

Menstrual Hygiene Management Practice and Associated Factors among Urban and Rural Primary School Adolescent Girls in Gondar City Administration and Gondar Zuriya District Northwest Ethiopia, 2021

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ABSTRACT

Background: Menstrual hygiene management is the practice done by girls or women through; using a clean material, changing a private way body using water with soap, and having disposal facilities. It is insufficiently acknowledged among adolescent school girls in Ethiopia. Therefore, understanding the level of hygiene management practice and identifying determinant factors is a crucial first step to taking appropriate interventions.

Method: An institution-based cross-sectional study design was employed among 335 urban adolescent girls from March to April 2021. Study participants were selected by using a multistage stratified sampling technique. An interviewer-administered structured questionnaire was used for data collection. The data were entered by using EPI INFO version 7.2 and analyzed by using STATA version 14.1 software. Bivariate and multivariable logistic regression analysis with a 95% confidence interval was employed. A P-value < 0.05 was considered as statistically significant and AOR with a 95% confidence interval was considered to show the strength of the association.

Result: Overall, prevalence of menstrual hygiene practice among adolescents' girls were 66.0% (95% CI: 60.7, 70.9) among urban school girls. urban residence [AOR= 3.41 (95% CI: 1.1, 10.58)], media exposure for SNP advertisement [AOR=2.43 (95%CI; 1.08, 5.48)], good menstrual knowledge [AOR=3.68 (95% CI: 1.76, 7.69)], female toilet inside locked [AOR=2.66 (95%CI; 1.1, 6.45)], girls who have private room at home [AOR=3.53(95% CI: 1.46, 8.5)], good water accessibility (AOR=3.35(95% CI:(1.62,6.95)), gain information from friends [AOR=3.35(95%CI:1.04,10.77)] were found to be significantly associated with good MHP among overall school adolescent girls,

Conclusion: Though the overall prevalence of the study was low, it was relatively better among urban school girls. It shows a significant variation between the urban and rural study groups. Therefore, implementation of girl friendly WASH services in all schools should be applied, health education should be strengthened, WASH facilities constructed at school levels, free discussion with parents and teachers in order to practice safe MHM.

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Introduction

A round nine percent of the global population is in the age group of 10-19 years and they are transitioning from childhood to adulthood, they undergo a number of physical, social and psychological pressures due to the changes taking place in their bodies. Adolescence in girls has been recognized as a special period in their life cycle that requires due attention [1,2].

Menstruation is the cyclical shedding of the inner lining of the uterus and the endometrium under the control of hormones of the hypothalamic-pituitary axis. Menarche is the first menstruation of a girl. It occurs at the age of 12- 13 years, although it may occur as early as 10 years or as late as 16 years. Menarche, or the onset of menstruation, is a landmark feature of female puberty and a

signal of reproductive maturity [3]. Most of these women and girls menstruate each month for between two and seven days, the menstrual cycle is usually around 28 days but can vary from 21 to 35 days [4,5].

Menstrual hygiene, which refers to the effective management of menstrual bleeding by women, is an important aspect of reproductive health, if it is not handled appropriately can cause infections of the urinary tract, pelvic inflammatory diseases, vaginal thrush, bad odor, soiled garments, ultimately shame, and leading to infringement on the girl's dignity [6].

To manage menstruation hygiene, women and girls must have access to water with soap, sanitation, private rooms to change sanitary cloths or pads; and facilities for safely disposing of used materials Menstrual hygiene is an issue that every girl and woman has to deal with in her life, but there is a lack of mindfulness of

the process of menstruation and correct necessities for handling menstruation among teenage girls [7,8].

During menstruation adolescent girls are faced with challenges related to the management of menstrual cycle in the public places [9]. In adolescents who experienced menstruation for the first time, menstrual hygiene management (MHM) is constrained by practical, social, economic and cultural factors such as the expense of commercial sanitary pads, poor family support, lack of support from teachers, limited economic resources to purchase sanitary products, lack of water and latrine facilities at schools, lack of a private room for changing sanitary pads, and limited education about the facts of menstrual hygiene [10]. In order to achieve safe practices, adolescent girls need acceptable knowledge regarding menstruation and menstrual hygiene [11]. Often, parents themselves do not know how to handle the physical and emotional development of their adolescent girls, particularly menstruation [12]. The researcher's preliminary observation, menstrual hygiene knowledge and practices are left for the adolescent girls to discover as a mystery. This lives a piece of knowledge and practical gap. In addition, in the African tradition, issues surrounding menstruation are secretive issues that the girl child should discuss in the privacy with her parents or senior women in the community [13].

In developing countries, poor menstrual hygiene has been an insufficiently recognized problem. There have been several cultural and religious taboos concerning menstrual blood, menstruating girls, women, and menstrual hygiene [14].

The solution which has taken in Ethiopia by plan international together with local governments and schools are gave training to district health workers, teachers and volunteers to educate young people about periods and they distributed menstrual hygiene materials for schools and teach girls how to manage their periods so they feel confident and stay in school. However, still insufficient accesses to water in schools, filthy and non-functioning toilets, lack of hand washing, and lack of privacy, for girls are the commonest cause of poor menstrual hygiene practice among Ethiopian adolescent school girls [15]. Additionally, youth- friendly sexual health services and implemented health facilities to access and make it friendly youths for adolescents.

Globally, in 2016 an estimated 335 million girls went to primary and secondary schools without water and soap available for washing their hands, bodies, or clothes when changing sanitary pads [16]. Unhygienic practices during menstruation predispose to higher chances of infection and gynecological problems among adolescent girls [17]. The prevalence of reproductive tract infections is 3 times higher among girls who have poor menstrual hygiene [18].

United Nation International Children Emergency Fund (UNICEF) estimates that 1 in 10 school-age African girls do not attend school during menstruation. Similarly, World Bank statistics indicated that students have been absent from school 4 days every 4 weeks because of menstruation [19]. Studies in other countries have shown that a significant difference in the proportion of menstrual problems and practices in rural and urban adolescent girls was documented [20]. Studies in Ethiopia so far have been conducted on a few study settings among primary school adolescent girls, which is insufficient to describe the status of menstrual hygiene management practice and its associated factors among primary school adolescent girls. Globally 20% girls miss from school due to their monthly period, and 39% and 8% of girls use water

but no soap for washing their menstrual protection in India and Afghanistan respectively [21-25].

Thus, an institution-based studies in primary schools can provide inclusive evidence on menstrual hygiene management practice to identify the gaps including above-implemented programs in Ethiopia. It is also hoped that the findings from the study would give the direction for the government to solve the problems by new project based on the results. Therefore, this study will be assessed menstrual hygiene practice in rural and urban adolescent school girls in Gondar City Administration and Gondar Zuriya district.

Methods and Materials

Study Design and Period

An institutional-based comparative cross-sectional study design was employed among rural and urban female adolescent primary school students between March and April, 2021(Grade 7 and 8).

Study Setting and Area

This study was carried out in Gondar Zuriya District and Gondar city among primary school girls. Gondar is located 727 KM from the capital city of Ethiopia, Addis Ababa and 172 km far from Bahir Dar where is the capital city of Amhara Regional state. According to the Gondar city administrative health office 2007 report, the population of Gondar was 355, 646 of these 174,630 are females of the 42,000 of females between the age of 9-14. And also, the Gondar district had a total population of 191,394, of whom 97,388 were men and 94,006 women; 18,377 were Makisegn town inhabitants. Among those total population 8,885 males and 10,095 females' adolescents level of schools. Gondar city is administratively divided into sub-cities, 25 urban and 11 rural Kebeles respectively. About 5,762 female students in 44 public primary schools and 8,885 female students in 47 public primary schools are found in Gondar city and Gondar zuriya district respectively.

Source and Study Population

All primary school female students (grade 7&8) at public schools in Gondar City Administration and Gondar Zuriya district were considered as a source of population and those all grade 7th & 8th school adolescent female students from the selected urban and rural public schools available during data collection period were considered as study population.

