

The relationship between menstrual hygiene management, practices, and school absenteeism among adolescent girls in Johannesburg, South Africa

N Khamisa,¹ PhD; N Nanji,² BPH (Hons); N Tshuma,³ PhD; J Kagura,⁴ PhD

¹ Division of Health and Society, School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

² School of Public Health and Family Medicine, Faculty of Health Sciences, University of Cape Town, South Africa

³ The Best Health Solutions, Johannesburg, South Africa

⁴ Division of Epidemiology and Biostatistics, School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author: N Khamisa (natasha.khamisa@wits.ac.za)

Background. Factors associated with menstrual hygiene management (MHM) and practices affect school absenteeism, with up to 7 million girls missing 25% of their given school year each month in South Africa (SA).

Objective. To identify the most significant factors associated with MHM and practices affecting school absenteeism among adolescents in Johannesburg, SA.

Methods. A secondary data analyses of a cross sectional study among 489 adolescent girls from 30 schools in Johannesburg, SA was conducted. Data was collected using a self-administered questionnaire. Logistical regression analysis was conducted for all variables affecting school absenteeism using STATA version 14.

Results. Female adolescents who had pre-menarcheal training were more likely to attend school (odds ratio (OR) 1.96; 95% confidence interval (CI) 1.04 - 3.73; $p=0.038$). Those who disposed of their absorbent materials by burning, throwing them by the roadside or on farmland were almost 2× more likely to be absent from school (OR 2.07; 95% CI 1.05 - 4.08; $p=0.038$). Dysmenorrhea (painful menstruation) was associated with higher likelihood of being absent from school (OR 2.6; 95% CI 1.29 - 5.29; $p=0.008$).

Conclusion. This present study reveals that MHM and practices related to school absenteeism extend beyond the availability of sanitary materials. These findings can be used to create dialogue between various stakeholders about best practices for reducing school absenteeism related to MHM.

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Menstrual hygiene management (MHM) and practices include the use of clean menstrual management materials for the absorption or collection of blood, the necessary changing of these materials in private for the duration of the menstrual cycle, the required use of soap and clean water for body washing, access to safe and convenient facilities for disposal of used materials, adequate knowledge about the menstrual cycle as well as the management thereof with dignity and absence of fear or discomfort.^[1]

In developing countries, MHM is particularly challenging due to inadequate knowledge as well as lack of access to sanitary materials and hygiene facilities, thereby impacting education and health outcomes.^[2] Sub-Saharan Africa (SSA) has one of the fastest growing populations of adolescent girls in the world, with poor MHM and practices being a prominent issue in this region.^[3] Poor MHM and practices is documented in several studies, with some studies showing that up to 87% of girls use old clothes and rags as absorbent materials and these materials are not properly washed before re-using.^[4] This as well as lack of clean, functional, private and gender-specific facilities, fear of leakage and poor access to sanitary materials are commonly reported to be associated with absenteeism at school.^[2]

School absenteeism among adolescent girls is a known effect, with some SSA studies estimating between 1.6 - 2.1 days of school

are missed every month by 50 - 70% of menstruating girls.^[3] In South Africa (SA), 7 million girls are reported to be absent from school each month due to lack of sanitary pads, which results in them missing 25% of learning during the school year.^[5] Embarrassment, fear of being ridiculed together with menstrual pain (dysmenorrhea) and lack of sanitary materials contributed to school absenteeism among girls in Uganda.^[6] Interestingly, an Ethiopian^[7] study showed that 56% of girls who received re-usable sanitary pads were absent from school. Pre-menarcheal training is associated with school absenteeism through knowledge of MHM and practices, and predictors of this include age and living with both parents.^[8]

School absenteeism is associated with several factors including access to sanitary materials, hygiene facilities, pre-menarcheal training, painful menstrual symptoms as well as age and living conditions. Noteworthy is that these factors often work together in influencing school absenteeism, with studies showing that despite pre-menarcheal training, a lack of adequate disposal facilities negatively affects school absenteeism.^[7] This not only impacts the psychosocial wellbeing of girls by negatively affecting their confidence and dignity, but also their academic experience through participation and performance at school.^[4] Reports further indicate that these issues are exacerbated in SSA, where 47% of schools have

limited or no sanitation facilities and 21% have basic hygiene services equipped with soap and water.^[9] In SA specifically, 7.1 million people (including women and children) and 4 500 schools do not have access to basic sanitation facilities.^[10] This as well as a lack of research that could potentially inform policy and practice in the country justifies the need for the present study. The present study seeks to identify the most significant MHM factors and practices affecting school absenteeism among adolescents in Johannesburg, SA.

