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ORIGINAL ARTICLE

Dysmenorrhea in students: Characteristics and predictors

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A B S T R A C T

Introduction: Dysmenorrhea is a very common reproductive issue present in young females that severely impacts their life.

Objectives: To determine the prevalence of primary dysmenorrhea amongst undergraduate students of Pakistan, the association of dysmenorrhea with various factors, and the impact on academic performance.

Methodology: An observational study was carried out at different Pakistani universities. The data was collected using a self-designed, pre-tested questionnaire. which was distributed online. The data was analyzed using IBM Statistical Package for Social Sciences (SPSS) version (Armonk, NY) 26.0. Descriptive statistics were applied for qualitative variables. Mean and standard deviation were calculated for quantitative variables. Chi-square was applied to determine if the differences in cycle length were significantly related to dysmenorrhea. T-tests were applied to determine if there were significant differences in age and body mass index in participants with dysmenorrhea.

Result: There were 226 students who had participated in the study. There were 193 (85.40%) participants who reported experiencing dysmenorrhea out of which 97 students (50.26%) took a drug or a combination of drugs to alleviate the pain. There was a high prevalence of stress symptoms associated with dysmenorrhea with fatigue after sleep ($p<0.05$). Physical activity did not have any effect on dysmenorrhea. Physical activity, the average grade of pain, and the presence of pain in each cycle were significant predictors of dysmenorrhea ($p<0.05$).

Conclusion Physical activity and characteristics of pain, such as cyclical nature and intensity, are predictors of dysmenorrhea.

Keywords: *Dysmenorrhea, undergraduate students, stress, BMI, physical activity*

Introduction

The prevalence of primary dysmenorrhea, a common problem in reproductive females, is usually underestimated and difficult to determine as the majority of the women and young females consider pain as a normal component of menstruation. Hence, their health can be seriously compromised leading to consequences in reproductive health in the future. On a global level, almost 71% of adolescents and women under 25 years of age experience dysmenorrhea.[1] In Pakistan, almost 78% of women report dysmenorrhea. With female adolescents being 51% of the global population, health facilities providing medical and psychological care are required to cater to the needs of this increasing population.[2,3]

Primary dysmenorrhea is defined as a cramping pain of varying severity in the lower abdomen before or during menstruation with no underlying cause. It may be accompanied by dizziness, headache, nausea, fatigue, vomiting, and diarrhea.[4,5] It frequently develops in adolescence and usually affects those in schools or universities, being a leading cause for absenteeism. It also has a significant effect on social relationships, mental status, academics, daily activities, sleep, and mood causing anxiety and depression.[6] The pain usually lasts for 8 to 72 hours and radiates to the lower back or back of the legs. Usually starting before menstruation, the severity is greatest for the first and second days of the cycle. This pain is attributable to the release of prostaglandins released during endometrial degeneration leading to myometrial contractions. The prostaglandin theory is further strengthened by the effectiveness of non-steroidal anti-inflammatory agents (NSAIDs) in alleviating symptoms of primary dysmenorrhea. Prostaglandin production is inversely related to the secretion of progesterone so as menstruation begins, progesterone levels drop and prostaglandins level increase thus leading to dysmenorrhea.[6]

Numerous factors affect the duration and severity of primary dysmenorrhea, such as family history of dysmenorrhea, low BMI, lack of physical activity, early age at menarche, heavy menstrual flow, irregular menstrual cycles, nulliparity, high levels of stress, smoking, disruption of social networks, depression and anxiety.[5] Regarding dietary intake, a study suggested that high levels of fish, eggs, and fruit in the diet was associated with a low frequency of primary dysmenorrhea.[7] According to a study conducted in India, a high prevalence of dysmenorrhea was seen in girls living in rural areas who had low BMI.[8]

Women with high-stress levels are twice more prone to primary dysmenorrhea compared to women with low-stress levels especially those with a history of dysmenorrhea.[9] Stress causes an impaired secretion of adrenaline and cortisol that affects prostaglandin synthesis. It also down-regulates the production luteinizing hormone and follicular stimulating hormone causing impaired follicular development, leading to a low secretion of progesterone that alters the synthesis of prostaglandins.[10]

