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

Mesfin Mammo*, Mihiretu Alemayehu*, Gizachew Ambaw*

School of Public Health, College of Health Science and Medicine, Wolaita Sodo University, Wolaita Sodo, Ethiopia

*These authors contributed equally to this work

Correspondence: Gizachew Ambaw, Wolaita Sodo, Ethiopia, Tel +251918556340, Email gizachewambawkase@gmail.com

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 Sodo town high schools.

Methods: An institution-based cross-sectional study was conducted among female students at Wolaita Sodo 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
menstruation prostaglandin level increase. These increase in prostaglandin level cause muscles contraction in uterus, which cause pain during menstrual flow.\textsuperscript{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.\textsuperscript{1,3} Globally, the previous epidemiological investigations have reported that the magnitudes of dysmenorrhea ranges from 41.7% to 94%\textsuperscript{4,5}. In sub-Saharan Africa, the prevalence of primary dysmenorrhea ranges also from 51.1% to 88.1%\textsuperscript{6,7}. In Ethiopia the prevalence of primary dysmenorrhea ranges from 62.3% to 85.4%\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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 dysmenorrhea among adolescent girls.\textsuperscript{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\%.\textsuperscript{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). 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.

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.

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).
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 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         |
|                   | Gurage             | 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         |
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        |
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%), Hararegie (69.26%), Ghana (68.1%) and Brazil 73%. However, the prevalence in this study was relatively lower than that, reported in Egypt 76.1%, Benin 78.3%, Oman 94%, Kuwait 85.6% and Romania 78.4%. 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%, Nigeria 51.1%, China 41.7%, South Korea 58.8%, Georgia 52%. 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, Nigeria and Iran. 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.
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, Nigeria, South Korea, Italy, and India. 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, Gondar, Hawassa, Ghana and Egypt. The possible explanation might be due to an immature hypothalamo-pituitary-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.

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, Debre Tabor, Gondar, Benin, India and Georgia secondary school students; 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.

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, Georgia, and China; but contrasts with studies done in Hawassa University that breakfast skipping preventive rather than risk. Nevertheless, it has been demonstrated that diet can influence

| Variables               | Categories       | Primary Dysmenorrhea | COR (95% CI) | AOR (95% CI) |
|-------------------------|------------------|-----------------------|--------------|--------------|
| Age in years            | 14–17            | 368                   | 2.54 (1.81–3.56) | 2.55 (1.77–3.68)** |
|                         | 18–19            | 127                   | 1.00 (0.70–1.43) | 1.00 (0.70–1.43) |
| Fathers education       | Unable to read and write | 34                   | 0.86 (0.43–1.73) | 0.83 (0.39–1.75) |
|                         | Read and write   | 76                    | 0.69 (0.42–1.14) | 0.75 (0.44–1.28) |
|                         | Primary          | 83                    | 0.61 (0.38–0.98) | 0.64 (0.38–1.07) |
|                         | Secondary        | 150                   | 0.93 (0.60–1.44) | 0.92 (0.57–1.48) |
| Family size             | <= 4             | 141                   | 1.00 (0.59–1.71) | 1.00 (0.59–1.71) |
|                         | 5–8              | 308                   | 0.70 (0.48–1.03) | 0.98 (0.64–1.49) |
| Duration of menstrual flow | < 3 days   | 134                   | 1.00 (0.59–1.71) | 1.00 (0.59–1.71) |
|                         | 3–7 days         | 275                   | 1.20 (0.84–1.72) | 1.18 (0.79–1.74) |
|                         | >7 days          | 96                    | 2.71 (1.50–4.92) | 2.72 (1.42–5.17) **|
| Cycle regularity        | Yes              | 178                   | 1.00 (0.60–1.38) | 1.00 (0.60–1.38) |
|                         | No               | 317                   | 2.32 (1.67–3.22) | 2.39 (1.68–3.40)**|
| Family history          | Yes              | 225                   | 2.27 (1.59–3.22) | 2.46 (1.67–3.64)**|
|                         | No               | 270                   | 1.00 (0.76–1.33) | 1.00 (0.76–1.33) |
| Sugar intake            | Not at all       | 50                    | 1.00 (0.86–1.16) | 1.00 (0.86–1.16) |
|                         | Minimal          | 210                   | 0.62 (0.33–1.15) | 0.53 (0.26–1.05) |
|                         | Moderate         | 195                   | 0.68 (0.36–1.28) | 0.63 (0.31–1.26) |
|                         | Excessive        | 40                    | 1.33 (0.53–3.36) | 1.12 (0.42–3.01) |
| Breakfast skipping      | Yes              | 353                   | 1.83 (1.31–2.56) | 1.62 (1.13–2.33)**|
|                         | No               | 142                   | 1.00 (0.84–1.21) | 1.00 (0.84–1.21) |

Note: ** Indicates variables significant at p-value <0.01.

Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval.
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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