Methods

Study setting and design

Johannesburg is the biggest city in SA, with a population of ~4.4 million people. It is situated in Gauteng Province (GP), the most populous and highly urbanised province in the country. The city is comprised of 1 434 856 households with an average household size of 2.8 people per household. Of these households, 64.7% have access to piped water and 26.9% have water in their premises.^[11] The Department of Water and Sanitation recently announced a plan to provide water to over 3 126 schools nationwide. To facilitate this and ensure installation of water tanks in schools, the department has partnered with Rand Water and Department of Education with the aim of having up to 1 320 tanks installed at schools across the provinces.^[12] GP has ~2 606 schools and Johannesburg has 269 schools.^[13]

Participants and sampling

This study is a secondary analysis of quantitative data obtained from a cross-sectional study among female adolescents aged between 12 and 19 years (grades 8 - 12) from 30 schools in the inner city of Johannesburg. Sample size calculation was done using 95% confidence interval, 0.05 precision and prevalence rate as well as the Leslie Fischer formula ($n=Z^2PQ/d^2$), which revealed a sample size of 489.

The primary study used a multistage sampling technique to identify the schools as well as participants. Proportionate stratified random sampling method was used in the identification of schools from each sub-district. The Department of Education quintile classification formed the strata from which public schools were randomly selected using a lottery method. The number of schools were selected using a sampling fraction in each of the strata that was proportional to that of the total sub-district population. Stratified systematic sampling method was used in the identification of participants in the selected schools. The grade levels formed the strata from which participants were systematically selected, with class registers constituting the sampling frame. In cases where a respondent declined to participate in the study, a successive participant was selected.

The inclusion criteria were female adolescents who were in grades 8 - 12 and between the ages of 12 - 19 years. Male and female adolescents below or above the ages of 12 - 19 who were not in grades 8 - 12 were excluded.

Data collection

A self-administered questionnaire with close-ended questions was administered to consenting participants during the primary study. An electronic data system was used to record responses using electronic tablets. The questionnaire consisted of questions related to demographics, pre-menarcheal training, MHM, menarche and menstrual cycle. Inter-rater reliability was achieved confirming the consistency of the questionnaire. Data quality was affirmed through an automated data entry spreadsheet, which underwent systematic checking.

Ethical considerations

Ethics approval was obtained for the secondary study from Monash University Human Research Ethics Committee (ref. no. 9690). Informed consent was provided by parents of participants prior to participation in the primary study. Data were password protected and stored in a safe place, with participant information were only available to the researchers. The participants were able to withdraw from the study at any time and referred for counselling if they experienced distress or discomfort.

Data analysis

The outcome variable was school absenteeism (measured as absent or not absent) and exposure variables included age, age at menarche, weight, height, body mass index (BMI) and duration of menstrual cycle, among others. Variables such as parents' education, pre-menarcheal training, disposal of absorbent materials, and dysmenorrhea were further categorised. Each completed questionnaire was coded using a pre-existing coding sheet to reduce errors. Data were cleaned and analysed using STATA, version 14.0 (STATA Corp, USA)

Descriptive analysis was used to determine sample characteristics. A χ^2 and Fisher's exact tests were performed on the categorical variables while student's *t*-test was performed for continuous variables. A stepwise logistic analysis using backward selection was used to identify the MHM factors and practices most significantly associated with school absenteeism after adjusting for confounding variables (these were significant at 20% in the bivariate analyses). Thereafter, the variables that were significant at 20% were retained and other variables of interest were refitted in the model. The model was refitted until the model with a good fit was achieved. This was confirmed using the goodness of fit test. Finally, interactions between some variables were checked by fitting their interaction terms into the model. This was followed by a likelihood ratio test, which was conducted after each interaction term was fitted in the model to determine if it improved the fit of the model.

