



Effects of Menstrual Characteristics on Academic Performance of Young Female Undergraduate Students in Eastern Nigeria

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Received: June 14, 2022

Published: July 22, 2022

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Abstract

Objective: This study was designed to determine the effects of menstrual characteristics such as dysmenorrhea and menorrhagia on learning outcomes and school-related activities of young female undergraduate students at the University of Nigeria, Enugu Campus.

Methods: A total of 421 post-menarcheal female undergraduate students were selected using cross-sectional sampling. Data on dysmenorrhea, menorrhagia, and perceived academic performance were collected using a validated questionnaire while the actual academic performance of students was determined from students' records in their departments. While the pain of dysmenorrhea was graded using the Numeric Pain Rating Scale (NRS) which was designed by the American Chronic Pain Association, the quality of life (QOL) was determined using the Quality-of-Life Rating Scale. Effects of menorrhagia on the performance of physical functions such as academics, sports, and other leisure activities were measured using Menorrhagia Impact Questionnaire (MIQ). Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26 and relationships and correlations were considered significant at $P < 0.05$.

Results: The modal menarcheal age group for this study is 12-13 years, while the duration of the menstrual flow is 2-4 days. The modal cycle length was reported to be 25-29 days by 241 (57.2%) of respondents. The modal symptom reported by 262 (62.2%) was fatigue, followed by dizziness in 228 (54.2%) persons. It was further discovered that 138 (33.0%) of the respondents reported hospital visits on Menorrhagia, out of which 14.5 (10.5%) reported hospital admission on account of Menorrhagia. In addition, 156 (37.1%) reported having experienced dysmenorrhea and 154 (36.6%) reported routine visits to the hospital on account of dysmenorrhea. Most of the students (67.0%) reported an inability to concentrate effectively during group work due to Menorrhagia, and (62.7%) reported class absence as a result of dysmenorrhea. The result of the correlation of menstrual characteristics with both actual and perceived academic performance was significantly positive.

Conclusion: Dysmenorrhea and Menorrhagia are significant burdens in the female students' performance in academic and other school-related activities and therefore should be considered a significant health problem with negative implications for learning outcomes and must be given due and appropriate attention.

Keywords: Menstrual Characteristics; Dysmenorrhea; Menorrhagia; Academic Performance

Introduction

A number of discomfiting reactions, pains, and ill-health have been associated with menstruation and some authors have reported that these conditions have tremendous potentials to negatively affect learning outcomes and school-related activities [1-3]. In addition to the challenge of normal menstruation, some undergraduate adolescents may also present with dysmenorrhea (painful menstruation; a cramping pain located in the lower abdomen) and menorrhagia (excessive blood loss during menstruation). A research study describes dysmenorrhea and Menorrhagia as common gynecological problems encountered among female students and have been indicated as a major cause of absenteeism from college/school [3,4]. Titilayo., *et al.* [5] reported that dysmenorrhea and menorrhagia play very active roles in the cognitive, emotional, and social development of the girl child. The report also showed that students with dysmenorrhea are more vulnerable to depression than those without. Menorrhagia was also noted as the main factor affecting the social life and relationships of the students with their mates. Some of the notable symptoms associated with the menstrual cycle are breast tenderness, diarrhea, back pain, vomiting, and fluid retention [1].

The menstrual period has been reported to have a notable role in students' academic performance [6,7]. The menstrual period when associated with heavy flow and much pain not only negatively affects academics but also social activities [6,7]. A study on the menstrual pattern and common menstrual disorders among Turkish university students reported that dysmenorrhea caused absenteeism and several visits to hospitals among female students [8]. The paper further suggested that women's learning outcomes fluctuated around the menstrual cycle, so their cognitive ability was reduced within and some days before their period. There are also some researches that have reported that menses may not be adversely affecting women's academic output [8].

