

MENSTRUAL HYGIENE MANAGEMENT PRACTICES AND ASSOCIATED FACTORS AMONG URBAN AND RURAL ADOLESCENTS IN BAHIR DAR CITY ADMINISTRATION, NORTHWEST ETHIOPIA

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ABSTRACT

BACKGROUND: Menstrual hygiene management (MHM) practice varies greatly from country to country, and within the countries. Ethiopia has adopted youth friendly reproductive health and sexual health services to improve the health of young people including adolescents. Credible evidence on MHM practice at community level after adoption of youth friendly service is limited.

OBJECTIVE: The aim of the study was to assess MHM practice among adolescent girls in urban and rural areas.

METHODS: A community based comparative cross-sectional study design was employed in urban and rural kebeles of Bahir Dar city administration. Multi-stage stratified random sampling technique was used to select the study participants. Data were entered in to SPSS version 16. Descriptive statistics were used to describe data. Multivariable logistic regression analysis was used to identify the predictors of good menstrual hygiene practice.

RESULTS: Safe MHM practice was 24.5% and did not show significant variation between urban and rural adolescent girls. However, significantly higher numbers of adolescent girls in the urban area used sanitary pads than the rural adolescent girls. Being older, attending formal education and educational status of participants' mother were factors associated with safe MHM practice.

KEYWORDS: menstrual, hygiene, practice, adolescent, girls, Ethiopia

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INTRODUCTION

Adolescence is the period of transition from childhood to adulthood which is characterized by major physiological, psychological and social changes¹. Menstruation is one of the most important changes occurring among girls during the adolescent years of age²⁻⁴. Menstruation requires proper menstrual hygiene management practice which is essential for women and girls to protect from infections that are related to improper practice of menstrual hygiene, participate in society with dignity and comfort⁵.

Studies revealed that proper menstrual hygienic management practices during menstruation such as use of sanitary pads and frequent washing of the genital area are essential for the mental and physical well-being of women and adolescent girls⁵. Hygiene related practices of women and adolescent girls including disposal of used menstrual management materials are also considerable importance as it had health impacts in terms of increasing vulnerability to infection⁽⁵⁾. Poor hygienic practice of adolescents during menstruation predisposed them to reproductive tract infection, urinary tract infection and bad odor^{6, 7}.

Menstrual hygiene management is practiced differently in accordance with cultural, social, educational and economic status of the community⁸. Adolescent girls in developing countries often receive minimal instruction on menstrual hygiene management because menstruation is seen as a taboo by many communities, which makes it extremely difficult for adolescent girls to acquire necessary information and support from parents and school teachers^{6, 9}. There is gross lack of information on menstrual preparedness and management among adolescent girls¹⁰. As a result their experience has been confusing, frightening, and shame-inducing and can result in stress, fear and embarrassment, and social exclusion during menstruation¹¹.

Poor family support, lack of support from teachers, lack

of access to sanitary products, and limited economic resources to purchase sanitary products, inadequate water and sanitation facilities at school and lack of a clean and private space were mentioned as prominent challenges for menstrual hygiene management¹²⁻¹⁴.

Studies in other countries have shown that a significant difference in proportion of menstrual problems and practices in rural and urban adolescent girls was documented¹⁵⁻¹⁷. Studies conducted in Ethiopia so far have been conducted in school adolescent girls¹⁸⁻²¹ which are insufficient to describe the status of menstrual hygiene management practice and its associated factors among out of school adolescent girls. In Ethiopia, there is cross-sociocultural diversity and multi-dimensional cultures and taboos which have an effect on proper menstrual hygiene management practices. Moreover, youth friendly reproductive and sexual health service has adopted and implemented in health facilities to access and make it friendly youths including adolescents. Thus, community-based studies in different areas can provide inclusive evidence on menstrual hygiene management practice to identify the gaps and strengthen the existing strategies on reproductive and sexual health. Therefore, this study was designed to assess menstrual hygiene management practice among adolescent girls in urban and rural areas of Bahir Dar city administration, northwest Ethiopia.

METHOD AND MATERIALS

Study design: A community based comparative cross-sectional study design was conducted to determine menstrual hygiene management practices and associated factors among urban and rural adolescents in Bahir Dar city Administration, Northwest Ethiopia.