Inclusion and Exclusion Criteria

All grade 7th & 8th female students in regular programs who attend in public schools and who had started menstruation were included in the study where as those adolescent girls; unable to respond for questions, feel discomfort or illness were excluded from the study.

Sample Size Determination

The minimum sample size for each group (urban and rural) was calculated using the following formula for the two sample of comparison of proportion by considering the following assumptions 95% confidence interval, 80% power, and prevalence of good MHM among urban (49.1%) and rural (35.5%) schoolgirls from a previous study [26-40].

Sample size for the second objective was calculating using the proportion of each factors affecting to practice of menstrual hygiene among primary school students; such as mother educational level; presence of WASH facility and knowledge [31-33]. Based on these assumptions the prevalence of good practice among urban

49.1% (P1) and 35.38% (P2) among rural was taken which giving a larger sample size. Assuming a 95% confidence level, and the acceptable difference of 5%, where $Z_{\alpha/2}$ is the critical value of the normal distribution at $\alpha/2$ is 1.96, Z_{β} is the critical value of the normal distribution is 0.84 at β (a power of 80%, β is 0.2), D = design effect and p_1 and p_2 are the expected sample proportions of the two groups; two comparison groups [urban (n_1) to rural (n_2) population ratio 1:1]. The final sample size for this study was taken were 670 adolescent girls ($n_1=335$ for urban and $n_2=335$ for rural) by considering a 10% non-response rate and design effect 1.5 was assumed.

Sampling Procedure

Multistage stratified random sampling technique was used to select study participants among rural and urban primary school

adolescent students in Gondar city administration and Gondar zuriya district. After the participants was classified in to two strata by considering their residence heterogeneity and then make it homogeneity. Twenty percent of the total target population (out of 91 primary schools) which are eight primary schools from each stratum (urban & rural) were randomly selected on stage one. The urban and rural stratification was classified in to clusters, based on grades and its classes for those schools having one or more classes for each grade. Proportion to size allocation using list of female students for each schools was making to determine the required sample size from each selected school clusters (classes). Both grade seven and eight classes were selected using simple random sampling technique from each school.

Variables of the Study

Dependent Variable	Independent Variables
Menstrual hygiene practice	<p>Socio-economic and demographic variables (Age, Religion, Residence, Marital status, Grade level, Family average monthly income, Affordability of sanitary pad to buy, Parents educational and occupational status, student pocket money, Media exposure for SNK advertisement)</p> <p>Environmental related variables (Accessibility of water supply at home, Quantity of water, used per day (water adequacy), Availability of water at school, Availability of latrine at school and home, Sanitary pad availability at school, Private room at home, Separate latrine for female students at school, Designated area for bath and hand washing at home, Distance from home to the source of water),</p> <p>Knowledge and source of information related variables (Knowledge about menstruation and menstrual hygiene, Source of Information)</p>

Operational Definitions

Good Hygienic Practice: Respondents who scored 50% and above points among 13 practice questions were declared as having good practices, otherwise poor hygienic practice [27-41].

Good Knowledge: Respondents who gained 50% and above points among 21 knowledge questions were declared as having good knowledge, otherwise poor knowledge [27-37].

Water Accessibility: Accessible of water was measured, by if the time is taken to fetch water ≤ 30 minutes for a round trip [42].

Quantity of Water Used Per Day: Adequacy of water was measured, by if the individual could consume 25 liters and above per day when needed [43].

Availability of Water at School: Availability was measured, by if the availability of water at school during the survey time [43].

Data Collection Instrument and Procedure

The data was collected by an administered a questionnaire which is adapted from literature of similar studies with some modification [26-54]. It consists of basic socio-demographic characteristics; knowledge and awareness about menstruation, menstrual hygiene practice and associated factors and the questionnaire was prepared in the English version and was translated in to Amharic (local language) then back to English to check its consistency. During the data collection process; two BSC nurses and 5 certified diploma nurses were recruited as supervisors and data collectors respectively.

Data Quality Control

To ensure the quality of data, the questionnaire was pre-tested (5% (34 individuals)) from the total sample in another school (Meseret

primary school) which is not included in the final sampling. The necessary correction of the questionnaire was complete based on the pre-test. During data collection, close daily supervision was conducted by the principal investigator and supervisors, to observe how data collectors run the questions to the respondents and the collected data was checked for completeness, accuracy and data clean-up cross-checking were done before analysis. Five certified diploma nurses were involved for data collectors. Data collectors were trained for one day on content of questionnaire, interviewing technique, the purpose of the study and how to approach and maintain the confidentiality of the respondent by the principal investigator.

Data Processing and Analysis

After checking for completeness, data was cleaned, coded and entered to EPI info version 7.2 packages data entry forms and it was exported to STATA version 14 for analysis. Descriptive and analytical statistics was employed. Bi-variable logistic regressions were used to identify the association between dependent and independent variables. All variables with $p < 0.25$ in bi-variable analysis were fitted in to the multivariate logistic regression model to identify the predictors of menstrual hygiene practice. In the multivariable logistic regression models with a P value < 0.05 considered as statistically significant and AOR with 95% confidence interval was considered to show the strength of the variables. Multi-collinearity was checked using tolerances and variances inflation factor (VIF). Model fitness was checked by Hosmer-Lemeshow test and its adequacy was confirmed, via - p value > 0.05 . Presentation of the study findings was done using graphs and tables in order to summarize and simplified picture of the outcome of the study.

Ethical Clearance and Consent to Participate

Ethical clearance was obtained from the ethical review committee

of Gondar University College of medicine and health science. Support letter was obtained from the University of Gondar College of Medicine and Health Science Institute of Public Health Department of Reproductive Health to be given for Gondar City administration and Gondar Zuriya districts education offices and then to the respective directors of the primary schools. In addition, informed written consent for 18 years and above study participants and written informed school principal permission for the participant's age below 18 years were obtained, finally, from each study participants to confirm willingness (assent) for participation after explaining the objective of the study and assuring confidentiality of the responses. The respondents notifying that they have the right to refuse or stop at any point of the interview.

Results

Socio-Demographic Characteristics of the Respondents

Six hundred and Seventy girls from each group (urban and rural) were participated in this study with a response rate of 100% in both groups. The mean age (+SD) of urban and rural adolescent girls were (15.02(+1.14) Vs 14.87 (+1.45) years respectively. The majority of the respondents, 213 (63.6%) rural and 183 (54.6%) urban were in the age group of 15-17 years. The majority, 231(69%) in rural and 186(55.5%) urban of the participants had started their menstruation in the age range of >=14 and 10-13 years respectively. Almost all participants in urban and rural adolescent girls were from Amhara ethnic group (99.4% vs 98.5%, respectively) (Table 1).

Table 1: Socio-Demographic and Economic Characteristics of Respondents in Rural and Urban Primary School Adolescent Girls in Gondar City Administration and Gondar Zuriya District, Northwest Ethiopia, 2021

Variables	Rural n=335(%)	Urban n=335(%)	Total
Age in years	111 (33.1)	143 (42.7)	254 (38.0)
10-14	213 (63.6)	183 (54.6)	396 (59.0)
15-17	11 (3.3)	9 (2.7)	20 (3.0)
>=18			
Age at menarche	104(31)	186(55.5)	290(43.3)
10-13	231(69)	149(44.5)	380(56.7)
>=14			
Grade level	177(52.8)	140(41.8)	317(47.3)
7	158(47.2)	195(58.2)	353(52.7)
8			
Religion	318 (94.9)	281(83.9)	599(89.4)
Orthodox	17(5.1)	54(16.1)	71(10.6)
Muslim			
Region	330 (98.5)	333(99.4)	663(99.0)
Amhara	5 (1.5)	2(0.6)	7(1)
Oromia			
Marital status	11(3.3)	14(4.2)	25(3.7)
Married	324 (96.7)	321(95.8)	645(96.3)
Single			
Fathers educational status	184(54.9)	60(17.9)	244(36.4)
Have not formal education	113(33.7)	140(41.8)	253(37.8)
Have formal education	38(11.4)	135(40.3)	173(25.8)
High school and above			
Mother educational status	223(66.6)	115(34.3)	338(50.5)
Have not formal education	78(23.2)	138(41.2)	216(32.2)
Have formal education	34(10.2)	82(24.5)	116(17.3)
High school and above			
Fathers occupational status	22(6.6)	83(24.8)	105(15.7)
Government employee	22(6.6)	46(13.7)	68(10.1)
Private employee	283(84.4)	175(52.2)	458(68.4)
Self-employee	8(2.4)	31(9.3)	39(5.8)
Others *			
Mothers occupational status	2(0,6)	42(12.5)	44(6.6)
Government employee	13(3.9)	25(7.5)	38(5.7)
Private employee	16(4.8)	61(18.2)	77(11.5)
Self -employee	301(89.8)	199(59.4)	500(74.6)
House wife	3(0.9)	8(2.4)	11(1.6)
Others **			
Provided pocket money	156(46.6)	113(33.7)	269(40.1)
Yes	179(53.4)	222(66.3)	401(59.9)
No			
Afford to purchase SNK	141(42.1)	201(60)	342(51)
Yes	194(57.9)	134(40)	328 (49)
No			