This paper attempts to bring to bear some menstrual characteristics and the impact and perception of the effects of these menstrual characteristics on their academic performance and psychosocial interactions with others during this period. According to Titilayo., *et al.* [5], dysmenorrhoea and menorrhagia are significant predictors of the psychosocial relationship of female students. However, menorrhagia is a crucial factor affecting their daily school activities and relationships with colleagues. [9,10] also reported that dysmenorrhoea adversely limits students' social and academic performance. In Enugu, a study among adolescent students showed

the prevalence of dysmenorrhoea to be 64%, with less frequent menorrhagia (21%) [11]. Banikarim., *et al.* [12] and Klein, [13] reported that the consequences of dysmenorrhoea and menorrhagia include poor participation in school and sports activities, disruption of relationships, and school absenteeism. Other studies done globally show that dysmenorrhoea was highly prevalent among young undergraduates ranging from 59.7% to 85%, with over 10% reported affecting academic functions [13].

Some negative impacts of menstrual disorders on academic activities, as reported by Ciliwati., *et al.* [14], include being absent from school and class, decreased concentration in class, non-participation in sporting activities, and disruption of relationships with friends and family.

Determination of the relationship between academics and problems associated with menstrual characteristics will enable effective planning programs that will improve both the quality of life and the academic output of the female student [15]. Therefore, there is a need to assess the effect of menstrual characteristics on young undergraduate female students' academic performance and other school-related activities.

Methodology

A self-administered validated questionnaire was used for this study, exercise was considered as any physical activity done a minimum of two times a week. The students were assured of the confidentiality of the information they were giving and that participation was not optional. Ethical approval for the study was granted by the Research and Ethics Committee at the Faculty of Basic Medical Science, College of Medicine University of Nigeria Enugu Campus.

Research design

The study design was descriptive and cross-sectional. For the purposes of confidentiality, each respondent was assigned an identification number used throughout the study for all data collection.

Area of study and sample size

The research was carried out at the University of Nigeria, Enugu campus. Four hundred and twenty-one (421) post-menarcheal female undergraduates (200 Level) volunteers of the Faculties of Medical Sciences (UNEC) Health Sciences and Technology and Management Sciences (UNEC) were recruited for this study. The subjects were all second-year students Faculties of Medical, Health Sciences and Technology, and Management Sciences.

Inclusion criteria

Post menarcheal second-year students of Faculties of Medical, Health Sciences and Technology, and Management Sciences.

Exclusion criteria

Students who are mothers or those with Students with clinically established pelvic inflammatory disease

Materials

- Semi-structured self-administered questionnaire.
- Numeric Pain Rating Scale (NRS) and Quality of Life (QOL) rating scale.
- Modified menorrhagia impact questionnaire (MIQ) [16].

Assessment and tools

Dysmenorrhoea and quality of life (QOL)

A modified scale on the gradation of pain, i.e., Numeric Pain Rating Scale (NRS) and QOL based on the American Chronic Pain Association (ACPA), was used to measure the pain of dysmenorrhoea and QOL [17].

Menorrhagia

Modified Menorrhagia Impact Questionnaire (MIQ) was used to evaluate the ability to

- Perform physical functions
- Participate in academic functions
- Participate in social and leisure activities
- Measures the global change in menstrual blood loss and evaluates respondent
- Perceptions of the impact of Menorrhagia on academic performance. [16].

Academic performance

This report was obtained from the office of the Head of the Department of Anatomy, Accounting, and Banking and Finance departments of the University of Nigeria- Enugu campus. Results were assessed based on a retrospective analysis of second-year examination result indicators.

Ethical consideration

Ethical Clearance and permission were obtained from the Health Research Ethics Committee.

The purpose of the study was explained to all the participants, and informed consent was obtained from all the willing subjects.

Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26 and relationships and correlations were considered significant at P < 0.05.