Study setting and population

The study was conducted from February 5 to 25, 2015 in Bahir Dar city administration, Amhara National Regional State. Bahir Dar city is the part of

the city administration which is located at 565 km in Northwest direction of Addis Ababa, Ethiopia. The city administration has nine urban kebeles and nine rural kebeles for administrative purposes. Based on 2007 national census, the estimated population of city administration in 2015 is 297,775, of which 156, 515 are females and 40,028 were adolescent girls (10-19 years) (18). All adolescent girls in the study area during the study period were the study population.

Sample size determination and sampling procedure: The required sample size was calculated using two population proportion formula by considering the following assumptions: a 95% confidence level (1.96), 80% power, two comparison groups [urban (n1) to rural (n2) population ratio 1:2], 50% proportion of safe menstrual hygiene management practice among urban adolescent girls since there was no previous study, 40% practice of safe menstrual hygiene among rural adolescent girls to detect 10 % difference between urban and rural adolescent girls and design effect 2. The final sample size was 1010 adolescent girls (337 for urban and 673 for rural) by including 10% non-response rate.

Multi-stage stratified sampling technique was used to select adolescent girls in urban and rural kebeles of Bahir-Dar city administration. First, three kebeles from each stratum (urban and rural areas) were randomly selected. Proportion to size allocation was made to determine the required sample size from each selected kebeles. Adolescent girls were selected using systematic random sampling technique.

Study variables: Menstrual hygiene management practice was the outcome variable whereas socio-demographic variables (Age, age at menarche, marital status, residence, educational status, maternal education) were the explanatory variables. Menstrual hygiene management indicators were developed from previous study using three composite item questions which had yes or no response (use of menstruation

pad, frequency of washing genitalia and way of disposing used menstruation pad). Menstrual hygiene management practice was categorized into 'safe' or 'unsafe' menstrual hygiene management practice. If adolescent girls used menstruation pad, wash their genitalia two or more times per day and disposed of used menstruation pad in to latrine, their menstrual management hygiene practice was classified as 'safe' otherwise 'unsafe'.

Data collection tool: Data were collected using structured interviewer administered questionnaire. The questionnaire comprises of socio-demographic variables of the study participants and parents of participants, knowledge on menstruation and menstrual hygiene management practices. The questionnaire was developed in English then translated in to Amharic (local language) then back to English to check consistency. Five diploma nurses and two BSc nurses were recruited as data collectors and supervisors during the data collection process.

Data quality assurance: Data collectors and supervisors were trained on the purpose of the study, data collection technique and tool for two days. The questionnaire was pre-tested on 5% of the sample size in kebeles where the main study was not undertaken and the necessary amendments were done accordingly. The filed questionnaires were reviewed daily by principal investigator for ensuring completeness of questions. Incomplete questionnaires were discarded from the analysis.

Data analysis: Data were entered and analyzed using SPSS statistical package version 21.0. Descriptive statistics were used to describe data. Bivariate and multivariable logistic regressions were used to identify predictors of safe menstrual hygiene management. The Hosmer-lemeshow test was checked to assess the model fitted to conduct logistic regression. A p-value < 0.2 was considered to retain variables for multivariable logistic regression model. Backward stepwise logistic regression model was used during multivariable logistic

regression to control confounding effect. Crude and Adjusted odds ratios with 95% confidence intervals were calculated for each of independent variables to measure the strength of the association between outcome and independent variables. A p-value < 0.05 was considered as level of significance.

Ethical considerations: The study was approved by ethical review committee of College of Medicine and Health Sciences, Bahir-Dar University. Letter of permission was taken from respective administration. Those participants whose age is <18 years and \geq 18 years provided assent and informed verbal consent respectively. Verbal informed consent was also obtained from the parents of those participants whose age is <18 years before data collection. Privacy and confidentiality were maintained throughout the study period by excluding personal identifiers during data collection.