Results

The average age of the study participant was 16 years, age at menarche was 12 years, weight was 58 kg, height was 1.7 m, BMI was 20, and length of menstrual cycle was 27 days (Table 1).

As indicated in Table 2, mothers' education ($\chi^2 = 6.8$), type of absorbent material used ($\chi^2 = 4.15$), disposal of the absorbent material ($\chi^2 = 7.95$), experience at first menstruation ($\chi^2 = 10.18$), attitude towards menstruation ($\chi^2 = 10.7$), and dysmenorrhea ($\chi^2 = 11.4$) were significantly associated with school absenteeism ($p < 0.05$).

A unit increase in age at menarche showed a 28% increased odds of school absenteeism. Use of tissue paper or cloth as an absorbent material meant 105% increased odds of being absent from school. Disposal of absorbent material in another way (burning or on the roadside), compared with the reference of disposal in bins showed a 122% more likelihood of being absent from school. Being expectant of the girls' first menstruation was statistically significant with school absenteeism but being expectant as compared with undesirable (reference) was associated with 75% less likelihood of being absent from school. A satisfied attitude was associated with an 86% less likelihood of being absent from school. Having a painful menstruation was associated with a 200% more likelihood of being absent from school (Table 3).

Table 4 shows multivariate analyses, whereby age at menarche and pre-menarcheal training were marginally associated with school absenteeism, with an additional year being associated with 14%

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Table 1. Study sample characteristics of adolescent girls, aged 12 - 19 years

Variable	n (%)
Weight (kg)	57.8 (11.3)
Height (m)	1.71 (0.2)
BMI	20 (6.4)
Age (years)	16 (2.3)
Age at menarche (years)	12 (1.9)
Length of menstrual cycle (days)	27 (1.4)
Father's education	
No education	128 (26.2)
Some form of education	141 (28.8)
Educated	220 (45.0)
Mother's education	
No education	174 (38.9)
Some form of education	152 (34.0)
Educated	121 (27.1)
Mother's occupation	
Unemployed	128 (26.2)
Self-employed	166 (34.0)
Employed	195 (39.9)
Premenarcheal training	
No	279 (58.1)
Yes	201 (41.9)
Type of absorbent material used	
Sanitary pad	420 (89)
Toilet paper/cloth	52 (11)
Disposal of absorbent material	
Bin	323 (66.1)
Other	166 (33.9)
Experience at 1st menstruation	
Confusing	204 (41.7)
Frightening	177 (36.2)
Expectant	108 (22.1)
Attitude towards menstruation	
Undesirable	210 (42.9)
Unprepared	198 (40.5)
Satisfactory	81 (16.6)
Primary source of information	
Media	219 (44.8)
Mother or elder sister	174 (35.6)
Teacher or health worker	96 (19.6)
Duration of last menstruation	
0 - 3 days	128 (26.2)
4 days	116 (23.7)
5 days	131 (26.8)
6 or more days	114 (23.3)
Amount of last menstrual flow	
Light	81 (17.5)
Medium	167 (35.9)
Heavy	216 (46.6)
Dysmenorrhea	
No	426 (87.1)
Yes	63 (12.9)

(continued)

Table 1. (continued) Study sample characteristics of adolescent girls, aged 12 - 19 years

Variable	n (%)
Menorrhagia	
No	478 (97.7)
Yes	11 (2.25)
Mood changes	202 (41.3)
Pimples	134 (27.4)
Others	153 (31.3)
School absenteeism	
Not absent	434 (88.7)
Absent	55 (11.3)

BMI = body mass index.