Results

Age distribution

The age distribution of the respondents ranged from 17-26 years and the modal age in this study was 21 years.

| Variables | Groups | Frequency | Percentage frequency |
|--|--------------------|-----------|----------------------|
| Distribution of respondents by menarcheal age. | < 10 years | 11 | 2.6 |
| | 10- 11 years | 41 | 9.7 |
| | 12-13 years | 201 | 47.7 |
| | 14-15 years | 118 | 28.0 |
| | 16 years and above | 50 | 11.9 |
| Distribution of respondents by duration of menstrual flow (days). | 1 day | 2 | .5 |
| | 2-4 days | 271 | 64.4 |
| | 5-7days | 143 | 34.0 |
| | > 8 days | 5 | 1.2 |
| Distribution of respondents by days between menstrual cycle (days) | 15-19 days | 22 | 5.2 |
| | 20-24 days | 76 | 18.1 |
| | 25-29 days | 241 | 57.2 |
| | 30-34 days | 73 | 17.3 |
| | > 35 days | 9 | 2.1 |
| Frequency distribution of the numbers of pads used per day | 1-2 | 175 | 41.6 |
| | 3-4 | 209 | 49.6 |
| | 5-6 | 14 | 3.3 |
| | 7-8 | 9 | 2.1 |
| | > 9 | 14 | 3.3 |
| Distribution of Respondents by Academic grades | 70-100 = A | 31 | 7.4 |
| | 60-69 = B | 54 | 12.8 |
| | 50-59 = C | 80 | 19.0 |
| | 45-49 = D | 45 | 10.7 |
| | 40-44.9 = E | 74 | 17.6 |
| | < 39.9 = F | 137 | 32.5 |

Table 1: Frequency distribution of respondents based on menarcheal age, duration of menstrual flow and days, number of pads used and academic grades.

Frequency distribution of duration of menstrual flow (Days)

Table 2 shows the distribution of respondents by menarcheal age. 2.6% of the respondents commenced menarche at less than 10 years of age, while about 11.9% commenced menarche at age 16 and above.

From table 1, it can be noted that 75.7% of the participants commenced menarche between the ages of 12-15 years, with the menarcheal modal age group being 12-13 years, and the mean menarcheal age being 12.5 years.

Most of the respondents (64.4%) reported menstrual flow duration of 2-4 days. The modal duration of flow was 4 days. Most of our respondent (57.2%) reported 25-29 days menstrual cycle. The distribution also shows respondent by grades, showing failed group (grade < 39.9) accounting for the highest percentage frequency (32.5%) of the study population.

| Symptoms | Responses | |
|------------------|-------------------|------------------|
| | Yes (% Frequency) | No (% Frequency) |
| Abdominal Cramps | 349 (82.9) | 72 (17.0) |
| Nervousness | 326 (77) | 95 (23) |
| Irritability | 200 (47.5) | 220 (52.3) |
| Depression | 159 (37.8) | 262 (62.2) |
| Dizziness | 228 (54.2) | 193 (45.6) |
| Backache | 109 (25.9) | 311 (73.9) |
| Fatigue | 262 (62.2) | 159 (37.8) |
| Headache | 93 (22.1) | 328 (77.5) |
| Sleeplessness | 77 (18.3) | 344 (81.7) |
| Diarrhoea | 99 (23.5) | 322 (76.5) |
| Nausea/Vomiting | 176 (41.8) | 243 (57.7) |
| Acne/Flushing | 190 (45.1) | 190 (54.6) |
| General aching | 195 (46.3) | 226 (53.7) |

Table 2: Frequency distribution of the various symptoms associated with menstruation.

Table 2 Shows the frequency distribution of the responses to symptoms associated with menstruation. The majority (90.7%) of the students experienced symptoms during their menstrual period.

| Question | Responses | |
|---|-------------------|------------------|
| | Yes (% Frequency) | No (% Frequency) |
| Do you experience heavy flow? | 119 (28.3) | 299 (71.0) |
| Do you usually wear a sanitary pad and towel simultaneously during your menstrual flow? | 118 (28.0) | 303 (72.0) |
| Do you usually pass blood clot during your menstrual flow? | 256 (60.8) | 158 (37.5) |
| Do you normally visit the hospital on account of Menorrhagia? | 144 (40.5) | 277 (59.5) |
| Have you ever been admitted on account of Menorrhagia? | 138 (33.0) | 282 (67.0) |
| Do you experience dysmenorrhoea? | 156 (37.1) | 265 (62.9) |
| Do you normally visit the hospital on account of dysmenorrhoea? | 154 (36.6) | 267 (63.4) |
| Have you ever been admitted on account of dysmenorrhoea? | 115 (27.2) | 306 (72.3) |

Table 3: Frequency distribution of responses to questions concerning Menorrhagia and dysmenorrhoea.