Media exposure	111(33.1)	244(27.2)	355(53.0)
Yes	224(66.9)	91(72.8)	315(47.0)
No			
Family monthly income	221(66.0)	63(18.8)	284(42.4)
<1000	18(5.4)	41(12.3)	59(8.8)
1000-1500	75(22.3)	109(32.6)	184(27.5)
1501-3000	21(6.3)	122(36.3)	143(21.3)
>3000			

Others* Father occupational status= No job; cajoler
 Others** Mothers occupational status= Unknown by the girls

Environmental Factors

From school observation almost all, 8 rural and 7 urban schools have functional toilet facilities Out of 15 schools, only 3 rural and 4 urban schools had water for hand-washing but did not use soap to wash their hands. The study of the result revealed that, 221(66.0%) of rural and 195(58.2%) of urban participants didn't have designated area for bathing in their home, but only 114(34.0%) of rural and 140(41.8%) of urban respondents had designated area for bathing. Almost all, 335(100%) of rural and 299(89.3%) urban participants responded that menstrual hygiene materials provide at their school. In the present study the majority of the rural 226(67.5%) and urban 312(93.1%) of adolescent girls were responded that water from the main source didn't available at the school during the survey.

The majority of the respondents, 226(67.5%) of the rural and 262(72.8%) of urban were not feel comfort with their school environment to keep menstrual hygiene practice. The majority of the participants reason, why they didn't felt comforts with school environment was, no water supply atschool,131(58.0%)of rural and 110 (38.3 %) of urban (Fig.1)

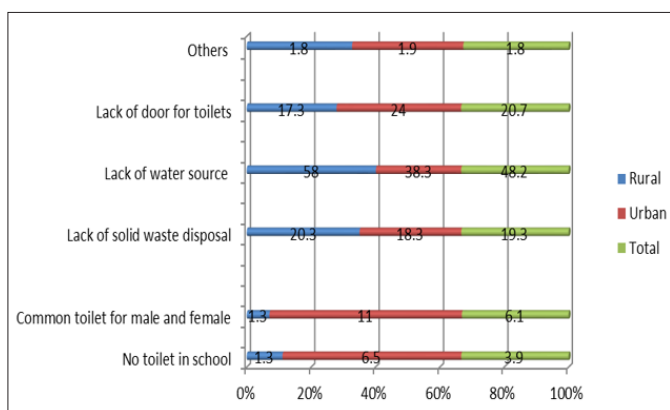


Figure 1: The Respondent Reason why Privacy is not Maintained in the School During Menstruation

Source of Information About Menstrual Hygiene

Two hundred forty-one (71.9%) of rural and 292(87.2%) of urban adolescent school girls had prior information about menstruation before they commenced menarche. The main sources of information about menstruation were, 94(38.7%) rural and 120(41.1%) urban; 50(20.6%) rural and 59(20.2%) urban; 34(14.0) rural and 23(7.9%) urban; 46(18.9%) rural and 33(11.3%) urban; 18(7.4%) rural and 20(6.9%) urban; 1(0.4) rural and 36(12.3%) urban; only 1(0.3%) of urban from mothers, sisters, friends, school, health professional, media and others (grandmother) respectively.Regarding freely discussion about menstruation with their parents and teachers were, 89(26.6%)

rural and 178(53.1%) urban and 233(69.6%) rural, 225 (67.2%) urban respectively. Two hundredforty-six (73.4%) rural and 157(46.9%) urban vs 102(30.4%) rural 110 (32.4%) urban were didn't discuss about menstrual hygiene with their parents and teachers respectively. The reason why they didn't discuss with their parents or teachers, was not habitual 40(15.2%) of rural 17 (19.0%) of urban; shamefulness 34(12.9%) of rural 32(16.4%) of urban; frustration 55(20.9) of rural 39(20%) of urban; secret issue 32(12.2%) of rural 22(11.3%) of urban; all choices 94(35.7%) of rural 57(29.2%) of urban and others (family luck of education, cultural influence) 8 (3.0%)of rural 8(3.0%) of urban.

Knowledge of Participants about Menstrual and Mhm

The study revealed, the overall prevalence of knowledge about MHMP was 386 (57.6%) and 284 (42.4%) of good and poor knowledge of MHMP respectively. Of those, one hundred fifty-three [45.7% (CI: 40.4%, 50.1%)] and 233 (69.6% (CI: 64.4%, 74.3%)] were rural and urban, respectively.Two hundred fifty-four(75.8) rural, 270(80.6%) of urban knew that the exact duration of a normal menses is 1 up to 7 days, however similar value, 248(74.03%) of each rural and urban of the study participants knew correctly that normal menstrual cycles vary between 20 to 35 days. Among 129(38.5%) of rural and 77(23%) of urban of the study participants responded that menstruation is a secrete issue of whom, 27(20.6%) rural and 13(17.3%) of urban were due to deep rooted culture in the society, 50(38.2) rural and 24(32%) of urban were due to believes and customs of the society, 54(41.2%) rural and 36(48%) urban were both reasons and the rest 2(2.7%) were other (due to sin) reason (Table 2).

Table 2: Knowledge about Menstrual and mhm among Respondents in Rural and Urban Primary School Adolescent Girls in Gondar City Administration and Gondar Zuriya District, Northwest Ethiopia, 2021.