Table 2. Study characteristics by MHM and practices in relation to school absenteeism

Variable	School absenteeism		p-value
	Not absent, n (%) ^a	Absent, n (%) ^a	
Weight (kg), mean (SD)	434 (88.8)	55 (11.2)	
Height (m), mean (SD)	57 (11.1)	57.72 (11.1)	0.0492
BMI, mean (SD)	1.72 (0.2)	1.68 (0.2)	0.6850
Age (years), mean (SD)	20 (5.5)	21 (6.3)	0.0492
Age at menarche (years), mean (SD)	15 (2.3)	16 (1.9)	-
Length of menstrual cycle (days), mean (SD)	12 (1.9)	13 (2.1)	0.0005
Father's education			
No education	27 (1.5)	27 (1.3)	0.6850
Some form of education			
No education	114 (89.1)	14 (10.9)	
Some form of education	132 (93.6)	9 (6.4)	
Educated	188 (85.5)	32 (14.5)	0.056
Mother's education			
No education	154 (88.5)	20 (11.5)	
Some form of education	140 (92.1)	12 (7.9)	
Educated	99 (81.8)	22 (18.2)	0.033
Mother's occupation			
Unemployed	114 (89.1)	14 (10.8)	
Self-employed	143 (86.1)	23 (13.9)	
Employed	177 (90.8)	18 (9.2)	0.394
Premenarcheal training			
Yes	181 (90.1)	20 (9.9)	
No	244 (87.5)	35 (12.5)	0.468
Type of absorbent material used			
Sanitary pad	382 (89.9)	43 (10.1)	
Toilet paper/cloth	52 (81.2)	12 (18.8)	0.042
Disposal of absorbent material			
Bin	296 (91.6)	27 (8.4)	
Other	138 (83.1)	28 (16.9)	0.005
Experience at 1st menstruation			
Confusing	171 (83.8)	33 (16.2)	
Frightening	160 (90.4)	17 (9.6)	
Expectant	103 (95.4)	5 (4.6)	0.006

(continued)

Table 2. (continued) Study characteristics by MHM and practices in relation to school absenteeism

Variable	School absenteeism		p-value
	Not absent, n (%) [*]	Absent, n (%) [*]	
Experience at 1st menstruation			
Undesirable	177 (84.3)	33 (15.7)	0.005
Unprepared	178 (89.9)	20 (10.1)	
Satisfactory	79 (97.5)	2 (2.5)	
Primary source of information			
Media	196 (89.5)	23 (10.5)	0.171
Relative	158 (90.8)	16 (9.2)	
Teacher or health worker	80 (83.3)	16 (16.7)	
Duration of last menstruation			
0 - 3 days	111 (86.7)	17 (13.3)	0.623
4 days	101 (87.1)	15 (12.9)	
5 days	118 (90.1)	13 (9.9)	
6 or more days	104 (91.2)	10 (8.8)	
Amount of last menstrual flow			
Light	67 (82.7)	14 (17.3)	0.233
Medium	150 (89.8)	17 (10.2)	
Heavy	193 (89.4)	23 (10.6)	
Dysmenorrhea			
No	386 (90.6)	40 (9.4)	0.001
Yes	48 (76.2)	15 (23.8)	
Menorrhagia			
No	425 (88.9)	53 (11.1)	0.462
Yes	9 (81.8)	2 (18.2)	
Premenstrual symptoms			
Mood changes	185 (91.6)	17 (8.4)	0.168
Pimples	114 (85)	20 (14.9)	
Others	135 (88.2)	18 (11.8)	

MHM = menstrual hygiene management; SD = standard deviation.
^{*} Unless otherwise specified.

increased odds of missing school due to menstruation. On the other hand, pre-menarcheal training was associated with 87% increased odds of missing school. Modes of disposal of absorbent material was one of the most significant predictor of school absenteeism related to menstruation, with any other form such as burning, roadside or on farmland as compared with bins (reference) being significantly associated with a 2-fold increase in school absenteeism. Dysmenorrhea was significantly associated with 3-fold increased odds of school absenteeism. Interestingly, there was a significant association between experience of first menstruation and school absenteeism; adolescents who were expectant of the first menstruation were notably less likely to miss school due to menstruation compared with those who were confused about menarche. There was an interaction between pre-menarcheal training and the experience at first menstruation (odds ratio (OR) 0.22; 95% confidence interval (CI) 0.06 - 0.84; $p=0.026$).