Table 3 Shows frequency distributions of responses to questions concerning Menorrhagia. 28.3% reported experiencing heavy flow and 28.0% also reported they usually wear sanitary pad and towels simultaneously during menstrual flow.

| Questions | Rate in days | Frequency | |
|---|--------------|----------------|--------------------|
| | | Hospital Visit | Hospital Admission |
| hospital visits and hospital admissions on the account of Menorrhagia | Nil | 377(89.5) | 282(67.0) |
| | 1 | 24(5.7) | 99(23.5) |
| | 2 | 5(1.2) | 38(9.0) |
| | 3 | 3(3.1) | 2(0.5) |
| | 4 | 2(0.5) | Nil |

| Question | Responses | |
|---|-------------------|------------------|
| | Yes (% Frequency) | No (% Frequency) |
| Do you experience dysmenorrhoea? | 156 (37.1) | 265 (62.9) |
| Do you normally visit the hospital on account of dysmenorrhoea? | 154 (36.6) | 267 (63.4) |
| Have you ever been admitted on account of dysmenorrhoea? | 115 (27.2) | 306 (72.3) |

Table 4: Shows frequency distribution of hospital visits and hospital admissions on the account of Menorrhagia.

Table 4 summarizes frequency Distribution of Hospital Visits and Hospital Admissions on Account of Dysmenorrhea. It also Shows the distributions of responses to questions concerning dysmenorrhea.

Most of the students (67.0%) reported inability to concentrate effectively during group work due to Menorrhagia. On impact of dysmenorrhea on the respondents, most of the students (62.7%) reported class absence.

| Question | Impact of Menorrhagia on Respondents | Impact of Dysmenorrhoea on Respondents |
|--|--------------------------------------|--|
| | Response | Response |
| | Yes (% Frequency) | Yes (% Frequency) |
| School Absence | 271 (64.4) | 258 (61.3) |
| Class Absence | 180 (42.8) | 264 (62.7) |
| Reduced concentration in class | 186 (44.0) | 185 (43.9) |
| Inability to Participate in sport | 257 (61.0) | 209 (49.6) |
| Affects relationship with family and friends | 181 (42.8) | 232 (55.1) |
| Reduces concentration during private study | 139 (33) | 176 (41.8) |
| Inability to concentrate effectively during group work | 287 (67) | 197 (42.5) |

Table 5: Shows frequency distribution of the responses to the impact of Menorrhagia on the activities of the respondent. The p-value is < 0.00001. The result is significant at p < 0.05.

| Question | Strongly Agree Freq (% Freq) | Agree Freq (% Freq) | Undecided Freq (% Freq) | Disagree Freq (% Freq) | Strongly Disagree Freq (% Freq) | Total Freq (% Freq) |
|---|------------------------------|---------------------|-------------------------|------------------------|---------------------------------|---------------------|
| Do you think that your academic performance would have been better if you were not experiencing Menorrhagia? | 217 (51.3) | 166 (39.3) | 27 (6.4) | 5 (1.4) | 5 (1.2) | 421 (100) |
| Do you think that your academic performance would have been better if you were not experiencing dysmenorrhea? | 94 (22.3) | 165 (39.2) | 39 (9.3) | 23 (5.5) | 95 (22.6) | 421 (100) |

Table 6: Frequency Distribution of the Respondents Perception on the Impact of Menorrhagia on Academic Performance. The p-value is < 0.00001. The result is significant at p < 0.05.