RESULTS

A total 1010 adolescent girls, 336 from urban and 670 from rural, participated in the study with a response rate of 99.6%. The mean age (+SD) of urban and rural adolescent girls was comparable (17.29 (+1.40) Vs 17.27 (+1.43) years respectively). Almost all participants in urban and rural adolescent girls were from Amhara ethnic group (97.0% vs 99.6% respectively). The majority of urban (92.2%) and rural (93.4%) adolescent girls were Orthodox Christian followers. Above three-fourth of urban (94.1%) and 76.3% of rural adolescent girls were attend primary education. Above two third of urban (68.4%) and rural (70.9%) adolescent girls were single. Regarding to their mother's education status, 61.8% of urban and 72.3% of rural mothers of adolescent girls were unable to read and write whereas only, 7(2.1%) urban and 24(3.6%) rural mothers of adolescent girls attended college and above. One hundred ninety-eight (58.9%) urban and 323(48.2%) rural adolescent girls had pain during menses. Above one fourth (26.3%) of urban and 18.4% of rural adolescent girls could not attend formal education during menses (Table 1).

Table1: Socio-demographic characteristics of respondents in Bahir Dar City Administration, 2015

Variables	Urban n=336(%)	Rural n=670(%)	Total
Age in years			
15-17	176(52.4)	330(49.3)	506(50.3)
18-19	160(47.6)	340(50.7)	500(49.7)
Education status			
Unable to read and write	14(4.1)	125(18.6)	139(13.8)
Able to read and write	6(1.8)	34(5.1)	40(4.0)
Primary	145(43.2)	315(47.0)	460(45.7)
Secondary	139(41.4)	170(25.4)	309(30.7)
College and above	32(9.5)	26(3.9)	58(5.8)
Marital status			
Single	255(75.9)	458(68.4)	713(70.9)
Married	77(22.9)	195(29.1)	272(27.0)
Divorced	4(1.2)	17(2.5)	21(2.1)
Religion			
Orthodox	310(92.2)	626(93.4)	936(93.0)
Protestant	3(1.0)	1(0.2)	4(0.5)
Catholic	23(6.8)	43(6.4)	66(6.5)
Ethnicity			
Amhara	326(97.0)	667(99.6)	993(98.7)
Others*	10(3)	3(0.4)	13 (1.3)
Education status of mothers			
Unable to read and write	243(72.3)	414(61.8)	657(65.3)
Able to read and write	31(9.2)	109(16.3)	140(13.9)
Primary	29(8.7)	76(11.3)	105(10.4)
Secondary and above	33(7.7)	71(10.6)	101(10.4)
Living with older sister/relative			
Yes	155(46.1)	228(34.0)	383(38.1)
No	181(53.9)	442(66.0)	623(61.9)
Attending formal education			
Yes	213(63.4)	272(40.6)	485(48.2)
No	123(36.6)	398(59.4)	521(51.8)
Do you have pain during menses?			
Yes	198(58.9)	323(48.2)	521(51.8)
No	138(41.1)	347(51.8)	485(48.2)
School absenteeism due to menses			
Yes	83(26.3)	94(18.4)	177(21.4)
No	233(73.7)	417(81.6)	650(78.6)

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Menstrual hygiene management practice of adolescent girls

Almost one-third (29.5%) of urban and 21.9% of rural adolescent girls did safe menstrual hygiene practices. Two hundred twenty-two (76.3%) urban and 230 (49.4%) rural adolescent girls used menstruation pad during menstruation. Three hundred twenty-five (96.7%) urban and 655(97.8%) rural adolescent girls washed their genitalia during menstruation. One

hundred forty-eight (45.5%) urban and 260(39.7%) rural adolescent girls used soap to clean their genitalia during menstruation. One hundred ten 110(33.8%) urban and 113(17.2%) rural adolescent girls washed their genitalia four or more times per day. Forty-five (15.5%) urban and 207 (44.4%) rural adolescent girls reuse cloth that they used during menstruation. One hundred eighteen (48.0%) urban and 179 (69.1%) rural adolescents discard used menstruation pad/cloth into latrine (Table 2).