Respondents' characteristics	Category	Rural n=335(%)	Urban n=335(%)	Total n=670(%)
Age of a girl does commence her menarche? n=670	9-16	210(62.7)	296(88.4)	506(75.6)
	Don't know	125(37.3)	39(11.6)	164(24.4)
Menstruation is n=670	Physiological process.	222(66.1)	277(82.7)	499(74.5)
	Caused by a sin.	22(6.5)	5(1.5)	27(4.0)
	Curse of God.	32(9.6)	14(4.2)	46(6.9)
	Pathological process	1(0.3)	4(1.2)	5(0.7)
	I don't know.	59(17.5)	35(10.4)	94(13.9)
Cause of menstruation n=670	Hormones	91(27.2)	75(22.4)	166(24.8)
	Curse of god	83(24.8)	45(13.4)	128(19.1)
	Caused by disease	12(3.6)	11(3.3)	23(3.4)
	Don't know	147(43.8)	189(56.4)	336(50.2)
	Others*	2(0.6)	15(4.5)	17(2.5)
Menstruating is anormal phenomenon n=670	Yes	175(52.2)	223(66.6)	398(59.4)
	No	36(10.6)	22(6.5)	58(8.7)
	Don't know	124(37.2)	90(26.9)	214(31.9)
Menstruating is a lifelong n=670	Yes	42 (12.6)	19(5.7)	61(9.1)
	No	184(54.9)	208(62)	392(58.5)
	Don't know	109(32.5)	108(32.3)	217(32.4)
Menstruating girls could conceive n=670	Yes	61(18.2)	44(13.1)	105(15.7)
	No	162(48.4)	194(57.9)	356(53.1)
	Don't know	112(33.4)	97(29.0)	209(31.2)
Source of bleeding n=670	Uterus	165(49.3)	192(57.3)	357(53.3)
	Vagina	34(10.1)	20(6.0)	54(8.1)
	Urinary bladder	26(7.8)	42(12.5)	68(10.1)
	Don't know	110(32.8)	81(24.2)	191(28.5)
Absorbent ideally used n=670	Disposable sanitary pads	151(45.1)	222(66.3)	373(55.7)
	Reusable & washable cloth	110(32.9)	74(22.0)	184(27.4)
	Don't know	72(21.5)	35(10.5)	107(16.0)
	Others**	2(0.6)	4(1.2)	6(0.9)
	Available sanitary pads on market n=670	Yes	220(65.7)	275(82.3)
No	36(10.8)	11(3.0)	47(7.0)	
Don't know	79(23.5)	49(14.7)	128(19.0)	
Normal pattern of menstruation n=670	Below 21 days	16(4.8)	32(9.6)	48(7.2)
	From 21-35days	248(74)	248(74.0)	496(74.0)
	Above 35days	3(0.9)	6(1.8)	9(1.3)
	Don't know	68(20.3)	49(14.6)	117(17.5)
Normal duration of menstruation n=670	1-7 days	254(75.8)	270(80.6)	524(78.2)
	Above 7 days	16(4.8)	10(3.0)	26(3.9)
	Don't know	65(19.4)	55(16.4)	120(17.9)
Student go to school during mensus n=670	Yes	248(74)	260(77.6)	508 (75.8)
	NO	36(10.8)	37(11.1)	73(10.9)
	Don't know	51(15.2)	38(11.3)	89(13.3)
Menstruation is a secret issue n=670	Yes	129(38.5)	77(23.0)	206(30.7)
	No	187(55.8)	245(73.1)	432(64.5)
	Don't know	19(5.7)	13(3.9)	32(4.8)
Why menstruation is secret issue n=670	Deep rooted culture	27(20.6)	13(17.3)	40(19.4)
	Believes and customs	50(38.2)	24(32.0)	74(35.9)
	Both	54(41.2)	38(50.7)	91(44.7)
Menstrual blood is unhygienic n=670	Yes	139(41.5)	149(44.5)	288(43.0)
	No	91(27.2)	72(21.5)	163(24.3)
	Don't know	105(31.3)	114(34.0)	219(32.7)
Poor menstrual hygiene practice predispose to infection n=670	Yes	229(68.3)	225(67.2)	454(67.8)
	No	29(8.7)	29(8.6)	58(8.6)
	Don't know	77(23)	81(24.2)	158(23.6)

Comfortability is one advantage of sanitary pad n=670	Yes	214(63.9)	257(76.7)	471(70.3)
	No	64(19.1)	36(10.8)	100(14.9)
	Don't know	57(17)	42(12.5)	99(14.8)
Properly absorb is one advantage of sanitary pad n=670	Yes	217(64.8)	261(77.9)	478(71.4)
	No	45(13.4)	35(10.5)	80(11.9)
	Don't know	73(21.8)	39(11.6)	112(16.7)
Prevent staining cloth is one advantage of sanitary pad n=670	Yes	225(67.2)	262(78.2)	487(72.7)
	No	67(20.0)	31(9.3)	98(14.6)
	Don't know	43(12.8)	42(12.5)	85(12.7)
Prevent itching for single use is one advantage of sanitary pad n=670	Yes	160(47.8)	221(66)	381(56.9)
	No	64(19.1)	44(13.1)	108(16.1)
	Don't know	111(33.1)	70(20.9)	181(27.0)
Restricted activity during menses n=670	No restricted activities	77(23.0)	75(22.4)	152(22.7)
	Not playing	31(9.3)	56(16.7)	87(13.0)
	Isolated from males	36(10.7)	42(12.5)	78(11.6)
	Not inter in to kitchen	8(2.3)	15(4.5)	23(3.4)
	Isolated in the household	5(1.5)	8(2.4)	13(1.9)
	Not read bible/Quran	157(46.9)	113(33.7)	270(40.3)
	Others***	21(6.3)	26(7.8)	47(7.1)
Level of Knowledge	Good	153 (45.7)	233 (69.6)	386 (57.6)
	Poor	182 (54.3)	102 (30.4)	284(42.4)

Others* Cause of menstruation= A gift of God; ** ideally used of pad= piece of rang, soft, Others*** Restricted activity during menstruation= didn't go church and mosque

Menstrual Hygiene Practice of Respondents

The overall prevalence of good menstrual hygiene management practice was 57.7% with 95% CI between 54% and 61.5% with significant variation between MHM practice among rural 49.4% (95% CI: 44.2%, 54.9%) and urban 66.0% (95%CI:60.7,70.9) residence. Almost half, 166(49.4%) of rural and above half 221(66.0%) of urban adolescent girls did good menstrual hygiene practices (Figure-2).

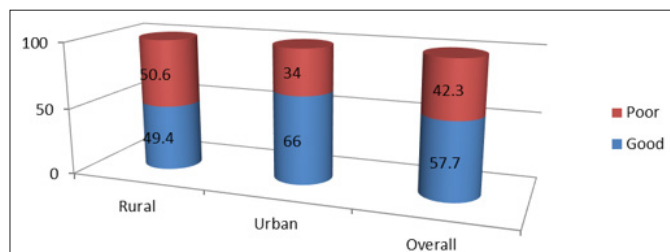


Figure 2: Menstrual Hygiene Practice of Respondents in Rural and Urban Primary School Adolescent Girls in Gondar City Administration and Gondar Zuriya District, Northwest Ethiopia, 2021 Gc.

From 670 Study Participants, 297(88.7%) of Rural and 313(93.4%) of Urban Used Sanitary Material(S) During Menstruation, among those 95(32.0%) of Rural and 197(62.9%) Used Disposable Sanitary Pads; 48(16.2%) Rural and 38(12.1%) Urban Used Disposable Piece of Rags; 105(35.4%) Rural and 63(20.1%) of Urban Used Deusable Sanitary Pads; 45(15.1%) of Rural and 13(4.3%) of Urban Used Underwear; The Rest 4(1.3%) Rural and 2(0.6%) Urban Used other Sanitary Materials (Toilet Tissue Paper, Hand Towel, Handkerchief). The Major Reasons not Used Sanitary Pads Was, 8(21.1%) Rural and 8(36.4%) Urban Respondents due to Lack of Awareness; 23(60.5%) Rural and 10(45.5%) Urban due to High Cost of Materials; 4(10.5%) Rural and 2(9.1%) Urban due to in Availability of Sanitary Materials; The Rest 7.5% Rural and 9.5% Urban due to Shyness and others Reason (Used Water) (Table 3).

Table 3: Menstrual Hygiene Management Practice of Respondents in Rural and Urban Primary School Adolescent Girls in Gondar City Administration and Gondar Zuriya District, Northwest Ethiopia, 2021

Hygienic practices	Categories	Rural n=335(%)	Urban n=335(%)	Total n=670(%)
Do you use sanitary material(s) during menses? n=670	Yes	297(88.7)	313(93.4)	610(91)
	No	38 (11.3)	22(6.6)	60(9.0)
What sanitary material do you use n=610	Disposable sanitary pads.	95(32.0)	197(62.9)	292(47.9)
	Disposable piece of rags.	48(16.2)	38(12.1)	86(14.1)
	Reusable sanitary pads	105(35.4)	63(20.1)	168(27.5)
	Underwear.	45(15.1)	13(4.3)	58(9.5)
	Others *	4(1.3)	2(0.6)	6(1)

