ORIGINAL RESEARCH

Prevalence of Primary Dysmenorrhea, Its Intensity and Associated Factors Among Female Students at High Schools of Wolaita Zone, Southern Ethiopia: Cross-Sectional Study Design

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Introduction: Primary dysmenorrhea is a highly prevalent gynecological problem and one of the most common causes of school absenteeism among school adolescents. Nearly, half of females with primary dysmenorrhea missed school or work at least once per cycle. Therefore, this study aimed to assess the prevalence of primary dysmenorrhea and its associated factors among female students in Wolaita soddo town high schools.

Methods: An institution-based cross-sectional study was conducted among female students at Wolaita soddo town high schools from October 1–30/2021. A total of 733 students were selected using a simple random sampling technique. The data were entered using Epi data version 3.1 and exported to SPSS version 25 for analysis. Binary logistic regression analysis was used. Variables with a p-value of <0.05 in the multivariable logistic regression analysis model were considered statistically significant.

Results: The prevalence of primary dysmenorrhea was 70% (95% CI (66.6%, 73.4%)). Factors such as age <18 years (AOR 2.55; 95% CI (1.77, 3.68)), long duration of menstrual flow (AOR 2.72; 95% CI (1.42, 5.17)), irregular menstrual cycle (AOR 2.39; 95% CI (1.68, 3.41)), family history of dysmenorrhea (AOR 2.46; 95% CI (1.67, 3.64)) and skipping breakfast (AOR 1.62; 95% CI (1.13, 2.33)) were associated with primary dysmenorrhea.

Conclusion: The prevalence of primary dysmenorrhea was high among high school students in the study area. Being younger age, long menstrual flow duration, irregular monthly menstrual cycle, family history of dysmenorrhea, and skipping breakfast were determinants of primary dysmenorrhea.

Keywords: primary dysmenorrhea, prevalence, adolescents, menstruation, Ethiopia

Introduction

Dysmenorrhea is defined as the presence of painful cramps of uterine origin that occur during menstruation.[1] Dysmenorrhea can be divided into two broad categories of primary and secondary. Primary dysmenorrhea is described as recurrent, cramping pain occurring with menses in the absence of identifiable pelvic pathology. Secondary dysmenorrhea is menstrual pain associated with underlying pelvic pathologies such as endometriosis, uterine myomas, pelvic inflammatory disease, ovarian cyst, intra-uterine adhesions and cervical stenosis. The most common symptoms of dysmenorrhea are cramps lower abdominal pain, back pain, nausea/vomiting and headache.[2]

The cause of primary dysmenorrhea is not well established. However, the responsible cause has identified on the hyper-production of uterine prostaglandins, thus resulting in increased uterine one and high amplitude contractions. Women with dysmenorrhea have higher levels of prostaglandins, which are highest during the first two days of menses. Prostaglandin production is controlled by progesterone; when progesterone levels drop, immediately prior to

menstruation prostaglandin level increase. These increase in prostaglandin level cause muscles contraction in uterus, which cause pain during menstrual flow.[1,2]

Primary dysmenorrhea is the most commonly reported gynecological and menstrual disorder. It affects a large proportion of women of reproductive ages. It affects millions of women during their reproductive year.[1,3] Globally, the previous epidemiological investigations have reported that the magnitudes of dysmenorrhea ranges from 41.7% to 94%.[4,5] In sub-Saharan Africa, the prevalence of primary dysmenorrhea ranges also from 51.1% to 88.1%.[6,7] In Ethiopia the prevalence of primary dysmenorrhea ranges from 62.3% to 85,4%.[3,8] The common risk factors for primary dysmenorrhea are a positive family history of dysmenorrhea, obesity, being younger age, shorter or longer menstrual cycle interval, stress, menstrual cycle irregularity, early menarche before 12 years and circumcision.[11,12]