| Grade | Very mild | How will you rate the impact of Menorrhagia on your academic performance? | | | | |
|--------|-----------|---|----------|--------|-------------|-------|
| | | Mild | Moderate | Severe | Very severe | |
| 70-100 | Freq | 11 | 8 | 5 | 3 | 4 |
| | (% freq) | 35.5% | 25.8% | 16.1% | 9.7% | 12.9% |
| 60-69 | Freq | 15 | 23 | 8 | 4 | 4 |
| | (% freq) | 27.8% | 42.6% | 14.8% | 7.4% | 7.4% |
| 50-59 | Freq | 22 | 35 | 11 | 8 | 4 |
| | (% freq) | 27.5% | 43.8% | 13.8% | 10.0% | 5.0% |

| | | | | | | |
|------------------------|----------|--|-----------|------------|---------------------|-------|
| 45-49 | Freq | 11 | 21 | 5 | 4 | 4 |
| | (% freq) | 24.4% | 46.7% | 11.1% | 8.9% | 8.9% |
| 40-44.9 | Freq | 27 | 23 | 12 | 6 | 6 |
| | (% freq) | 36.5% | 31.1% | 16.2% | 8.1% | 8.1% |
| < 39.9 | Freq | 52 | 50 | 11 | 9 | 15 |
| | (% freq) | 38.0% | 36.5% | 8.0% | 6.6% | 10.9% |
| Total | Freq | 138 | 160 | 52 | 34 | 37 |
| | (% freq) | | | | 8.1% | 8.8% |
| Grade I strongly agree | | Do you think that your academic performance would have been better if you were not experiencing Menorrhagia? | | | | |
| | | I agree | Undecided | I disagree | I strongly disagree | |
| 70-100 | Freq | 14 | 14 | 3 | 0 | 0 |
| | (% freq) | 45.2% | 45.2% | 9.7% | 0.0% | 0.0% |
| 60-69 | Freq | 28 | 22 | 3 | 0 | 1 |
| | (% freq) | 51.9% | 40.7% | 5.6% | 0.0% | 1.9% |
| 50-59 | Freq | 41 | 31 | 5 | 2 | 1 |
| | (% freq) | 51.2% | 38.8% | 6.2% | 2.5% | 1.2% |
| 45-49 | Freq | 26 | 16 | 2 | 1 | 0 |
| | (% freq) | 57.8% | 35.6% | 4.4% | 2.2% | 0.0% |
| 40-44.9 | Freq | 38 | 28 | 5 | 1 | 2 |
| | (% freq) | 51.4% | 37.8% | 6.8% | 1.4% | 2.7% |
| < 39.9 | Freq | 70 | 55 | 9 | 2 | 1 |
| | (% freq) | 51.1% | 40.1% | 6.6% | 1.5% | 0.7% |
| Total | Freq | 217 | 166 | 27 | 6 | 5 |
| | (% freq) | 51.5% | 39.4% | 6.4% | 1.4% | 1.2% |

Table 7: Relationship of Grade with Perception of Impact of Menorrhagia on Respondents’ Activities.

The result is not significant at $p < 0.05$.

Discussion

This study examined the relationship between menstrual characteristics, physical activities, habits, and academic performance among female undergraduate students at the University of Nigeria, Enugu Campus (UNEC). The age range and modal age of the study population correspond to the age distributions of earlier study by Parveen., *et al.* [8]. Majority of our respondents were between the ages of 19 and 25 years (93.0%).

In this study 75.7% of the respondents had menarche at 12-15 years, very few had early onset (i.e., less than 10 years old). Similar

results have been reported by Ann and Allison [18], with a suggested menarcheal age range of 9 to 17 years. The mean menarcheal age reported in this study was 12.5 ± 1.5 years. The age of menarche in this study corresponds to the age of menarche described by Rigon., *et al.* [19] for an Italian population and Amaza., *et al.* [20] another Nigerian population from the Northern part of the country.