Discussion

This study sought to identify MHM factors and practices that most significantly affect school absenteeism among female adolescents in Johannesburg, SA. The results confirmed that age at menarche, pre-menarcheal training, disposal method, experience of first menstruation, and dysmenorrhea were significantly associated with school absenteeism.

Table 3. Bivariate logistic regression

Variable	OR (95% CI)	p-value
Age (years)	1.14 (0.99 - 1.3)	0.051
Weight (kg)	1.00 (0.98 - 1.03)	0.747
Height (m)	0.22 (0.04 - 1.13)	0.070
BMI	1.03 (0.99 - 1.08)	0.153
Age at menarche (years)	1.28 (1.11 - 1.47)	0.001
Length of menstrual cycle (days)	1.04 (0.09 - 1.27)	0.684
Father's education		
No education	1.00	-
Some form of education	0.56 (0.23 - 1.33)	0.187
Educated	1.39 (0.71 - 2.71)	0.339
Mother's education		
No education	1.00	-
Some form of education	0.66 (0.31 - 1.40)	0.278
Educated	1.71 (0.89 - 3.30)	0.109
Mother's occupation		
Unemployed	1.00	-
Self-employed	1.31 (0.64 - 2.66)	0.455
Employed	0.83 (0.40 - 1.73)	0.616
Premenarcheal training		
No	1.00	-
Yes	1.30 (0.73 - 2.32)	0.380
Type of absorbent material used		
Sanitary pad	1.00	-
Tissue paper or cloth	2.05 (1.02 - 4.13)	0.045
Disposal of absorbent material		
Bin	1.00	-
Other	2.22 (1.26 - 3.91)	0.006
Experience at 1st menstruation		
Confusing	1.00	-
Frightening	0.55 (0.30 - 1.02)	0.061
Expectant	0.25 (0.095 - 0.66)	0.005
Attitude towards menstruation		
Undesirable	1.00	-
Unprepared	0.60	0.094
Satisfactory	0.14	0.007
Primary source of information		
Media	1.00	-
Mother or elder sister	0.86 (0.44 - 1.69)	0.667
Teacher or health worker	1.70 (0.86 - 3.39)	0.129
Duration of last menstruation		
0 - 3 days	1.00	-
4 days	0.97 (0.46 - 2.04)	0.935
5 days	0.72 (0.33 - 1.55)	0.400
6 or more days	0.63 (0.27 - 1.43)	0.269
Amount of last menstrual flow		
Light	1.00	-
Medium	0.54 (0.25 - 1.16)	0.116
Heavy	0.57 (0.28 - 1.17)	0.126
Dysmenorrhea		
No	1.00	-
Yes	3.01 (1.55 - 5.86)	0.001
Premenstrual symptoms		
Mood changes	1.00	-
Pimples	1.90 (0.96 - 3.79)	0.065
Others	1.45 (0.72 - 2.92)	0.297

OR = odds ratio; CI = confidence interval; BMI = body mass index.

Table 4. Multivariate logistic regression

Variable	OR (95 CI)	p-value
Age at menarche (years)	1.21 (1.00 - 1.44)	0.043
Mother's education		
No education	1.00	
Primary	1.00 (0.36 - 2.82)	0.985
Secondary	0.75 (0.26 - 2.10)	0.577
Tertiary	1.07 (0.41 - 2.80)	0.895
Premenarcheal training		
No	1.00	
Yes	1.87 (0.99 - 3.54)	0.052
Disposal of absorbent material		
Bin	1.00	-
Other	2.31 (1.27 - 4.23)	0.006
Experience at 1st menstruation		
Confusing	1.00	-
Frightening	0.53 (0.27 - 1.01)	0.055
Expectant	0.28 (0.10 - 0.82)	0.020
Dysmenorrhea		
No	1.00	-
Yes	2.96 (1.44 - 6.10)	0.003
Premenstrual symptoms		
Mood changes	1.00	-
Pimples	1.78 (0.85 - 3.70)	0.124
Others	1.66 (0.79 - 3.49)	0.179

OR = odds ratio; CI = confidence interval.