Primary dysmenorrhea is a significant contributor to approximately 10% of incapacitating severe menstrual pain among females during adolescence and early adulthood. In addition, it is severe enough to result in a significant socio-economic dysfunction and disability particularly in adolescents and young women.[9] In United-States an estimated 600 million work hours and 2 billion dollars of economic loss are associated with dysmenorrhea. It has a significant negative impact on students' academic performance.[7] Several studies have stated that primary dysmenorrhea usually affects relationships, functioning, and productivity, contributes to absenteeism in class/work and reduces day-to-life activities.[10] In despite this, the problem is considered to be underestimated and untreated as most women do not seek medical treatment because they commonly perceive that pain is an expected part of menstruation. For example, about 85.8% of females do not seek medical care/advice which indicates that screening all adolescent girls for primary dysmenorrhea is important.[28] So that findings can guide to design an effective menstrual health education program and to develop strategies to compensate lost classes and improve poor academic performance.

Developing appropriate management and preventive strategies is important to reduce the health impact of dysmenor-rhea among adolescent girls.[9] However, studies on the status of dysmenorrhea and associated factors among female high school students are scarce in southern Ethiopia. Therefore, this study aimed to determine the prevalence of primary dysmenorrhea and its associated factors among female students at Wolaita soddo town high schools, southern Ethiopia.

Methods
Study Setting and Period
A cross-sectional study was conducted among female students at Wolaita soddo town high schools from October 1–30/ 202. Wolaita Soddo town is the capital city of Wolaita zone found southern nation nationalities people regional state of Ethiopia. It is about 320 km away from Addis Ababa the capital of Ethiopia. There are seven public and four private high schools in the town serving for a total of 12,792 students of which 6580 are female.

Source Population and Study Population
All female high school students attending their education in Wolaita Soddo town were used as source populations. On the other hand, all randomly selected female high school students who were present in the four selected high schools during the data collection period were taken as the study population.

Inclusion and Exclusion Criteria
Female students who undergo their education in the selected high schools in Soddo town were included in the study. On the other hand, female students who had a known diagnosed medical history of pelvic pathology were excluded from the study.

Sample Size Determination
The required sample size was computed using Open Epi V.3.03 statistical software. The following assumptions were considered; a confidence level of 95%, marginal error of 5%, design effect = 2 and the prevalence of primary dysmenorrhea from previous study as 64.7%.[13] Based on this assumption the required sample size was 660. Finally, considering a 10% non-response rate, the required sample size was 733.

Sampling Technique and Procedure

Study participants were selected from all Soddo town high schools using a multistage stratified sampling technique. First, the eleven schools were stratified into seven public and four private schools. Then, three schools were selected from the public and one from the private by using simple random sampling. The selected schools were stratified and proportionally allocated to their grades from 9 to 12 and the list of female students from each grade was used as a sampling frame. Finally, the study participants were selected using a simple random sampling technique after the required sample size was proportionally allocated to each grade.

Data Collection Tools and Procedures

Data were collected using a pretested structured self-administered questionnaire developed based on review of the related literature. The questionnaire contained items on socio-demographic and economic factors, menstrual characteristics of respondents, lifestyle and behavioral related factors, menstrual characteristics and severity of dysmenorrhea was measured using a 10-point visual analogue scale (VAS).[13] The tool was first developed in English and translated into Amharic, and then translated back to English for consistency. Three BSc nurses and one MPH level health professional were recruited and trained as data collectors and supervisors, respectively.

Operational Definition

Primary dysmenorrhea: - Students who had pain in the abdomen, thighs and lower back one day before and/or the first to third day of menstruation in the last 3 months.[14]

To measure the intensity of primary dysmenorrhea; a 10-point numerical rating scale (NRS) was used to represent the continuum of girls' student perception of degree of pain and classified as mild 1–3, moderate 4–7 and severe 8–10.[13]

Data Processing and Analysis

The collected questioners first manually checked for completeness, and then the data was coded and entered using Epi data version 3.1 and exported to SPSS version 26 for data analysis. The descriptive statistics, such as frequency, percentage, mean, standard deviation were performed to describe study population. Bi-variable binary logistic regression model was computed to test the presence of crude association between primary dysmenorrhea and independent variables and to identify candidate variables for multivariable analysis. All variables in bi-variable analysis with p < 0.25 were included in multivariable binary logistic regression analysis. Significance factors were identified based on p-value <0.05. Finally, text, tables and graphs were used to present the result.