In the management of primary dysmenorrhea, NSAIDs play a very important role as the first-line therapy to relieve the painful symptoms as NSAIDs block the formation of the enzyme cyclooxygenase that forms prostaglandins.[11] Contraceptive hormones are also used as they inhibit ovulation and decrease endometrial proliferation. These cause immediate relief from symptoms associated with dysmenorrhea.[12] Additionally, non-medicinal treatments are also used widely, such as topical heat application, mild exercises, using herbal remedies and the use of ginger and cinnamon, meditation and other stress-relieving activities in the daily routine.[13]

Therefore, the objective of the study was to determine the prevalence of primary dysmenorrhea amongst undergraduate students of Pakistan, the association of dysmenorrhea with various factors, and the impact on academic performance.

Methodology

An observational study was carried out at different universities of Pakistan, after approval from the Institutional Review Board of Shifa International Hospital (IRB#1188-464-2018). The sample size was calculated to be 226 using an online software with a probability of 50%, confidence interval of 95%, and a design effect of 1.0. A non-probability sampling technique was used because our study targeted females. The time for the study was one year. The data was collected using a pre-tested, self-designed questionnaire. The questionnaire had a total of 38 questions which were divided into four domains. The first domain was concerned with the basic demographic data. The second domain included menstrual history i.e. age of menarche, regularity of cycles, duration and flow of bleeding, pain intensity (assessed using NPRS scale), and associated symptoms. The third and fourth domains assessed stress levels and physical activity using preformed but summarized questionnaires respectively. Stress was assessed using a 9 question section on our questionnaire, inquiring about deadline stress, low self-confidence, insufficient sleep, fatigue after sleep, appetite change, irritability upper back pain, difficulty in concentrating, and caffeine dependency. The stress questionnaire was tailored according to the International Stress Management Association (ISMA), picking those questions that would be most relevant in the current

setting. The intensity of physical was measured on a scale of 0 to 5 with 0 being none and 5 being the maximum. Nine activities were measured: lifting weights, digging, climbing stairs, cycling, jogging, running, walking, gym and others. The data collected was analyzed using IBM Statistical Package for Social Sciences (SPSS) version (Armonk, NY) 26.0. Descriptive statistics were applied for qualitative variables. Mean and standard deviation were calculated for quantitative variables. Chi-square was applied to determine if the differences in cycle length were significantly related to dysmenorrhea. T-tests were applied to determine if there were significant differences in age and body mass index in participants with dysmenorrhea.

Results

There were 226 participants in the study. All of the participants were female. There were 193 participants who had dysmenorrhea. The demographic data and menstrual history are detailed in Table 1.

Table 1: Demographic details and menstrual history

Characteristics		Measure	Dysmenorrhea (n=193)	p-value
Age (Mean±SD)		20.10±1.10	20.50±1.20	0.05
Age at menarche in years (Mean±SD)		12.80±1.50	12.80±1.70	0.86
BMI (Mean±SD)		21.40±3.60	21.80±4.00	0.55
Average length of cycle (n, %)	<21 days	3 (9.09)	20 (10.36)	>0.05
	21-28 days	15 (45.45)	94 (48.70)	0.84
	28-35 days	11 (33.33)	64 (33.17)	0.93
	>35 days	4 (12.13)	15 (7.77)	0.55
Duration of bleeding (days) (Mean±SD)		5.00±2.00	5.00±1.00	>0.05
Number of pads used (Mean±SD)		3.00±1.00	3.33±3.14	0.25
Average grade of pain (Mean±SD)		3.00±2.60	6.20±4.10	<0.05
Physical activity score (Mean±SD)		42.09±8.09	42.70±6.53	0.63
Stress score (Mean±SD)		15.19±2.95	16.06±2.93	0.10

There were 110 students studying medicine, 4 studying dentistry, 8 studying pharmaceutical sciences, 27 students studying arts, 19 students studying commerce and 58 students were enrolled in other courses.