Reason not using sanitary pads n=60	Lack of awareness High cost In availability Shyness Others **	8(21.1) 23(60.5) 4(10.5) 3(7.9) 0(0.0)	8(36.4) 10(45.5) 2(9.1) 1(4.5) 1(4.5)	16(26.7) 33(55.0) 6(10.0) 4(6.7) 1(1.6)
Do you wash your genitalia n=670	Yes No	235(70.2) 100(29.8)	306(91.3) 29(8.7)	541(80.7) 129(19.3)
What you use the medium n=541	Soap and water Only water Others ***	142((60.4)	152(49.7)	294(54.3)
How often do you wash your genitalia per day? n=541	< two times/day two and above/day	93(39.6) 0(0.00) 73(31.0) 162(69.0)	153(50.0) 1(0.3) 35(11.4) 271(88.6)	246(45.5) 1(0.2) 108(20.0) 433(80.0)
Do you take bath during menstruation? n=670	Yes No	235(29.9) 100(70.1)	210(62.7) 125(37.3)	445(66.4) 225(33.6)
How often do you take bath during menstruation/ day?n=445	>two times/day <=two times/day	58(24.7) 177(75.3)	75(35.4) 135(64.6)	132(29.7) 312(70.3)
Do you change your sanitary material(s) during menstruation? n= 670	Yes No	237(70.8) 98(29.2)	288(86.0) 47(14.0)	525(78.4) 145(21.6)
How often do you change your sanitary material per day n=525	>= Four times/day <Four times/day	8(3.4) 229(96.6)	39(13.5) 249(86.5)	47(9.0) 478(91.0)
How do you dispose of menstrual materials after use	Wrap in paper and put in the bin Latrine Open field/every where Others****	58(17.3) 208(62.1) 20(6.0) 49(14.6)	142(42.3) 162(48.4) 6(1.8) 25(7.5)	200(29.9) 370(55.2) 26(3.9) 74(11.0)
Where do you store your new and/or reusable absorbent(s)?	Bathroom Drawer's Dressing cabinet Store with routine cloth Never store Others*****	72(21.5) 32(9.6) 60(17.9) 63(18.8) 104(31.0) 4(1.2)	41(12.2) 88(26.3) 60(17.9) 76(22.7) 58(17.3) 12(3.6)	113(16.9) 120(17.9) 120(17.9) 139(20.7) 162(24.2) 16(2.4)
Area of keeping sanitary pads after washing for drying?	In the sunlight outside In the shade inside In the sunlight outside and inside Hidden with cloths Never wash B/c I use SNK Never wash B/c I drop it	58(17.3) 62(18.5) 72(21.5) 35(10.5) 55(16.4) 53(15.8)	21(6.3) 78(23.2) 18(5.3) 21(6.3) 149(44.5) 48(14.4)	79(11.8) 140(20.9) 90(13.4) 56(8.4) 204(30.5) 101(15.0)
MHP	Good MHP Poor MHP	166(49.4) 169(50.6)	221(66.0) 114(34.0)	387(57.7) 283(42.3)

Factors Associated with Good Menstrual Hygiene Practice among Overall Rural and Urban Primary School Adolescent Girls

In a multivariable logistic regression analysis, urban residence, marital status being single, girls who had media exposure, source of information about menstruation (friends & health personnel), girl's good knowledge status towards menstruation and its hygienic practice, adolescent girls who have private room, good water accessibility, toilet internally locked were showed statistical significant association with good menstrual hygiene management practice.

In multivariable logistic regression analysis, urban residence had association with menstrual hygiene practice; adolescent girls who lived in the urban had 3.41 times [AOR=3.41(95% CI; ((1.1,10.58))] higher odds of good menstrual management practice than school adolescent girls who are living in the rural.

adolescent school girls whose marital status is single were 3.34 times more likely to have good menstrual hygiene management practice than married one [AOR=3.34, 95%CI:(3.34(1.15,4.22)]. The odds of good menstrual management practice among adolescent school girls having media exposure were, 2.45 times higher, [AOR=2.45, 95%CI: (1.10, 5.43)], compared to adolescent school girls who had not media exposure.

Similarly, adolescent girls who did have information about menstruation from health professionals had almost 83% [AOR 0.166(95% CI; (0.04, 0.76))] lower odds of good menstrual management practice than school adolescent girls who had menstrual information from mother's sources. Those school adolescent girls who did have information about menstruation from friends had 3.35 times [AOD=

3.35(95%CI; (1.04, 10.77)] higher odds of good menstrual management practice than school adolescent girls who had menstrual information from mother's source.

Adolescent girls who had good menstrual hygiene management knowledge were 3.69 more likely to have good menstrual hygiene management practice than adolescent girls who had poor menstrual hygiene management knowledge [AOR= 3.69, 95%CI: (1.77, 7.69)].

Adolescent school girls who had private room at home had 3.53 times, [AOR=3.53, 95%CI: (1.46, 8.51)] higher odds of good menstrual hygiene management practice compared to those adolescent's school girls who had not room at home.

The odds of good menstrual hygiene management practice among adolescent girls whose school which had internal locker was 2.66 times [AOR=2.66, 95%CI: (1.1, 6.45)] higher than adolescent girls whose school toilet had not internal locker.

The odds of good menstrual hygiene management practice among adolescent girls who live near the good water accessible area were 3.35 times [AOR=3.35, 95%CI: (1.62, 6.95)] higher compared to the adolescent's girls who live in near inaccessibility of water (Table 4).

Table 4: Bivariable and Multivariable Logistic Regression Analysis for Factors Affecting the Practice of Menstrual Hygiene among Overall Rural and Urban Grade 7 and 8 Adolescent School Girls Gondar City Administration and Gondar Zurna District, Northwest Ethiopia, 2021.

Variables	Characteristics	Good	Poor	COR(95%CI)	AOR(95%CI)
Age	18and above	14	6	1.9(0.7, 5.1)	6.29 (0.54,73.33)
	15-17	233	163	1.2(0.8,1.6)	0.86(0.39,1.92)
	10-14	140	114	1.00	1
Residence	Urban	221	114	1.97(1.4, 2.7)***	3.41 (1.1,10.58) **
	Rural	166	169	1.00	1
Marital status	Single	376	269	1.78(0.8, 4.0)	3.34(1.15,4.22) **
	Married	11	14	1.00	1
Father educational status	High school and above	119	54	1.8(1.2, 2.8)*	0.68(0.22,2.1)
	Have formal education	135	118	0.95(0.68,1.4)	0.68(0.29,161)
	No formal education	133	111	1.00	1
Provided pocket money	Yes	181	88	1.95(1.4, 2.68)***	1.5 (0.71,3.35)
	No	206	195	1.00	1
Able to buy sanitary materials	Yes	153	108	2.5(1.80, 3.39)***	1.28(0.567,2.86)
	No	234	175	1.00	1
Average family monthly income	>3000	101	42	2.54(1.66, 3.91)***	2.74(0.77,9.84)
	1501-3000	115	69	1.76(1.21, 2.57)**	1.71(0.695,4.18)
	1001-1500	33	26	1.34(0.76,2.36)	2.43 (0.54,10.97)
	<1000	138	146	1.00	1
Media exposure for SNK	>3000	101	42	2.54(1.66, 3.91)***	2.74(0.77,9.84)
	1501-3000	115	69	1.76(1.21, 2.57)**	1.71(0.695,4.18)
	1001-1500	33	26	1.34(0.76,2.36)	2.43 (0.54,10.97)
	<1000	138	146	1.00	1
Media exposure for SNK	Yes	238	117	2.27(1.66, 3.10)***	2.43 (1.10,5.48) **
	No	149	166	1.00	1
Source of information	Sisters	57	53	0.55(0.34,0.87)*	.44 (0.17,1.16)
	Friends	37	20	0.94(0.51,1.73)	3.35(1.04,10.77) **
	School	52	27	0.98(0.57,1.68)	1.72(0.6,4.94)
	Health professional	24	14	0.87(0.42,1.78)	0.17(0.04,0.76) **
	Media	25	12	1.06(0.50,2.22)	0.49(0.11,2.08)
	Mother	142	72	1.00	1
Freely discuss with parents n=670	Yes	195	72	2.98(2.13,4.15)***	2.36(0.71,7.89)
	No	192	211	1.00	1
Freely discuss with teachers n=670	Yes	305	153	3.16(2.25,4.43)***	3.07 (0.86,10.97)
	No	82	130	1.00	1
If not,you discussed why? n=458	Frustration	55	39	1.5(0.8,2.82)	0.72(0.2,2.5)
	Not habitual	37	40	0.98(0.51,1.9)	0.40 (0.11,1.46)
	Secret	22	32	0.73(0.35,1.51)	0.81 (0.2,3.34)
	All	69	82	0.89(0.50, 1.6)	0.55(0.16,1.87)
	Others	7	9	0.83(0.26,2.48)	0.24 (0.04,1.5)
	shamefulness	32	34	1.00	1