National Institute of Care and Excellence report [16] reported that the very early menses are often light and irregular and that out of every 3 girls, 2 will have a regular pattern of menstrual periods in the first 2 years of menarche, despite the fact that heavies and longer flows are experiences most often during this teenage. In

this study, 64.4% of the student respondent reported a menstrual flow duration of 4 days, 34.0% of the student respondent reported a menstrual flow duration of 5-7 days and about 9.4% of the respondents did not know their menstrual cycle lengths, this finding is in contrast with others studies in Nigeria in which less than 5% had the abnormal menstrual pattern [21-23] The mean duration of menstrual flow in this study was 4.6 days which closely corresponded to the mean duration of 4.5 days that was reported another Nigeria study [24] from the south western population of the country, by Thomas, *et al.* 1990 and Zegeye, *et al.* [22] from Ethiopian population in East Africa. In line with the finding of this study, Thomas, *et al.* [24] opined that about 10% or more of menstruating females are bedridden for up to 3-4 days as a result of monthly menstruation. Being out of school for about 4 days every 4 weeks could give rise to a cumulative absenteeism of about 10 to 20 percent of the school days making it very difficult for such students to compete fairly with other counterparts [25-27].

Abdominal cramps (82.7%), nervousness (77%), and fatigue (62%) were the most typical reported symptoms associated with menstruation. This is similar to the US female adolescents report by Allen and Lam, [28], stating that abdominal cramp was the most reported of all the symptoms. While sleepiness (18%) and headache (21%) were the least reported. Klein, *et al.* [13], in a study of the effects of menstruation on school activities in Malaysia, stated that 54.3% reported nervousness during menstruation and 21.3% reported headaches. Adekemi, *et al.* [29] in a study of menstrual disorder: "The implication on health and academic activities of female undergraduates in a federal university in Nigeria" showed that most of the health disorders reported by the students include dizziness, headache, etc. were premenstrual symptoms, meanwhile not even one of the respondents reported these as pre-menstrual symptoms (PMS) but as real experiences during menstruation. As a result of the weakness and exhaustion following menstruation felt by most students, they are usually unable to carry out their routine activities leading to being absent from both school and class.

Most commonly reported menstruation disorders have been dysmenorrhea and menorrhagia [2,30,31]. Hillen, *et al.* [32] noted dysmenorrhea to be the most common gynecologic disorder among female adolescents with a prevalence of 60% to 93%. In this study, although menorrhagia occurred less frequently (28.3%) than dysmenorrhoea (37.1%), it occurred more with dizziness, headache, and depression, among those whose menstruation warranted

medical or surgical attention ($P < 0.05$). This finding corresponds to the report by Titilayo, *et al.* 2009. Dysmenorrhea in this study, accounted for 61.0% of Inability to participate in sports. This result corresponds with the observations of Banikarim, *et al.* [12], that dysmenorrhea was the leading cause of non-participation in exercise, in a population of Hispanic female adolescents. The degree of impact of Menorrhagia on respondents' inability to participate in sports accounted for 63.6% (mild to moderate). The prevalence of dysmenorrhea reported in this study is comparatively low compared to 72.4% in Sweden [33], about 72% in Ethiopia [22,34], and 92% in Saudi Arabia [3] but high compared to 6.2% reported for Italian population [19].

Regarding the impact on Academic performance, 84% reported mild to moderate school and class absence, while 64.2% reported mild to moderate inability to concentrate in class ($P < 0.05$). This also agrees with a study in Kuwait, where 75.5% of their respondents reported an inability to effectively participate in class [35], and also with a Hispanic study that noted severe distraction of the students from class work [1]. Titilayo, *et al.* [5] concluded that both menorrhagia and dysmenorrhea can be used as significant predictors of academic performance and psychosocial relationships ($P < 0.05$). This report also compares with earlier research findings in Nigeria by Adekemi, *et al.* [29], which reported that the highest academic effect recorded was an absence from school (64.5%), followed by loss of concentration and feeling of irritation in the same proportion (63 o%). Over 65% of the students in our study reported a loss of concentration in group work due to dysmenorrhea, and this is also in line with other students from other continents of the world [1,35,36]. In our report, dysmenorrhea and menorrhagia showed a negative impact on both perceived and actual academic performances of the female students. Menstrual cycle length (days) and days between menstrual cycle correlated strongly with perceived and actual academic performance ($P < 0.05$). The relationship between class grade and menstrual flow duration is also not statistically significant ($P < 0.05$).

