = 0.43, indicating good model fit.

DISCUSSION

The biopsychosocial framework clarifies how biological factors such as menstrual regularity and dysmenorrhea directly affect comfort and hygiene practices, while psychological factors like knowledge, self-efficacy, and shame shape attitudes. Social factors including school WASH facilities, parental education, and cultural norms create the environment in which these behaviors occur. In Shao, poor infrastructure and stigma interact with

limited knowledge to sustain suboptimal practices, illustrating the need for multi-level interventions that address all three domains simultaneously.

The sociodemographic characteristics reported in this study are comparable to those of other studies conducted on Nigerian adolescents residing in rural areas. An average age of 16.97±1.73 years and an age at menarche of 12–15 years in 53.4% of the participants is in keeping with the ages reported in Taraba and Ogun States (Nnennaya et al., 2021; Agbede & Ekeanyanwu, 2021) as well as with the average age of menarche in Sub-Saharan Africa (Anbesu & Asgedom, 2023). Dysmenorrhea, which affects more than half of the respondents, is similarly prevalent among Ethiopian and Ghanaian adolescents (Belayneh & Mekuriaw, 2019; Mohammed & Larsen-Reindorf, 2020).

There was uneven knowledge regarding menstrual hygiene. Although 78.6% correctly understood that menstruation is a physiological phenomenon, 61.1% believed that it is related to conception, and merely 22.6% correctly stated that the uterus is the origin of menstrual bleeding. Likewise, similar levels of knowledge existed in Ogun State; only 28.7% of adolescents showed satisfactory levels of knowledge, and myths like menstruation being a punishment by God remained prevalent (Agbede & Ekeanyanwu, 2021). Knowledge that menstruation occurs due to hormone fluctuations (54.3%) is better than that revealed in Ethiopia; there, misconceptions included curses and diseases (Belayneh & Mekuriaw, 2019). In summary, 60.6% exhibited good knowledge levels, which is comparable to the 61.22% found amongst senior high school students in Ghana (Appiah-Agyekum et al., 2025) and better than the 58.7% among Nigerian adolescents (Eze et al., 2023).

The practices relating to menstrual hygiene were moderately good. The majority of participants used absorbent materials (72.9%), which is consistent with the trends observed in urban Nigeria and Ethiopia (Belayneh & Mekuriaw, 2019; Nnennaya et al., 2021; Sahiledengle et al., 2022). Nonetheless, the percentage of those who always used commercial sanitary pads was lower at 31.4%, due to the financial constraints experienced similarly in Taraba State, where the percentage was 42.8% (Nnennaya et al., 2021). Additionally, the majority of participants changed absorbents more than thrice daily (70%) and washed their private parts frequently (85.7%), which is higher than that in rural Anambra, where the majority of girls change their pads either twice daily or fewer (Onubogu et al., 2024).

The attitude towards menstrual hygiene was mostly negative (76.3%). While most respondents felt confident about handling MHM during school, they experienced shame when discussing the topic and buying menstrual hygiene products, a result of ongoing sociocultural stigma among teenage girls. Some of the main challenges include limited privacy in the toilet (70.9%) and the high price of menstrual hygiene products (49.4%), which is similar to results found in Sub-Saharan Africa because of limited school WASH facilities (Sharma et al., 2024). The socio-cultural aspect, such as beliefs from family and peers, influenced the MHM practices of most respondents.

Sociodemographic characteristics showed significant relationships with knowledge, practice, and attitude. Knowledge was found to be significantly related to age, religion, birth order, school type, parents' educational level, menstrual regularity, and period. Practice had significant relationships with guardian, religion, parents' educational level, menstrual regularity, family history of dysmenorrhea, period, and pain. Attitude was significantly associated with guardian, family structure, menstrual regularity, and family history of dysmenorrhea. The finding that only 40.9% of students had good menstrual hygiene practice despite 60.9% having adequate knowledge mirrors patterns reported in Taraba and Ogun States, where knowledge does not automatically translate into practice due to economic and infrastructural constraints. This disconnect underscores the limitation of information-only interventions and supports the need for structural changes such as free pad distribution and improved school sanitation, as recommended by UNICEF for Sub-Saharan Africa. Moreover, the high prevalence of negative attitudes toward menstruation in Shao aligns with evidence from Ethiopia and South Africa, where stigma and embarrassment hinder help-seeking and product use. Integrating peer-led education and involving male teachers and parents in sensitization, as piloted in Ghana, may reduce shame and improve communication about menstrual health in rural Nigerian schools.