Knowledge n=670	Good Poor	272 115	114 169	3.51(2.54,4.84)*** 1.00	3.69(1.77,7.69) *** 1
School privacy maintained n=670	Yes No	114 273	68 215	1.32(0.93,1.87) 1.00	0.69(0.31,1.53) 1
Female toilet lockedinternally n=670	Yes No	100 287	93 190	0.71(0.51,0.99)* 1.00	2.66(1.1,6.45) ** 1
Designated area for bath n=670	Yes No	192 195	62 221	3.51(2.49,4.96)*** 1.00	1.44(0.63,3.28) 1
Sanitary material providedat school n=670	Yes No	24 363	9 274	2.01(0.92,4.4) 1.00	0.39(0.06,2.44) 1
Have private room at home n=670	Yes No	160 227	47 236	3.54(2.44,5.14)*** 1.00	3.53(1.46,8.51) *** 1
Water accessibility	Accessible Inaccessible	288 99	128 155	3.52(2.54,4.89)*** 1.00	3.35(1.62,6.95) *** 1

Factors Associated with Good Mph for Rural and Urban Participants

In bivariate logistic regression analysis, age, marital status, provided pocket money from their parents, able to buy menstrual hygiene materials, girls who had media exposure, family monthly income, source of menstrual information, girls freely discussed with their parents and teachers about menstruation, why the reason girls who were not discussed about menstruation, girls knowledge status towards menstruation and its hygienic practice, school environment privacy to changing sanitary materials, girls who have private room for changing sanitary materials, girls who had designated area for bath at home, availability and accessibility of water for rural adolescent school girls were identified variables as a candidate for multivariable analysis among rural school adolescents.

Rural adolescent school girls whose age is 18 and above were 6.75 times more likely to have good MHMP than the adolescent girls whose age is 15 and below [AOR= 6.75 (95% CI: 3.03,7.05)].

Those rural school adolescent girls who were got information about menstruation from their friends were 5.4 times more likely to have good MHMP than rural school adolescent girls who had menstrual information from mother sources [AOR 5.42 (95% CI; (1.6, 18.7)].

Rural adolescent girls who had good menstrual hygiene management knowledge were 3.69 more likely to have good menstrual hygiene management practice than adolescent girls who had poor menstrual hygiene management knowledge [AOR= 3.69, 95%CI: (1.7, 7.69)]. The odds of good MHMP among rural adolescent school girls having good MHM knowledge, 3.69 times higher, [AOR=3.7, 95%CI: (1.9, 7.4)] compared to rural adolescent school girls who had poor knowledge of MHM knowledge.

The odds of good MHMP among rural adolescent school girls having MHMP discussion with their teachers were, 3.6 times higher, [AOR=3.6, 95%CI: (1.5, 8.8)] compared to rural adolescent school girls who are not discussed with their teachers (Table 5).

Table 5: Bivariable and Multivariable Logistic Regression Analysis for Factors Affecting the Practice of Menstrual Hygiene among Rural Adolescent School Students Gondar City Administration and Gondar Zuria District, Northwest Ethiopia, 2021.

MHMP					
Variables	Characteristics	Good	Poor	COR(95%CI)	AOR(95%CI)
Age	18 and above	9	2	5.49(1.13, 26.58)	6.75(3.03,7.05)*** 1.37(0.62, 3.05) 1
	15-17	107	106	1.23(0.78,1.95)	
	10-14	50	61	1.00	
Provided money	Yes	99	57	2.9(1.86, 4.53)	1.19(0.53, 2.65) 1
	No	67	112	1.00	
Able to buy sanitary materials	Yes	89	52	2.6(1.66, 4.067)	1.43(0.62,3.29) 1
	No	77	117	1.00	
Average family monthly income	>3000	13	8	2.04(0.81, 5.11)	0.75(0.18,3.08) 1.9(0.83,4.34) 1.95(0.21,8.32) 1
	1501-3000	45	30	1.9(1.10, 3.02)	
	1001-1500	10	8	1.57(0.6, 4.13)	
	<1000	98	123	1.00	
Media exposure	Yes	65	46	1.72(1.09, 2.73)	1.30(0.61,2.78) 1
	No	101	123	1.00	

Source of information	Sisters	21	29	0.49(0.24,0.99)	0.64(0.25,1.66)
	Friends	25	9	1.88(0.79,4.48)	5.42(1.6,18.7)***
	School	25	21	0.81(0.4, 1.65)	1.14(0.45,2.94)
	Health personnel	9	10	0.61(0.23,1.64)	0.38(0.11,1.32)
	Mother	56	38	1.00	1
Freely discuss with teachers	Yes	135	98	3.16(1.92,5.18)	3.6(1.5,8.8)***
	No	31	71	1.00	1
Freely discuss with parents	Yes	57	32	2.24(1.36,3.69)	1.10(0.49,2.49)
	No	109	137	1.00	1
Knowledge n=335	Good	101	52	3.5(2.23, 5.49)	3.74(1.9,7.4)***
	Poor	65	117	1.00	1
School privacy maintained	Yes	64	45	1.73(1.09,2.75)	1.01(0.53,2.29)
	No	102	124	1.00	1
Designated area for bath n=670	Yes	78	36	3.27(2.03,5.28)	2.18(0.97,4.93)
	No	88	133	1.00	1
Have private room at home n=670	Yes	58	29	2.59(1.55,4.32)	1.9(0.78,4.62)
	No	108	140	1.00	1
Water accessibility	Accessible	103	45	4.51(2.83,7.16)	0.45(0.12,1.5)
	Inaccessible	63	124	1.00	1

similarly, able to buy the pads, heard information about menstruation before menarche, having discussion with teachers and mother, having good MHM knowledge, having designated area for bath, having private room at home and had accessible water for urban adolescents school girls were identified variables as a candidate for multivariable analysis.

At p-value less than <0.05 was used as a cutoff point to declare statistical significant association with menstrual hygiene management practice.

In a multivariable logistic regression analysis, age 18 and above, marital status being single, source of information about menstruation (friends), girls discussed with teachers, girl's good knowledge status towards menstruation and its hygienic practice, were showed statistical significant association with good MHMP in rural adolescent school girls. Whereas, good MHM knowledge and adolescent girls having private room at home were also showed that statistical significant association with MHMP in urban adolescent school girls. In the other hand, urban adolescent school girls having private room at home were 4.2 times, [AOR=4.2, (95%CI:1.8, 9.8)] higher odds of good MHMP compared to those urban adolescent school girls who had not private room at home. The odds of good MHMP among urban adolescent girls who had good MHM knowledge were 2.3 times [AOR=2.3, (95%CI: 1.1, 5.1)] higher compared to the urban adolescent girls who had poor MHM knowledge (Table 6).