Table 2: Menstrual Hygiene Management Practice among Adolescents in Bahir Dar City Administration, 2015

Variables	Urban n=336(%)	Rural n=670(%)	Total
Thinking menses needs special care	Yes	325 (96.7)	642 (95.8)
	No	11 (3.3)	28 (4.2)
Use menstruation pad/cloth during menses	Yes	291(86.6)	466(69.5)
	No	45(13.4)	204(30.5)
Type of menstruation pad/cloth (n=757)	Menstruation pad		230(49.4)
	New cloth	36(12.4)	74(15.9)
	Old cloth	33(11.3)	162(34.8)
Do you wash the vagina during menses?	Yes	325(96.7)	655(97.8)
	No	11(1.1)	15(2.2)
What do you use to wash it? (n=980)	Water only	177(54.5)	395(60.3)
	Water and soap		260(39.7)
Frequency of washing (n=980)	Once	14(4.3)	32(4.9)
	Two times	78(24.0)	243(37.1)
	Three times	123(37.6)	267(40.8)
	Four and above times		113(17.2)
Where do you put your menstruation pad/cloth?(n=757)	I reuse it	45(15.5)	207(44.4)
	I dispose it	246(84.5)	259(55.6)
Where did you put if you dispose used menstruation pad/cloth (n=505)	In latrine	118(48.0)	179(69.1)
	I disposed in the compound	5(2.0)	10(3.9)
	Dispose together with solid wastes	123(50.0)	70(27.0)
Menstrual hygiene	Safe*	99(29.5)	147(21.9)
	Unsafe	237(70.5)	523(78.1)

*If adolescent girls used menstruation pad, wash their genitalia two or more times per day and disposed of used menstruation pad in to latrine, their menstrual management hygiene practice

Factors associated with safe menstrual hygiene practice

In bivariable logistic regression place of residence, age, educational status, maternal education, being a

student, marital status, age of menarche and perception of adolescent girls on menses needs special care showed statistically significant association with safe menstrual hygiene management practice (Table 3).

Table 3: Factors Associated with Menstrual Hygiene Management Practice of Adolescent Girls in Bahir Dar City Administration, 2015

Variables	Menstrual hygiene practice		COR (95%CI)	AOR (95%CI)	
	Safe	Unsafe			
Place of residence	Urban	99	237	1.48(1.1,2.0)	
	Rural	147	523	1.00	
Age	15-17 years	107	399	1.00	1.00
	18-19 years	139	361	1.43(1.0,1.9)	1.46(1.1,1.9)
Educational status	No formal education	16	163	1.00	1.00
	Primary	101	359	2.86(1.6,5.0)	5.01(2.5,9.7)
	Secondary	106	203	5.32(3.0,9.3)	8.53(4.4,16.4)
	College and above	23	35	6.69(3.2,13.9)	6.96(3.1,15.4)
Thinking menses needs special care	Yes	243	724	4.02(1.2,13.1)	3.21(1.1,10.9)
	No	3	36	1.00	1.00
Education status of mothers	Cannot read and write	143	514	1.00	1.00
	Can read and write	31	109	1.02(0.6,1.5)	3.14(1.7,5.5)
	Primary	36	69	1.87(1.2,2.9)	3.29(1.9,5.5)
	Secondary and above	36	68	1.90(1.2,2.9)	3.62(2.1,6.0)
Being a student during survey	Yes	144	341	1.73(1.2,2.3)	1.80(1.2,2.5)
	No	102	419	1.00	1.00
Marital status	Married	51	221	1.56(1.1,2.2)	
	Single/divorced	189	524	1.00	
Age of menarche	11-13years	198	642	0.94(0.6,1.4)	
	14-15years	15	17	2.70(1.2,5.9)	
	16-18years	33	101	1.00	