In terms of socio-demographic influences, this study revealed that parental education and school type likely influence menstrual hygiene knowledge and practice by shaping access to information and resources. Students

in private schools and those with tertiary-educated parents had higher knowledge scores, consistent with findings that parental literacy improves health communication at home. Regular menstruation and lower menstrual pain may reduce anxiety and facilitate better hygiene practices, whereas irregular cycles and dysmenorrhea increase discomfort and avoidance behaviors, as seen in Ethiopia. Living with parents also emerged as a protective factor for practice and attitude. Parental presence may provide material support for sanitary products and a safer space for discussing menstruation, reducing stigma. These patterns suggest that interventions targeting parents and guardians could amplify school-based efforts.

The logistic regression analysis identified household support and menstrual health status as independent predictors of good menstrual hygiene practice. Students living with parents had more than twice the odds of good practice compared to those in non-parental care. This likely reflects both material support for menstrual products and the presence of a trusted adult for guidance, which reduces embarrassment and improves access to information. The finding aligns with studies in Ethiopia and Ghana where parental presence was linked to better MHM outcomes, and it underscores the need for targeted support for students living with relatives, guardians, or in hostels.

Maternal education also remained significant after adjustment. Adolescents with mothers who attained tertiary education were nearly twice as likely to practice good menstrual hygiene, suggesting that maternal literacy enhances health communication at home and reduces reliance on myths. This is consistent with evidence from Nigeria and sub-Saharan Africa showing that parental education is a stronger determinant of adolescent health behaviors than school type alone. Regular menstruation and absence of dysmenorrhea were additional independent predictors. Pain-free, predictable cycles likely reduce anxiety and facilitate consistent hygiene routines, while dysmenorrhea may lead to avoidance of changing pads frequently due to discomfort and absenteeism. These results indicate that clinical management of menstrual pain should be integrated into school health programs alongside education and WASH interventions.

Taken together, the model suggests that interventions in Shao should prioritize two groups: students not living with parents and those experiencing dysmenorrhea. Providing free or subsidized menstrual supplies, peer support, and on-site pain management education in public schools could close the practice gap even where knowledge is already moderate.

Limitations, Mitigation Steps and Suggestions for Future Studies

Some limits can be identified as being associated with this study. First, the cross-sectional nature of the design means that knowledge, practices, and perceptions were assessed only once, and, therefore, no causal relationship can be established from the findings. Moreover, the use of self-reporting in this work allows for the influence of social desirability bias because people tend to report things they think would be more socially acceptable to say rather than their true behavior. Finally, the limitation of using secondary school students in one local government area restricts the generalization of results beyond the scope of that region.

To lessen the effects of these constraints, the process of data gathering involved the use of structured questionnaires, which provided uniformity in terms of consistency and clarity in responses, ensuring that respondents remained anonymous throughout the data-gathering stage in order to promote honesty. The selected respondents came from public and private institutions in order to have a more comprehensive sample representing various socio-demographic profiles in Shao. Research assistants were also available during the administration of the questionnaires in order to clarify any doubts and ensure accurate data collection. In addition, statistical analysis was carried out through the appropriate chi-square test in order to establish associations between variables.

Future studies should use longitudinal methods to measure changes in menstrual hygiene knowledge, practices, and attitudes over time and in relation to certain interventions. Broadening the scope of investigation to encompass various rural and urban communities within Kwara State or Nigeria will improve the external validity of findings and facilitate cross-cultural comparison. In addition, employing qualitative research techniques like focus groups and in-depth interviews will shed more light on cultural perceptions and constraints that cannot be

measured using quantitative data alone. Lastly, evaluating the efficacy of particular interventions like school health education campaigns and the provision of free sanitary pads should be considered in future investigations.