Results

Socio Demographic Characteristics of the Participant and Their Parents

A total of 707 female students participated in the study with a response rate of 96.4%. The mean (SD) age was 16.7 ± 1.32 years with the minimum age of 14 and the maximum age of 19 years. About nine tenth of 636 (90%) of the study participants were Wolaita by ethnicity. Of the respondents, majority 600 (84.9%) were urban dwellers and nearly two-third 482 (68.2%) lived with their parents. Regarding parents' educational status, more than half of the fathers 413 (58.4%) had an educational status of secondary or higher (Table 1).

Obstetric and Gynecological Related Characteristics

Two-third of the participants 478 (67.6%) started menarche at 13–14 years with a mean age of menarche at 13.39 years. More than half 398 (56.3%) reported a menstrual duration of 3–7 days, and more than three-fourth of them 568 (80.3%) reported a normal amount of menstrual flow. Nearly, one-tenth 70 (9.9%) of the study participants had ever used hormonal contraceptives. Moreover, 282 (39.9%) of students reported a family history of dysmenorrhea (Table 2).

Table 1 Socio- Demographic Characteristics of Female Students at Wolaita Soddo Town High School Southern Ethiopia, 2021, (n=707)

Variables	Category	Frequency	Percent (%)
Age in years	14–17	481	68
	18–19	226	32
Religion	Protestant	552	78.1
	Orthodox	125	17.7
	Muslim	17	2.4
	Catholic	9	1.3
	Others	4	0.6
Ethnicity	Wolaita	636	90
	Amhara	31	4.4
	Guragie	13	1.8
	Gamo	14	2.0
	Others	13	1.8
Place of residence	Urban	600	84.9
	Rural	107	15.9
Living with parents	Yes	482	68.2
	No	225	31.8
Mothers education	Unable to read and write	116	16.4
	Read and write	235	33.2
	Primary	157	22.2
	Secondary	118	16.7
	Tertiary	81	11.5
Fathers education	Unable to read and write	48	6.8
	Read and write	115	16.3
	Primary	131	18.5
	Secondary	207	29.3
	Tertiary	206	29.1
Family size	<=4	189	26.7
	5–8	456	64.5
	≥9	62	8.8

Life Style and Behavioral Characteristics

More than half 417 (59.0%) of the respondents were not involved in regular physical activity. Almost all of the participants, 690 (97.6%) did not smoke cigarettes. There were 71 (10.0%) participants consumed alcohol and 495 (70.0%) consumed chocolate. Approximately, 397 (56.2%) of them took three or fewer glasses of tea per day. Approximately 475 (67.2%) and 369 (52.2%) students skipped breakfast and did not get adequate sleep per night, respectively (Table 3).

Prevalence of Primary Dysmenorrhea and Its Intensity

According to this study, 495 (70.0%) with CI (66.6–73.4%) of the students reported that they were suffering from primary dysmenorrhea. According to the numeric rating scale (NRS) experienced mild pain 203 (41.0%), moderate pain 181 (36.6%) and severe pain 111 (22.4%) (Figure 1). More than two-thirds of students 338 (68.3%) had pain that started a few days before menstrual flow and in almost half of the students 245 (49.5%) pain lasts within one day of menstrual flow. The location of this pain varies among students and was mostly reported in the lower abdomen 341 (68.9%), followed by the lower back 103 (20.8%), and abdominal pain that extended to thighs (10.1%). Backache and fatigue were the most common symptoms associated with primary dysmenorrhea and drinking coffee or tea and getting rest were the most preferable management options used by students during menstrual pain.