Table 2 shows stress symptoms among the participants with dysmenorrhea. The chi-square for differences in participants reporting fatigue after sleep was significant (p<0.05) with more participants reporting fatigue in the dysmenorrhea group as compared to the other group.

Table 2: Stress levels among the two groups

Stress symptom	No dysmenorrhea	Dysmenorrhea	p-value
Deadline stress	18	120	0.66
Low self confidence	25	152	0.41
Insufficient sleep	12	92	0.23
Fatigue after sleep	17	134	0.04
Appetite change	23	141	0.85
Irritability	21	124	0.95
Non-specific pain	13	104	0.12
Difficulty in concentrating	25	147	0.88
Caffeine dependency	9	80	0.12
Stress scores (Mean±SD)	15.19±2.95	16.06±2.93	0.10

Table 3 shows a comparison of physical activity with dysmenorrhea. The mean physical score did not vary significantly amongst the two groups (p>0.05).

Table 3: Physical activities among the two groups.

Activity done in past week	No Dysmenorrhea	Dysmenorrhea	P-value
Lifting weights	8	34	0.57
Digging	0	5	NA
Climbing stairs	28	180	0.73
Cycling	1	13	0.92
Jogging	7	46	0.81
Running	11	66	0.88
Walking	30	183	0.68
Gym	1	18	0.85
Other	11	49	0.73

NA: Not Applicable

Table 4: Logistic Regression Model

Variables	Unadjusted Estimates			Adjusted estimates		
	Risk	CI	p-value	Risk	CI	p-value
Age	0.99	0.61-1.62	0.98	1.09	0.59-2.03	0.76
BMI	0.79	0.63-0.99	0.04	0.76	0.58-1.01	0.06
Age of menarche (years)	0.81	0.56-1.16	0.25	0.82	0.54-1.25	0.36
Cycle length (days)	1.64	0.75-3.59	0.21	1.89	0.81-4.41	0.14
Duration of bleeding (days)	1.07	0.67-1.71	0.78	1.22	0.69-2.16	0.49
Pad usage	0.56	0.28-1.11	0.10	0.72	0.35-1.49	0.38
Pain in each cycle	12.11	2.48-59.03	<0.05	14.51	2.16-97.50	0.01
Intensity of pain varies in each cycle	1.94	0.51-7.40	0.33	1.92	0.40-9.25	0.42
Average grade of pain	0.58	0.42-0.81	<0.05	0.51	0.34-0.76	<0.05
Physical activity	0.92	0.84-1.01	0.07	0.88	0.79-0.98	0.02
Stress	0.97	0.78-1.20	0.80	0.98	0.76-1.28	0.92

BMI-body mass index, CI-confidence interval

Symptoms such as mood swings (74.80%), headaches (76.00%), irritability (71.20%), insomnia (21.00%), lower backache (66.00%), and breast tenderness (40.00%) were also recorded. A logistic regression model was used to assess independent predictors for dysmenorrhea. The estimates were also adjusted for other variables. Table 4 shows the results of the model.

The participants used a variety of methods to help alleviate the pain. There were 97 participants (50.26%) who used pharmacological methods for the pain. Out of the 97 participants, 23.30% used acetaminophen, 11.40% used NSAIDs, 7.30% used mefenamic acid, 2.10% used butylscopolamine bromide and 1% used some other medicine. There were 12 participants (5.20%) who had to use a combination of medicines to soothe the pain.

Discussion

In this study, among 226 participants the overall prevalence of primary dysmenorrhea in medical students was exceedingly high (85.4%) as compared to the studies carried out in the international literature reviewed. One of the most common symptoms suffered by females was pain in the lower abdomen that radiated to the back and upper thighs. These symptoms were almost similar to a study carried out in King Khalid University of Saudia which suggested lower abdomen, leg and back pain were one of the most common locations.[3,4,14]

Various studies show that there is an inconsistent relationship between the age of menarche and dysmenorrhea and our results show that no significant association was found between the age of menarche and dysmenorrhea.[15] These variations are probably due to sociocultural and lifestyle factors. In addition to this, various studies showed that cycle irregularity and heavy

menstrual blood flow had a strong relation with dysmenorrhea.[16,17] A study carried out among students in Egypt showed that girls with longer cycle length and heavy blood flow experienced dysmenorrhea in comparison to those with normal or shorter cycle length, however, we did not find any association of cycle length with dysmenorrhea in our study.[18] This discrepancy could be since most of the participants in this study had a normal duration and flow of menstruation than others.