CONCLUSION AND RECOMMENDATIONS

In summary, it is clear from this study that poor menstrual hygiene management among females in Shao is a systemic problem that stems from a lack of education, inadequate infrastructure, limited resources, and societal attitudes and customs. To tackle these problems, an integrated approach is needed viz:

School-based interventions: There is need for the schools to introduce compulsory menstrual health education in JSS 1 and SS 1 using age-appropriate modules and peer educators. Schools should establish “period corners” with emergency pads, soap, and private changing spaces, monitored by trained female teachers.

Community sensitization programs: The Parent Teachers Association (PTA) should partner with traditional rulers and religious leaders in Shao to hold quarterly community dialogues that normalize menstruation and challenge myths. There is need to use Yoruba-language radio programs and market outreach to reach parents and boys.

Menstrual product subsidy mechanisms: The Kwara State Ministry of Education and NGOs should consider a subsidized pad scheme for public secondary schools, modeled on the Basic Health Care Provisions Fund (BHCPF) approach. There is need to explore reusable pad distribution and local production to reduce costs and disposal problems.

Furthermore, funding teacher training initiatives and embarking on national-level public awareness campaigns would go a long way towards changing cultural narratives, breaking down any associated stigma, and encouraging conversations about menstruation within communities. Schools play a crucial part in putting policy into practice by ensuring that facilities remain functional and accessible, while at the same time including menstrual health education led by peers as part of their curriculum to ensure proper understanding and attitudes among children. Educators must be properly trained on how to incorporate culturally sensitive as well as scientifically accurate information concerning menstrual health and how to create an enabling environment for their learners to share and talk about their experiences.

The role of teachers will be important in advocating for better sanitation infrastructure, as well as working with parents in workshops to bridge the school-home gap through proper dialogue. Parents, in turn, must educate their girls from an early age, defy cultural practices at home that might reinforce stigma, and give preference to purchasing low-cost or reusable pads. Through participation in menstrual health programs within schools and the wider community, parents have the potential to encourage good practices that help their daughters attend school even when menstruating. Collectively, this will create an atmosphere that helps normalize menstruation, gives girls information and tools to manage menstruation, and improves health, educational, and gender equity outcomes sustainably within Shao and other rural areas.

Declarations

Ethics Approval and Consent to Participate

Informed consent was obtained from all the selected students before engaging them in the study. There was no use of any form of pressure, temptation, or undue influence in gaining consent from the students. All participants received an information sheet detailing the study purpose, voluntary participation, right to withdraw, and confidentiality, and they were given the chance to ask questions about things that they were not sure of. Written informed consent was obtained before questionnaire administration.

No identifying information such as names, school number, home address, phone number of parent /guardian, etc. was collected. Data were stored in a password-protected computer accessible only to the principal investigator. Participation was voluntary and no incentives were provided.

Moreover, the students were fully informed that they can withdraw from the study at any time and face no consequences whatsoever as far as the withdrawal is concerned. There were absolutely no risks associated with taking part in the study, and the benefits of the study were worth much more than the risks involved. This study was conducted in accordance with the Declaration of Helsinki. Information about all the respondents were kept strictly confidential and anonymous throughout the study process.

The ethical approval to carry out this study was granted by the Ethical Review Committee of the Kwara State Ministry of Health (ERC/MOH/2025/05/593). Additional permission was sought from the Ministry of Education and Human Capital Development and the Principals of each of the selected schools.

There was no use of force or coercion on the part of the researcher in order to ensure that the female secondary school students participated in the study. Written Informed consent was obtained from all eligible students ($\geq$18 years) or from the parents /guardians of those <18 years old before participation. Participants were informed that their participation is voluntary and that they may withdraw at any time without any consequences.

Competing Interests

The authors declare that they have no competing interests.

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Disclaimer (Artificial Intelligence)

Author(s) hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Authors' Contributions

YFI: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Project Administration.

SBS: Methodology, Validation, Supervision of Data Collection, Data Curation, Writing – Review & Editing.

ORM: Investigation, Literature Review, Supervision of Data Collection and report editing

RSO: Formal Data Analysis, Literature Review, Writing – Review & Editing.

MFA: Literature Review, Supervision of Data Collection, Writing – Review & Editing

ETI: Formal Data Analysis, Supervision of Data Collection and report editing

OOB: Investigation, Writing – Review & Editing & Literature Review

All authors read and approved the final manuscript and agreed on its publication.

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