In the multivariable logistic regression analysis age had associations with menstrual hygiene practice, adolescent girls whose age is >18 years of age were 1.4 times more likely to have safe menstrual hygiene management practice than their counterparts [AOR=1.46, 95% CI: (1.1, 1.9)]. Educational status of adolescent girls and their mothers had associations with their menstrual hygienic practice. Adolescent girls attended primary education were 5 times [AOR=5.01, 95% CI: (2.5, 9.7)], those attended secondary education were 8.5 times [AOR=8.53, 95% CI: (4.4, 16.4)] and those attend college and above were 6.9 times [AOR=6.96, 95% CI: (3.1, 15.4)] more likely to have safe menstrual hygiene management practice than those who had no formal education. Adolescents whose mother was able to read and write were 3 times more likely to have safe menstrual hygiene management practice [AOR=3.14, 95% CI: (1.7, 5.5)] than those mothers who could not read and write. Mothers of adolescent girls who attended primary education [AOR=3.29, 95% CI: (1.9, 5.5)] and secondary and above [AOR=3.62, 95% CI: (2.1, 6.0)] were 3.2 times and 3.6 times, respectively, more likely to have safe menstrual hygiene management practice than those mothers who could not read and write. Being a student currently and adolescents who believe menses needs special care were factors associated with safe menstrual hygiene practice. Adolescents who are a student currently were 1.8 times and those who believe menses needs special care were 3.2 times more likely to have safe menstrual hygiene management practice than their counterparts [AOR=1.80, 95% CI: (1.2, 2.5)] and [AOR=3.21, 95% CI: (1.1, 10.9)] respectively (Table 3).

DISCUSSION

The magnitude of safe menstrual hygiene management practice (considering use of menstruation pad, frequency of washing genitalia and way of disposing the used menstruation pad) among the study participants

was only 24.5 % (95%CI: 21.8, 27.1%). This study showed safe menstrual hygiene management practice did not show statistically significant differences among urban and rural adolescent girls [29.5 %, (95% CI: 24.6, 34.4) Vs 21.9 %, (95% CI: (18.8, 25.1))]. The possible explanation for this difference might be related to the composite variables that we used to measure safe menstrual hygiene practice. For instance, more urban (66.0%) compared to rural adolescents (34.4%) used menstruation pad whereas proper disposal of used menstruation pad (disposal into latrine) was higher in rural (69.0%) area than urban (48.0%). However, disposal together with solid wastes was lower in rural area (27.0%) than urban area (50.0%). The reason that urban adolescents in the study area are more likely to dispose used menstruation pad together with solid wastes might be due to the convenient of disposal methods. In urban adolescents are living in houses which have water flushed toilet which is not compatible and convenient to dispose used menstruation pad into sewer system due to blockage of the sewerage system unlike the rural adolescent girls lived in a house with latrine that is convenient for receiving and disposing of used menstruation pad.

Among all participants, 75.3% of them used any absorbent material of which 44.9% (95%CI: 41.9%, 48.0%) were using menstruation pad. The overall use of menstruation pad in this study is higher than the study done in Northeast Ethiopia (35.4%)¹⁹ and lower than the community based studies done in India which found in the range between 49% to 70.0%²⁰⁻²²; however, it is consistent with a systematic review and meta-analysis study done in India which found 45% (38% to 52%)²³. The different results between community-based studies might be related to time gap between the studies, the cultural and economic difference in the study areas.

School absenteeism was documented among adolescent in low income countries during menstruation due to

several reasons. Almost one-fourth of urban and one-fifth of rural adolescent girls were unable to attend formal education during menses in the study. This finding is consistent with systematic review and meta-analysis done in India¹⁶. However, it is lower than studies done in Kenya^{9, 22} and Bangladesh²³ where 41% of girls post-menarche reported usually missing school during menstruation. The difference might be due to variation in the study participants. In this study the participants were adolescent from the community whereas the study participants conducted in Kenya and Bangladesh were school adolescent girls.

This study revealed that menstruation pad utilization had shown a significant variation in urban and rural adolescent girls with 66.1% (95% CI: 61.0%, 71.2%) Vs 34.3% (95% CI 30.7%, 37.9%) respectively. This result is in line with a systematic study in India which revealed that sanitary pads were highly utilized in urban (pooled magnitude was 67%; 95%CI; 57% to 76%) areas than rural areas (pooled magnitude was 32%; 95%CI; 25% to 38%)²³. The difference on menstruation pad use between urban and rural adolescent girls might be due to the fact that urban adolescent girls and their mothers have more awareness of reproductive health related issues, have better access for menstruation pad and parental/family communication about menstruation and its hygienic management than the rural adolescent girls.