Table 2 Obstetric and Gynecological Related Characteristics of Female Students at Wolaita Soddo Town High School Southern Ethiopia, 2021, (n=707)

Variables	Categories	Frequency	Percent (%)
Age at menarche	<= 12	133	18.8
	13–14	478	67.6
	≥ 15	96	13.6
Duration of menstrual flow	< 3 days	206	29.1
	3–7 days	398	56.3
	>7 days	103	14.6
Amount of blood flow	<= 1 pad/day	33	4.7
	2–4 pads/day	568	80.3
	≥ 5 pads/day	106	15.0
Length of menstrual cycle	< 21 days	45	6.4
	21–35 days	653	92.4
	>35 days	9	1.3
Menstrual cycle regularity	Yes	298	42.1
	No	409	57.9
Hormonal contraceptive use	Yes	70	9.9
	No	637	90.1
Circumcision history	Yes	487	68.9
	No	220	31.1
Child birth	Yes	26	3.7
	No	681	96.3
Family history	Yes	282	39.9
	No	425	60.1

Table 3 Life Style and Behavioral Characteristics of Female Students at Wolaita Soddo Town High School Southern Ethiopia, 2021, (n=707)

| Variables	Categories	Frequency	Percent (%)
Physical activity	Yes	290	41.0
	No	417	59.0
Cigarette smoking	Yes	17	2.4
	No	690	97.6
Alcohol consumption	Yes	71	10.0
	No	636	90.0
Chocolate consumption	Yes	495	70.0
	No	212	30.0
Coffee intake in cups	Not at all	290	41.0
	< 3 cups	257	36.4
	≥ 3 cups	160	22.6
Tea drinking	Not at all	119	16.8
	< 4 glasses	397	56.2
	≥ 4 glasses	191	27.0
Sugar intake	Not at all	65	9.2
	Minimal	312	44.1
	Moderate	281	39.7
	Excessive	49	6.9
Skipping breakfast	Yes	475	67.2
	No	232	32.8
Sleeping pattern in hours	< 7hrs	369	52.2
	≥ 7hr	338	47.8
Sexual activity	Yes	290	41.0
	No	417	59.0
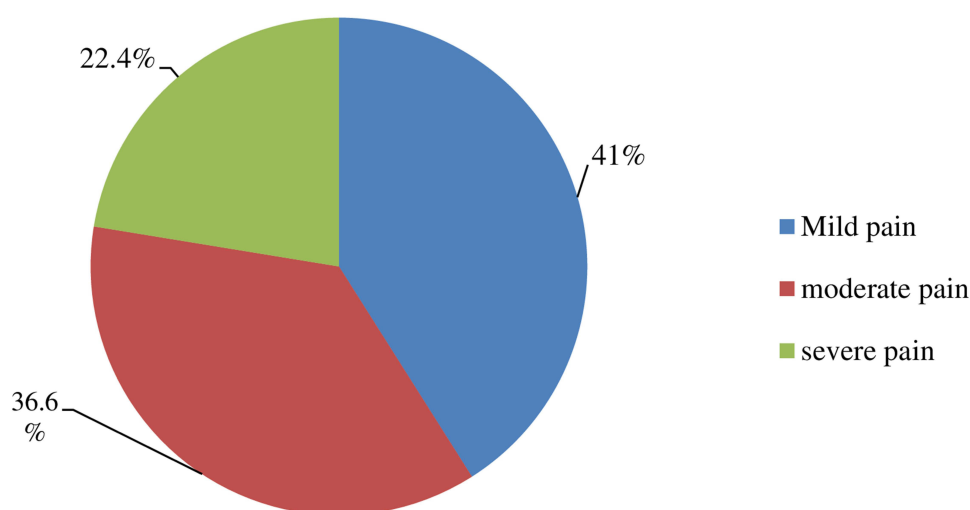
Figure 1 Pie chart for intensity of menstrual pain among female students at Wolaita soddo town high school southern Ethiopia, 2021.