Table 6: Bivariable and Multivariable Logistic Regression Analysis for Factors Affecting the Practice of Menstrual Hygiene Among Urban Adolescent School Students Gondar City Administration and Gondar Zuria District, Northwest Ethiopia, 2021

Variables		MHMP		COR(95%CI)	AOR(95%CI)
		Good	Poor		
Grade level	Grade 8	135	60	1.41(0.9, 2.23)	1.39(0.7,2.77)
	Grade 7	86	54	1.00	1
Father educational status	Have high school and above	97	38	1.37(0.72, 2.63)	1.07(0.42,2.79)
	Have formal education	85	55	0.83(0.44,1.56)	0.805(0.32,2.01)
	Not educated	39	21	1.00	1
Provided pocket money	Yes	82	31	1.58(0.96,2.59)	1.72(0.78, 3.78)
	No	139	83	1.00	1
Able to afford to buy SNK	Yes	145	56	1.98(1.25,3.13)	0.8(0.37,1.74)
	No	76	58	1.00	1
Average family income	>3000	88	34	1.49(0.78,2.84)	0.56(0.19,1.62)
	1501-3000	70	39	1.03(0.54,1.97)	1.07(0.39,2.97)
	1000-1500	23	18	0.73(0.33,1.64)	1.28(0.36,4.6)
	<1000	40	23	1.00	1
Source menstrual information	Sisters	35	24	0.58(0.3,1.11)	0.51(0.21,1.24)
	Friends	12	11	0.43(0.17,1.07)	1.06(0.31,3.59)
	Schools	27	6	1.78(0.67, 4.69)	0.92(0.29,2.90)
	Health personnel	41	16	1.01(0.50, 2.04)	1.06(0.40,2.79)
	Mothers	86	34	1.00	1

Discussed with parents	Yes No	138 83	40 74	3.08(1.92,4.93) 1.00	1.54(0.71,3.32) 1
Discussed with teachers	Yes No	170 51	55 59	3.58(2.21,5.79) 1.00	2.16(0.88,5.33) 1
Knowledge of MHMP	Good Poor	171 50	62 52	2.87(1.77, 4.66) 1.00	2.3(1.1,5.1)** 1
Separate room at home	Yes No	161 60	75 39	1.4(0.86,2.27) 1.00	1.47(0.72, 3.00) 1
Designed area for bath	Yes No	114 107	26 88	3.61(2.16,6.01) 1.00	1.54(0.72, 3.28) 1
Private room at home	Yes No	102 119	18 96	4.57(2.59,8.07) 1.00	4.2(1.8,5.2)*** 1
Water accessibility	Accessible Inaccessible	185 36	83 31	1.92(1.11,3.31) 1.00	1.02(0.42, 2.47) 1

Discussion

This institution based study attempted to assess the magnitude and associated factors of menstrual hygiene management in Gondar city and Gondar zuriya. Accordingly, hygienic practice of adolescent girls during menstruation and influencing factors were identified.

The findings of this study showed that overall prevalence of good menstrual hygiene management practice among school adolescent girls were 57.7% [95% CI: (54%, 61.5%)]. The finding was surprisingly in line with the studies conducted in Adama City, Ethiopia (57%), East Harare Zone, Ethiopia (58.3%) and Harar town Eastern, Ethiopia (55.8%) (36, 42, 44). A possible explanation for this similarity might be girls had good discussion with their families, friends about menstrual hygiene management, openly. The other possible explanation could be due to the good knowledge status of the participants. Especially, Eastern Ethiopia and Hararge zone, Ethiopia studies had somewhat findings similar, mainly due to the participants' good knowledge of menstrual hygiene compared to the knowledge level in the current study. However, this prevalence is lower than the studies conducted in different regions in the world. Jatinangore, Indonesia (88.24%), Bhagalpur, Nepal (72.5%), Dang districts, Nepal (67.0%), North Western Nigeria (88.7%) [21-24]. This variation might be due to different study setting, and divergence scoring system for measuring the practice level of menstrual hygiene in different studies. The possible explanation for this difference also, might be related to socio economic status variation, as this study group incorporates the rural school adolescent's girls who are constrained from the factors which are affecting menstrual hygienic practice like inaccessible of sanitary material, un affordability SNK, inconvenient school and home environment etc. It might also be due to the respondent's level of education; hence, the study participants are primary school girls who are not had expected biological knowledge about menstruation comparing to the student whose level of education is above eighth grade. It might be due to low educational level of parents.

In this study it was observed that, lower level of practice of menstrual hygiene was recorded from similar studies conducted on, Southern Ethiopia, Gedo Zone (39.7%); Bahir Dar city administration, Northwest Ethiopia (24.5%), [43,45]. Thus, the reason for the observed difference could be due to low level of knowledge about menstruation and its hygienic practice by those comparative study participants. Another possible explanation might be, due to changed time of the studies.

This study revealed that the prevalence of good MHMP among rural school adolescent girls were lower than among urban one's. The possible explanation for this difference might be due to the availability of WASH facilities both at home and schools of urban respondents more likely to accessed than rural respondents. The other possible explanation is might be the urban school adolescent girls are better at gaining information, menstrual sanitary materials, and financial support compared to counter parts.

Therefore, a good MHMP prevalencee 49.5% (95% CI: 44.2%, 54.9%) in this rural study settings adolescent girls lower than the previous study conducted in different regions of the world; Rural Northern Ghana (61.4%), Another comparative study done on menstrual hygiene in rural and urban adolescent, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India showed that significantly more number of girls in the urban area were using commercially available sanitary pads as compared to girls in the rural area (62.03% of urban and 43.4% of rural girls and Kathuma District, India (59.5%) [28-30]. The reasons might be due to lack of WASH facilities, while a little while confirmed by our observations showed that schools had poor WASH facilities (toilets lacked doors and locks, lack of soap, no emergency pads, no hand washing facilities and none of the rural schools had facilities for bathing). The other possible difference might be the respondent whose educational status is primary school that is not knows scientific information about MHM. It might also be related to the economic disparities. Moreover, the prevalence of good MHM, 66.0% (95% CI: 60.7%, 70.9%) in urban study settings in the current study among adolescent girls higher than the study conducted in Jalingo town, Nigeria (57.8%) [33]. Likewise, this finding is higher than previous studies done in different parts of Ethiopia such as DessieCity, Northeastern Ethiopia (53.9), in Addis Ababa, Ethiopia (51.3%), Central Ethiopia (34.7%), Sebeta Town, Ethiopia (21%) [34-39]. This discrepancies could be related to the current government with stakeholders giving attention for adolescent reproductive health status with a little bite by supporting the schools through giving the health education for the students about menstruation and MHMP and increased media advertisement than the previous one. Among all the study participants, 91% of them used any absorbent sanitary material of which 47.9% (95% CI: 43.9%, 51.8%) were using disposable menstruation pad. The overall use of menstruation sanitary pad in the current study is lower than the study done in Chitwan district, Nepal; Dang District, Nepal; Northwestern, Nigeria (93.8%, 72.2%, 98.3%), respectively [22-24]. This difference might be due to the difference in the study area. Almost half adolescent girls of our study were from rural areas which is the health information and communication related to menstrual hygiene is