The frequency of hospital visitations and admissions as a result of menorrhagia and dysmenorrhea can be said to be global by reason of similar results gotten from researchers across the globe. In this study, hospital visits made as a result of Menorrhagia was 40.5% and hospital admission was 33.0%. This result corresponds with the report of 42% hospital visitation and 37% admission by Thomas, *et al.* [24].

Conclusion

In conclusion, dysmenorrheal and menorrhagia in this study have been reported to be significant burdens in the female students' performance in academic and other school-related activities, this has also been widely reported [25,27] Both factors should be considered as strong significant health problems with very heavy negative implications on the learning outcomes of the female students. Oster and Thornton [37] reported that female education should be given very adequate attention and be made a very important policy priority in many developing countries.

Bibliography

1. Jahromi MK, et al. "Influence of a physical fitness course on menstrual cycle characteristics". *Gynecological Endocrinology* 24 (2008): 659-662.
2. Armour M, et al. "The prevalence and academic impact of dysmenorrhea in 21,573 young women: a systematic review and meta-analysis". *Journal of Women's Health* 28.8 (2019): 1161-1171.
3. Hanan D, et al. "Effect of dysmenorrhea on the academic performance among students studying in Princess Nourah Bint Abdulrahman University, Riyadh". *International Journal of Medicine in Developing Countries* 5.2 (2021): 588-594.
4. Charu S, et al. "Menstrual characteristics' and 'Prevalence and Effects of Dysmenorrhoea' on Quality of Life of medical students". *International Journal of Collaborative Research on Internal Medicine and Public Health* 4.4 (2012): 276-294.
5. Titilayo A, et al. "Menstrual discomfort and its influence on daily academic activities and psychosocial relationship among undergraduate female students in Nigeria". *Tanzan Journal of Health Resources* 11.4 (2009): 181-188.
6. Smith RP. "Scope of the Problems". In: Smith RP, editor. *Dysmenorrhea and menorrhagia: a clinician's guide*. New York: Springer International Publishing (2018): 19-30.
7. Hashim RT, et al. "Prevalence of primary dysmenorrhea and its effect on the quality of life amongst female medical students at King Saud University, Riyadh, Saudi Arabia". *Saudi Medical Journal* 41 (2020): 283-289.
8. Parveen N, et al. "Attitude and knowledge of medical students of Isra University about dysmenorrhoea and its treatment". *Journal of Ayub Medical College Abbottabad* 21 (2012): 159-162.
9. Gumanga SK and Kwame-Aryee RA. "Menstrual characteristics in some adolescent's girls in Accra, Ghana". *Ghana Medical Journal* 46.1 (2012): 03-09.
10. Andersch B and Milsom I. "An epidemiological study of young women with dysmenorrhea". *American Journal of Obstetrics and Gynaecology* 144 (2004): 655-660.
11. Nwankwo TO, et al. "Menstrual disorders in adolescents schoolgirls in Enugu, Nigeria". *Journal of Pediatric and Adolescent Gynecology* 23 (2010): 358-363.
12. Banikarim C, et al. "Prevalence and impact of dysmenorrhoea on Hispanic female adolescents". *Archives Pead and Adolescents Medicine* 154 (2000): 1226-1229.
13. Klein JR. "Epidemiology of adolescent dysmenorrhea". *Journal of Epidemiology and Community Health* 62.5 (2008): 461-470.
14. Ciliwati JC, et al. "Menstrual joy: the construct and its consequences". *Psychology of Women Quarterly* 18 (2007): 375-387.
15. Akiyama S, et al. "Evaluation of the treatment patterns and economic burden of dysmenorrhea in Japanese women, using a claims database". *ClinicoEconomics and Outcomes Research* 9 (2017): 295-306.
16. National Institute of Care and Excellence annual report (2012).
17. McCaffery M and Beebe A. "Pain: Clinical manual for nursing practice". Mosby St. Louis, MO (1989).
18. Ann OJ and Allison B. "Psychoendocrinology of the menstrual cycle: 1. Enjoyment of daily activities and moods". *Psychosomatic Medicine* 41 (2006): 587-604.
19. Rigon F, et al. "Menstrual pattern and menstrual disorders among adolescents: an update of the Italian data". *Italian Journal of Pediatrics* 38 (2012): 38.
20. Amaza D, et al. "Menstrual Pattern among Female Medical Students in University of Maiduguri, Nigeria". *British Journal of Medicine and Medical Research* 2.3 (2012): 327-337.
21. Fakeye O. "The interrelationships between age, physical measurements and body composition at menarche in schoolgirls at Ilorin, Nigeria". *International Journal of Gynecology and Obstetrics* 23 (1985): 55-58.