Factors Associated with Primary Dysmenorrhea

Participants whose age 14–17 years were 2.55 times more likely to experience primary dysmenorrhea than those aged ≥18 years (AOR 2.55; 95% CI (1.77, 3.68)). Long duration of menstrual flow was 2.72 times more likely to develop primary dysmenorrhea compared to shorter duration (AOR 2.72; 95% CI (1.42, 5.17)). Students who had irregular menstruation were 2.39 times more likely to have primary dysmenorrhea compared to students who had regular menstruation (AOR 2.39; 95% CI (1.68, 3.41)), and participants who had a family history of dysmenorrhea were 2.46 times more likely to have primary dysmenorrhea than those who did not had a family history of dysmenorrhea (AOR 2.46; 95% CI (1.67, 3.64)). Students who skipped breakfast were 1.62 times more likely to develop primary dysmenorrhea compared with those who ate breakfast (AOR 1.62; 95% CI (1.13, 2.33)) (Table 4).

Discussion

Adolescence is the transition period from puberty to early adulthood during which physical, emotional and psychological changes occur in the body. Menarche is a significant landmark of adolescence that prepares girls for future motherhood. The present study was conducted to assess one of the menstrual problems; associated with primary dysmenorrhea among adolescent girls.

The prevalence of primary dysmenorrhea among the study participants was 70%. Of these, 203 (41.0%), 181 (36.6%), and 111 (22.4%) rated their pain intensity as mild, moderate, and severe respectively. The findings of this study were comparable with those of previous studies reported in Debre Markos (69.3%),[9] Hararegie (69.26%),[15] Ghana (68.1%)[16] and Brazil 73%.[17] However, the prevalence in this study was relatively lower than that, reported in Egypt 76.1%,[18] Benin 78.3%,[19] Oman 94%,[4] Kuwait 85.6%[20] and Romania 78.4%.[29] The possible reasons for the discrepancies in the estimated prevalence may be the socio-cultural differences of the study participants in pain perception during menstruation and lifestyle differences.

In contrast, the prevalence was relatively higher than that reported in studies conducted among university students in Hawassa 51.5%,[11] Nigeria 51.1%,[6] China 41.7%,[5] South Korea 58.8%,[21] Georgia 52%.[22] This inconsistency is probably because the prevalence of primary dysmenorrhea is higher among adolescents and decreases with increasing age, whereas in studies performed among university students age range between 18 and 29 years.

In this study, younger age was significantly associated with primary dysmenorrhea. Participants aged <14–17 years were 2.55 times more likely to experience primary dysmenorrhea than those aged ≥18 years. This finding was in line with those of the studies conducted in Benin,[19] Nigeria[6] and Iran.[23] This may be because primary dysmenorrhea is more frequent in young virgin girls and those who have not given birth and its prevalence decreases with increasing age.

Table 4 Factors Associated with Primary Dysmenorrhea Among Female Students at Wolaita Soddo Town High School Southern Ethiopia, 2021, (n=707)

Variables	Categories	Primary Dysmenorrhea		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age in years	14–17	368	113	2.54 (1.81–3.56)	2.55 (1.77–3.68) **
	18–19	127	99	1	1
Fathers education	Unable to read and write	34	14	0.86 (0.43–1.73)	0.83 (0.39–1.75)
	Read and write	76	39	0.69 (0.42–1.14)	0.75 (0.44–1.28)
	Primary	83	48	0.61 (0.38–0.98)	0.64 (0.38–1.07)
	Secondary	150	57	0.93 (0.60–1.44)	0.92 (0.57–1.48)
	Tertiary	152	54	1	1
Family size	<= 4	141	48	1	1
	5–8	308	148	0.70 (0.48–1.03)	0.98 (0.64–1.49)
	≥ 9	46	16	0.98 (0.50–1.88)	1.67 (0.81–3.42)
Duration of menstrual flow	< 3 days	134	72	1	1
	3–7 days	275	123	1.20 (0.84–1.72)	1.18 (0.79–1.74)
	>7 days	86	17	2.71 (1.50–4.92)	2.72 (1.42–5.17) **
Cycle regularity	Yes	178	120	1	1
	No	317	92	2.32 (1.67–3.22)	2.39 (1.68–3.40) **
Family history	Yes	225	57	2.27 (1.59–3.22)	2.46 (1.67–3.64) **
	No	270	155	1	1
Sugar intake	Not at all	50	15	1	1
	Minimal	210	102	0.62 (0.33–1.15)	0.53 (0.26–1.05)
	Moderate	195	86	0.68 (0.36–1.28)	0.63 (0.31–1.26)
	Excessive	40	9	1.33 (0.53–3.36)	1.12 (0.42–3.01)
Breakfast skipping	Yes	353	122	1.83 (1.31–2.56)	1.62 (1.13–2.33) **
	No	142	90	1	1

Note: ** Indicates variables significant at p-value <0.01.
Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval.