less accessible. Similarly, this finding is lower than the previous studies done in different parts of Ethiopia like Finote Selam, Northwest, Ethiopia (71.5%), Holeta, Central Ethiopia (66.3%), East Hararghe Zone, Eastern Ethiopia (66.1%), Harari region, Eastern Ethiopia (72.8%) [38-51]. This difference might be due to different Socio demographic and cultural characteristics like talking about menstruation might be taboo in the current study setting, especially the rural adolescent girls and residency of rural it is difficult to access sanitary pads. The current study revealed that menstruation sanitary pad utilization had shown not statistical significant variation in rural and urban adolescent girls with 88.7% (95% CI: 84.8%, 91.6%), Vs 93.4 % (95% CI: 90.2%, 95.6%), respectively. This result is contradicted with a systematic study in India which revealed that sanitary pads were highly utilized in urban (pooled magnitude was 67% (95%CI; 57%, 76%) areas than rural areas (pooled magnitude was 32% (95%CI; 25%, 38%) [55]. This difference might be the nature of studies, as it showed that the pooled prevalence of sanitary pad utilization or systematic nature. Among all the study participants, 80.75% (95% CI: 77.6%, 83.6%) of them were wash their external genitalia, of which 70.2% (95% CI: 65.0%, 74.8%) rural and 91.3% (95% CI: 87.8%, 93.9%) of urban adolescent school girls were washed their external genitalia. This variation might be related to the availability of water, commercial disposable SNK, hygienic facilities is better in urban than rural. However, it is contradicted with the study done Bahar Dar city, urban (96.7%) and rural (97.8%) adolescent girls had no significant variations of washing their genital area during menstruation [45]. Of those 64.6% (95% CI: 60.9%, 68.2%) of adolescent school girls cleaned their external genitalia twice and above a day, among those 48.4 % (95% CI: 43.0%, 53.7%) rural and, 80.9% (95% CI: 76.3%, 84.8%) of urban school adolescent girls. This difference might be the urban adolescent girls had better water access to wash their genitalia more frequently, it is supported by this finding, 44.2% rural and 80% of urban were had good water accessibility. This is contradicted the study done in Karnataka, India showed that the rural school student was better to washed their external genitalia than the urban students [40]. The variations might be related to the rural area of Karnataka more accessible with river, ponds and irrigation water than Karnataka city. In the present study, 70.1% (95% CI: 65.0%, 74.8%) of rural and 62.7% (95% CI: 57.4%, 67.7%) of urban adolescent school girls were take bath (exceptional from the usual). It is also no more difference between the groups; the reason might be their awareness almost similar which is the importance of taking bath during menstruation to prevent infection. This study revealed that, 17.3% (95% CI: 13.6%, 21.8%) rural and 22.1% (95% CI: 17.9%, 26.9%) of urban adolescent girls were take bath more than twice a day. Regarding to menstrual pad (sanitary materials), 70.7% (95%CL: 65.6%, 75.4%) of rural and 86% (95% CI: 81.8%, 89.3%) of urban school adolescent girls had changed with 24 hours. This variation might be due to the place which is changed the pads is more convenient in urban than rural adolescent girls. Other possible explanation could be the urban student has private room than rural adolescent girls. Of those the frequency of changing sanitary materials (pads), 2.4% (95% CI: 1.2%, 4.7%) of rural and 11.6% (95% CI: 8.8%, 15.6%) of urban school adolescent girls had changed four times and above per a day. This is supported by the study done in Karnataka, India [40]. In the current study, 79.4% (95% CI: 74.7%, 83.4%) of rural and 90.7% (95CI: 87.1%, 93.4%) of urban adolescent school girls had disposed the used sanitary menstrual materials properly, through disposing in to pit latrine and dust bin after wrapped with paper. The disparities might be the utilization and availability of dust bin in rural area are is less than urban. The possible description also, might be

the rural adolescent girls are less awareness than urban about disposal system and they are freely disposed everywhere due to the residence not constrained with other merged population and in rural place no pit latrine and dust bin. The other might be, the urban has better toilet facility than rural. This is supported by the study done in Karnataka, India [40].

In this study, being single for marital status among adolescent girls was the predictor of overall good menstrual hygiene practice. Adolescent girls who are single marital status had a higher good menstrual hygiene management practice than adolescent girls who are married ones. The possible explanation might be due to having enough time to keep their aesthetics including maintaining their hygienic practice.

Residence was found to be statistically significant association with overall MHMP. It was observed that girls who live in urban are more likely to have good menstrual hygiene practice. The discrepancy between urban and rural girls towards hygienic practices could be due to the differences in access to media exposure about menstrual hygiene, access to appropriate and affordable sanitary products, and access to WASH facilities at the household and school levels.

It may also be partly attributed to socioeconomic differences between urban and rural residents, since the majority of Ethiopia's poor people live in rural areas. This result is consistent with the finding in Bangalore India (16) and Egypt [52]. Accessibility of water from the place of participants was also a significant predictor of overall good MHMP. Of those participants who are lived the places of more accessible with water were more likely to practiced good MHM. This is supported by the study conducted in India, Ethiopia which indicated that access for water was strong predictor of good practice of menstrual hygiene [48-53]. Good knowledge was found to be another positive predictor of good MHMP. Study subjects with a good level of knowledge regarding menstruation and menstrual hygiene practiced have good MHMP than their counterparts. Surprisingly, knowledge was highly statistically significant associated with good MHMP for overall, rural and urban study participants. Therefore, it implies that knowledge could a strong tool for performing MHP at large. Studies conducted in Nepal, Nigeria, Indonesia and in different parts of Ethiopia region; East Hararghe, Mehal Meda, Dessie, Holeta also found that knowledge about menstruation was significantly associated with good MHPs [21,33,35-48].

Adolescent girls gained Information from their friends was another significant predictor of overall good menstrual hygiene practice. It was also a significant association with good MHMP in rural adolescent girls. The possible exploration might be sharing information about sensitive issues with peer is simpler than mothers without shyness and apprehension. This study was making an agreement with the study done in Dessie city, Ethiopia [35].

In other ways, good MHP of the participants were associated with adolescent girls who had SNK media exposure. This might be the adolescent girls who have media exposure, they are more likely to have good knowledge about menstruation and those aware about where the place of availability the commercial sanitary pads with its usage. This finding was consistent with the studies done in Singur Block of Hoogly district, West Bengal [49].

Other important predictors were school toilets with inside lock and adolescent girls who had private room had positively significant

association with menstrual hygiene practice. This is because students with school toilets with no inside locks were forced to wear soiled sanitary materials until they find the appropriate place to change or dispose of it and fail to clean their genitalia privately. This finding is in line with the study done in Holeta Town, Oromia region, Ethiopia [38].

Comparatively, age eighteen and above was the predictor of good menstrual hygiene practice in rural adolescent school girls. The possible reason might be, in rural school almost all adolescent school girls are above the age of seventeen, so they are more aware about MHMP than the age below fifteen. In addition, those who are older than 18 years might also have a better experience regarding menarche and menstruation management compared to their counter parts. This finding is consistent with previous studies in west Bengal and Bahir Dar city administration [45-54].

The possible explanation might be rural adolescent girls had a chance of prior exposure about awareness on menstruation and proper menstrual hygiene management practice through their informal communication between themselves and their teachers.

Furthermore, rural adolescent school girls who are got menstrual hygiene information from their teacher were positively significant association with good MHP. This study is parallel with the studies conducted in Eastern Nigeria and Addis Ababa, Ethiopia [34-55]. This might be they thought as the probabilities of accepting the information which is expected to delivering more scientific, biological and credible evidence are more likely to address by teacher than mothers.

Limitation

Even though, the comparative nature of the study could be the strength, however, there might be possibilities of social desirable bias, such as washing genital area, use of soap, utilization pad and the possibility of recall bias among respondents answering questions related to events happening in the past like who were the source of information before adolescent girls commenced her menarche; water daily consumption, media exposure for SNK and time to took the distance of water source.

Conclusions

The study found that more than half school adolescent girls had good menstrual hygiene management practice in the overall study settings and did show that the significant variation between the urban and rural study groups. Being single marital status, place of urban residence, media exposure for menstruation and menstrual sanitary materials, friend's source of information, good knowledge, school female toilet inside lock, had private room, accessible water near the home revealed that positively significant association with good menstrual hygiene management practice among overall school adolescent girls. Age eighteen and above, source of information from friends, free discussion with their teachers and good knowledge were positively statistical significant with Good MHMP in rural adolescent school girls. Furthermore, adolescent school girls who had good knowledge level in MHM and private room at home were also statistically positive associated with good MHMP among urban schools.

Finally, good knowledge was positively associated with good MHMP in overall, rural and urban adolescent school girls.

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Authors Contribution

MM designed the study, developed data collection tools, performed the analysis and interpretation of data. HY and WK participated in the development of the study proposal, analysis, interpretation, and revised drafts of the paper. WK prepared the manuscript. All authors revised the manuscript critically and read and approved the final manuscript.

These authors contribute equally to this work

Consent for Publication

Not applicable

Availability of Data and Material

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interest

All authors declare that they have no computing interest

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Ethical Clearance and Consent to Participate

Ethical clearance was obtained from ethical review committee of Gondar University College of medicine and health science.

Informed written consent for 18 years and above study participants and written informed school principal permission for the participant's age below 18 years were obtained, finally, from each study participants to confirm willingness (assent) for participation after explaining the objective of the study and assuring confidentiality of the responses. The respondents are notifying that they have the right to refuse or stop at any point of the interview.

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