Another important factor affecting dysmenorrhea in young females in physical activity. Literature shows significant relation of physical activity with the volume of menstrual flow and intensity of dysmenorrhea.[10] Females who were more physically active had fewer symptoms of dysmenorrhea as compared to those who exercised less, due to endorphin release.[19] Another study focusing on physical activity showed a significant difference in physical symptoms and pain in the two groups.[20] Our study contradicted this hypothesis which could be attributed to the fact that physical activity is usually restricted by females due to dysmenorrhea and other social factors. Most females due to lack of awareness and cultural beliefs prefer resting during their cycles and avoid heavy work.

Low BMI indicates poor nutritional levels which is a causative factor for dysmenorrhea as shown in a study carried out in India.[7] Low caloric intake, body weight, and fat mass disturb pulsatile secretion of pituitary gonadotropins leading to an increase in the rate of dysmenorrhea.[21] The obtained values for BMI of this present study are not in a range depicting severe malnutrition hence, the relation of BMI with the prevalence of dysmenorrhea could not be well-explained as suggested by another study carried out in Iran which showed no significant association of BMI with dysmenorrhea.[22] This could be due to different geographical and sample characteristics.

In addition to the aforementioned factors, stress is also an important determinant of the intensity of dysmenorrhea. Women who are stressed are twice more likely to suffer from dysmenorrhea than those who do not experience much stress. Stress alters normal levels of prostaglandins and also down-regulates the production LH and FSH causing impaired follicular development which impairs progesterone synthesis ultimately leading to deranged prostaglandin synthesis.[9] According to the stress scores in our study, the average stress score in females with dysmenorrhea was higher than that of females who were not afflicted with primary dysmenorrhea, supporting the notion that This gave stress can be a risk factor for primary dysmenorrhea.

A study showed that considering many other factors, pain is the most strongly associated factor in sleeping difficulties.[23] The National Sleep Foundation's women and sleep poll from 1998 showed that women reported more sleeping difficulties in the first few days of their cycle due to pain and cramps. In association with lack of sleep, most women presented with daytime fatigue or fatigue after sleep due to a disturbed sleep.[3] In our study, the specific symptom of fatigue after sleep had a strong association with dysmenorrhea giving a p-value of 0.04. However, based on the previous studies reviewed, the role of this association is unclear.

Dysmenorrhea is one of the leading causes of self-medication among young females.[24] Out of the 97 participants, 23.30% used acetaminophen, 11.40% used NSAIDs, 7.30% used mefenamic acid, 2.10% used butylscopolamine bromide and 1% used some other medicine. 5.2% of this population used a combination of three drugs, Acetaminophen, NSAIDs, and mefenamic acid. This indicates the severity of the symptoms suffered by this population in question. According to a study, the usage of NSAIDs showed great efficacy in improving dysmenorrhea symptoms as compared to paracetamol or placebo but was associated with more adverse effects. According to another study that compared the efficacy and safety of over-the-counter NSAIDs, ibuprofen was the optimal drug for usage.[25]

The main limitations of the study were the small sample size. The study did not aim at investigating the impact of various professions or routines on dysmenorrhea. The observational nature of the study poses difficulty in generalizing the results irrespective of time and geography. Similar studies could be carried out on a larger scale to find significant correlations that would help to create greater awareness among young females. Lifestyle modifications and stress management could be a good implementation of this study in helping the community.

Conclusion

Physical activity and characteristics of pain, such as cyclical nature and intensity, are predictors of dysmenorrhea. These factors are important in developing agents that can relieve dysmenorrhea.

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