A longer duration of menstrual bleeding (>7 days) was an important risk factor for primary dysmenorrhea; and long duration of menstrual flow (>7) was 2.72 times more likely to develop primary dysmenorrhea. This finding is supported by studies from Mekele,[12] Nigeria,[6] South Korea,[21] Italy,[24] and India.[25] Menstrual irregularity was also one of the contributing factors for primary dysmenorrhea. Those students who had irregular menstruation were 2.39 times more likely to have primary dysmenorrhea. This finding was consistent with a study in Debre Tabor,[3] Gondar,[13] Hawassa,[11] Ghana[16] and Egypt.[18] The possible explanation might be due to an immature hypothalamopituitary- ovarian axis or it may be due to changing trends of lifestyle, changing dietary habits and tough competition which is responsible for psychological stress among adolescents and also the irregularity of menstruation which could fluctuate steroid hormones and might lead to primary dysmenorrhea.[26]

Family history of dysmenorrhea was another predictor for the presence of primary dysmenorrhea. It was found that primary dysmenorrhea was 2.4 time more prevalent among those respondents who have family history of dysmenorrhea. This was supported by a study in Hawassa,[11] Debre Tabor,[3] Gondar,[13] Benin,[19] India[25] and Georgia secondary school students;[22] this could be related to behaviors that girls learn from their mothers for the possibility of societal reward or that control pain. It might have also a psychological impact such as daughters may react to menstruation similarly like their mothers and they may share the same attitude and taboos towards menses.[27]

Our study demonstrated that breakfast skipping significantly increases the prevalence of primary dysmenorrhea. Students who skipped their breakfast were 1.62 times more likely to develop primary dysmenorrhea. This finding is compatible with studies done in India,[25] Georgia,[22] and China;[9] but contrasts with studies done in Hawassa University that breakfast skipping preventive rather than risk.[11] Nevertheless, it has been demonstrated that diet can influence

menstrual regularity. Specific dietary nutrients may have direct effects or exert their effects by altering the status of circulating sex steroids. So, as inadequate nutrition is a cause of low energy availability and can alter hormonal status.[22]

Limitation of the Study

The limitation of this study is the fact that temporal relations could not be established, since the study design was a cross-sectional study. Since the study variables were measured by the participant self-reporting, and there could be a recall bias as the students were asked for events within the last three months. However, this study still provides important insights regarding primary dysmenorrhea, and associated risk factors among female secondary school students.

Conclusions

A high proportion of female secondary school students were suffered from primary dysmenorrhea. Students with younger age, long duration of menstrual flow, irregular cycle, family history of dysmenorrhea, and breakfast skipping were more likely to develop primary dysmenorrhea.

Abbreviations

AOR, adjusted odd ratio; CI, confidence interval; COR, crude odd ratio; SD, standard deviation; SPSS, Statistical Package for Social Science; VAS, visual analogue scale.

Data Sharing Statement

All the minimal data sets used to reach the conclusions drawn in the manuscript are included within the manuscript.

Ethical Approval and Consent to Participants

Ethical clearance letter was obtained from Wolaita Soddo University, College of Health Sciences; School of Public Health institutional review board (IRB) (Ref. No. CRCSD9/03/2014). Official letter was received from the school of public health and submitted to Soddo town education office in order to get official letter of permission for data collection. Informed consent was obtained for respondents above 18 years of old and for those who are under 18 year's oral assent from them and consent obtained from parents before collecting the data. All relevant ethical principles under the Helsinki declaration were followed and respected.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that no one has competing interests in this work.

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