22. Zegeye DT, *et al.* "Age at menarche and the menstrual pattern of secondary school adolescents in northwest Ethiopia". *BMC Women's Health* 9 (2009): 29-35.
23. Sule ST and Ukwenya JE. "Menstrual experiences of adolescents in a secondary school". *Journal Of The Turkish-German Gynecological Association* 8 (2007): 7-14.
24. Thomas KD, *et al.* "A study of the menstrual patterns of adolescents in Ile-Ife, Nigeria". *International Journal of Gynecology and Obstetrics* 33 (1990): 31-34.
25. Sommer M, *et al.* "Managing menstruation in the workplace: an overlooked issue in low- and middle-income countries". *International Journal for Equity in Health* 15.1 (2016): 86.
26. Tembon M and Fort L. "Girls' education in the 21st century: gender equality, empowerment, and economic growth". The World Bank (2008).
27. Schoep ME, *et al.* "Productivity loss due to menstruation-related symptoms: a nationwide cross-sectional survey among 32 748 women". *BMJ Open* 9.6 (2019): e026186.
28. Allen LM and Lam AC. "Premenstrual syndrome and dysmenorrhea in adolescents". *Adolescent Medicine: State of the Art Reviews* 23 (2012): 139-163.
29. Adekemi JM, *et al.* "Psychoendocrinology of the menstrual cycle: 1. Enjoyment of daily activities and moods". *Psychosomatic Medicine* 41 (2013): 587-604.
30. Hennegan J, *et al.* "Women's and girls' experiences of menstruation in low- and middle-income countries: a systematic review and qualitative metasynthesis". *PLoS Medicine* 16.5 (2019): e1002803.
31. Omani Samani R, *et al.* "The prevalence of menstrual disorders in Iran: a systematic review and meta-analysis". *International Journal of Reproductive BioMedicine* 16.11 (2018): 665-678.
32. Hillen TL, *et al.* "Primary dysmenorrhea in young western Australian women: Prevalence, impact, and knowledge of treatment". *Journal of Adolescent Health* 25.1 (1999): 40-45.
33. Andersch B and Milsom I. "An epidemiologic study of young women with dysmenorrhea". *American Journal of Obstetrics and Gynecology* 144 (1982): 655-660.
34. Odujinrin OM and Ekunwe EO. "Epidemiologic survey of menstrual patterns amongst adolescents in Nigeria". *West African Journal of Medicine* 10.3-4 (1991): 244-249.
35. Omu FE, *et al.* "Premenstrual dysphoric disorder: prevalence and effects on nursing students' academic performance and clinical training in Kuwait". *Journal of Clinical Nursing* 20 (2011): 2915-2923.
36. El-Gilany L, *et al.* "Psychological and physiological factors in the development, maintenance, and treatment of menstrual disorders". In S. N. Hayes and L. Gannon (Eds.), *Psychosomatic Disorders: A Psychophysiological Approach to Etiology and Treatment*. New York: Praeger (2005).
37. Oster E and Thornton R. "Menstruation sanitary products and school attendance: evidence from a randomized evaluation". *American Economic Journal: Applied* (2011): 91-100.