This study also revealed that adolescent girls in urban (96.7%) and rural (97.8%) areas had no significant variations of washing their genital area during menses; however, there were variation in using soap and frequency of washing between rural and urban participants; from adolescent girls who wash their genital area during menses; more urban than rural adolescents use soap to clean their genitalia (45.5% Vs 39.7%) and frequency of washing at least four times was higher in urban than rural (33.8% Vs 17.2% respectively). The difference might be due to the level

of awareness on the benefit of using soap as the urban adolescent girls might have a higher tendency to talk about menstruation and its management with their parents compared to rural girls; and they might also wash their genitalia more frequently as they might have enough time compared to rural adolescent girls since these girls might spend much of their time in agricultural activities). In addition, the urban adolescent girls might also have a better access for water to wash their genitalia more frequently.

Age and educational status of adolescent girls in this study were the predictors of safe menstrual hygiene management practice. Adolescent girls with age 18 years and above had higher safe menstrual hygiene management practice than adolescent girls with age less than 18 years. The possible explanation might be due to prior awareness at school since if their age is beyond 18, they are highly likely to attend primary education than those whose age is <18 years which might bring a difference in awareness on menstruation and its management. 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 is also supported by the current study as those adolescent girls attended formal educational had higher safe menstrual management practice than those who had no formal education. This finding is consistent with previous studies in West Bengal²⁴. The possible explanation might be that educated adolescent girls had a chance of prior exposure about awareness on menstruation and proper menstrual hygiene management practice through their educational curriculum and/or informal communication between themselves and their teachers. Educational status of parents was an important predictor for menstrual hygienic management practice²⁵. In this study educational status of the mothers was one of the predictors of safe menstrual hygiene management practice of adolescent girls which is consistent with

other studies in Ethiopia¹⁹, Nigeria²⁶, Lebanon²⁷, and India²⁸. The possible reason could be that educated mothers might have awareness on practice of menstrual hygiene, could have open discussion with their daughters about menses and more likely provide sanitary pad for their daughters to clean their genitalia during menstruation.

Even though using well trained female data collectors to address the sensitive issue about menstrual hygiene, community based and comparative nature of among urban and rural could be the strengths of this study; the possibility of unavoidable social desirability bias and lack of qualitative component for triangulation could be taken as the limitation.

CONCLUSIONS

Safe menstrual management practice was low (24.5%) in the study area and did not show significant variation between in urban and rural adolescent girls. However, significantly higher numbers of adolescent girls in the urban area were using menstruation pad or sanitary pads as compared to the rural adolescent girls. Being older, attending formal education and educational status of the mother of the participants revealed significant positive association with safe menstrual management practice. Therefore, adolescent girls should be educated about safe menstrual hygiene management using different approaches in in and out-school areas giving emphasis for teenagers, further consolidating the contents.

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Bahir Dar University covered only the transportation and per-diem cost of data collectors and supervisors during the data collection process.

AUTHORS' CONTRIBUTIONS

All authors (MA, TE and YM) were involved in the conception, design of the research project proposal; analysis, interpretation, report writing and approval of the final manuscript.