Female adolescents exposed to pre-menarcheal training were more likely to attend school. This is aligned with several studies showing that lack of knowledge about MHM and practices negatively affect school attendance in developing countries.^[14] A Ugandan^[15] study showed that poor rates of school attendance were mitigated by 17% when pre-menarcheal training was involved. Studies have reported specific gaps in knowledge related to the reason for menstruation and origin thereof, which was attributed to the limited role of schools in providing pre-menarcheal training.^[16] Pre-menarcheal training offers knowledge about adequate MHM and practices, thereby improving preparedness and encouraging healthy management of menstruation. Female adolescents possessing adequate knowledge about how to manage their menstrual cycles are more likely to have positive feelings about it and are less likely to experience fear, secrecy and vulnerability associated with missing school.^[14]

In the multivariate analyses, disposal method of the absorbent material was shown to be significantly associated with school absenteeism. Female adolescents who disposed of absorbent materials by burning and throwing them by the roadside or farmland were notably more likely to be absent from school. Previous studies have attributed this to a lack of adequate disposal facilities such as bins, with one study reporting that only 1.1% of female adolescents were able to access these in Ugandan schools.^[6] Consistent with a study conducted in Zambia,^[17] where the majority of female adolescents disposed absorbent materials in toilets, it was explained that this was due to a lack of dustbins in the school toilets. This was also a preferred method of disposal due to fear of not wanting their used pads to be seen by others.^[17] Lack of adequate disposal facilities in schools prevents the frequent changing of absorbent materials, which leads to leaking on outer garments and makes it difficult for girls to attend school due to fear of shame and embarrassment.^[6]

The results of the present study confirm that female adolescents who were expectant of the first menstruation were less likely to miss school compared with those who were confused about first menstruation. Significant statistical interaction between pre-menarcheal training and experience of menarche also confirms that preparation for menarche in terms of training has a positive impact on adolescents' psychosocial wellbeing, while improving school attendance through creating a positive perception about menstruation.^[18]

Dysmenorrhea was also shown to be significantly associated with school absenteeism. Female adolescents who had dysmenorrhea showed 3-fold increased odds of being absent from school. These findings are confirmed by previous studies suggesting that those experiencing dysmenorrhea were 4.4× more likely to be absent from school.^[19] A similar study in Egypt^[20] showed that school absenteeism was the only factor among other daily activities that was significantly associated with dysmenorrhea. Dysmenorrhea is also considered to be the most prevalent menstrual problem among females and is reported to be the most common factor contributing to school absenteeism in Ethiopia.^[21] Evidently, the pain experienced by menstruating females is accompanied by a number of other symptoms including nausea, vomiting and fatigue, which affects the ability to attend school, sit in class and concentrate for an extended period of time.^[20,21]

Study limitations

Limitations of the present study include the small sample size, which reduces generalisability of the findings. Cross-sectional design of the study makes it difficult to establish causality and the use of a self-administered questionnaire makes it difficult to verify the accuracy of responses. School absenteeism in this sample was 11%, which is far lower than in other countries and might have affected the effect size. It is recommended that future studies should explore the effect of specific MHM practices on school absenteeism among female adolescents from a number of schools across SA.

Conclusion

This study provides empirical evidence for the direct association between pre-menarcheal training and school absenteeism in Johannesburg, SA, while adding new knowledge about the effect of disposal methods on school absenteeism. Understanding the impact of various menstrual symptoms, including dysmenorrhea, is important in this context and it is recommended that the findings of the present study be used to create dialogue between various stakeholders including schools, government, parents, teachers, and learners about best practices for reducing school absenteeism related to MHM and practices. Existing policies should incorporate improved MHM practices including compulsory pre-menarcheal training and access to adequate disposal facilities to increase attendance at school. Dispensing of pain medication by a qualified health professional should also be a consideration for pain management among menstruating adolescents attending school.

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Author contributions. NK, NN, JK and NT conceptualised this study. NT developed the protocol for this research study, planned the research, undertook data collection (with the assistance of trained research

assistants). NN and JK analysed the data and NK, NN and JK interpreted the data. NK wrote the draft of the manuscript. NK and JK provided input at all stages of the study. All authors approved the final version of the manuscript for publication.

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