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REFERENCES

1. UNICEF. The State of the World's Children 2011, Executive Summary: Adolescence an Age of Opportunity. New York: UNICEF. 2011.
2. Jones LL, Griffiths PL, Norris SA, Pettifor JM, Cameron N. Age at menarche and the evidence for a positive secular trend in urban South Africa. *Am J Hum Biol.* 2009;21(1):130-2. Epub 2008/10/24.
3. Prentice S, Fulford AJ, Jarjou LM, Goldberg GR, Prentice A. Evidence for a downward secular trend in age of menarche in a rural Gambian population. *Ann Hum Biol.* 2010;37(5):717-21. Epub 2010/05/15.
4. Anderson SE, Must A. Interpreting the continued decline in the average age at menarche: results from two nationally representative surveys of U.S. girls studied 10 years apart. *J Pediatr.* 2005;147(6):753-60. Epub 2005/12/17.
5. Sommer M, Sahin M. Overcoming the taboo: advancing the global agenda for menstrual hygiene management for schoolgirls. *Am J Public Health.* 2013;103(9):1556-9. Epub 2013/07/20.
6. Garg R, Goyal S, Gupta S. India moves towards menstrual hygiene: subsidized sanitary napkins for rural adolescent girls-issues and challenges. *Matern Child Health J.* 2012;16(4):767-74. Epub 2011/04/21.
7. Balamurugan SS, Bendigeri N. Community-based study of reproductive tract infections among women of the reproductive age group in the urban health training centre area in hubli, karnataka. *Indian J Community Med.* 2012;37(1):34-8. Epub 2012/04/25.
8. Kumar A, Srivastava K. Cultural and social practices regarding menstruation among adolescent girls. *Soc Work Public Health.* 2011;26(6):594-604. Epub 2011/09/22.
9. McMahan SA, Winch PJ, Caruso BA, Obure AF, Ogutu EA, Ochari IA, et al. 'The girl with her period is the one to hang her head' Reflections on menstrual management among schoolgirls in rural Kenya. *BMC Int Health Hum Rights.* 2011;11:7. Epub 2011/06/18.
10. Chandra-Mouli V, Patel SV. Mapping the knowledge and understanding of menarche, menstrual hygiene and menstrual health among adolescent girls in low- and middle-income countries. *Reprod Health.* 2017;14(1):30. Epub 2017/03/03.
11. Sommer M. Ideologies of sexuality, menstruation and risk: girls' experiences of puberty and schooling in northern Tanzania. *Cult Health Sex.* 2009;11(4):383-98. Epub 2009/03/28.
12. Hennegan J, Dolan C, Steinfield L, Montgomery P. A qualitative understanding of the effects of reusable sanitary pads and puberty education: implications for future research and practice. *Reprod Health.* 2017;14(1):78. Epub 2017/06/29.
13. Kuhlmann AS, Henry K, Wall LL. Menstrual Hygiene Management in Resource-Poor Countries. *Obstet Gynecol Surv.* 2017;72(6):356-76. Epub 2017/07/01.
14. Shah SP, Nair R, Shah PP, Modi DK, Desai SA, Desai L. Improving quality of life with new menstrual hygiene practices among adolescent tribal girls in rural Gujarat, India. *Reprod Health Matters.* 2013;21(41):205-13. Epub 2013/05/21.
15. Thakre SB, Thakre SS, Ughade S, Thakre AD. Urban-rural differences in menstrual problems and practices of girl students in Nagpur, India. *Indian Pediatr.* 2012;49(9):733-6. Epub 2012/06/26.
16. van Eijk AM, Sivakami M, Thakkar MB, Bauman A, Laserson KF, Coates S, et al. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open.* 2016;6(3):e010290. Epub 2016/03/05.
17. Mishra SK, Dasgupta D, Ray S. A study on the relationship of sociocultural characteristics, menstrual hygiene practices and gynaecological problems among adolescent girls in Eastern India. *Int J Adolesc Med Health.* 2016. Epub 2016/03/02.
18. Tegegne TK, Sisay MM. Menstrual hygiene management and school absenteeism among female adolescent students in Northeast Ethiopia. *BMC Public Health.* 2014;14:1118. Epub 2014/10/31.
19. Zegeye DT, Megabiaw B, Mulu A. Age at menarche and the menstrual pattern of secondary school adolescents in northwest Ethiopia. *BMC Womens Health.* 2009;9:29. Epub 2009/10/07.
20. Upashe SP, Tekelab T, Mekonnen J. Assessment of knowledge and practice of menstrual hygiene among high school girls in Western Ethiopia. *BMC Womens Health.* 2015;15:84. Epub 2015/10/16.
21. Gultie T, Hailu D, Workineh Y. Age of menarche and knowledge about menstrual hygiene management among adolescent school girls in Amhara province, Ethiopia: implication to health care workers & school teachers. *PLoS ONE.* 2014;9(9):e108644. Epub 2014/10/01.
22. Mason L, Nyothach E, Alexander K, Odhiambo FO, Eleveld A, Vulule J, et al. 'We keep it secret so no one should know'-a qualitative study to explore young schoolgirls attitudes and experiences with menstruation in rural western Kenya. *PLoS ONE.* 2013;8(11).
23. Alam MU, Luby SP, Halder AK, Islam K, Opel A, Shoab AK, et al. Menstrual hygiene management among Bangladeshi adolescent schoolgirls and risk factors affecting school absence: results from a cross-sectional survey. *BMJ Open.* 2017;7(7):2016-015508.