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Research Article

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Relation of Primary Dysmenorrhea with BMI and Associated Risk Factors Among Medical Students of Rawalpindi

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ABSTRACT

Background: Primary dysmenorrhea (PD) is one of the most common gynecological complaints in women of childbearing age, which severely impacts their quality of life.

Objective: The study aims to investigate the prevalence of dysmenorrhea among women of different ranges of Body Mass Index (BMI) and its associated risk factors.

Methodology: 250 students (aged 18-24) from three medical colleges; Army Medical College, Foundation University Medical College, and Rawalpindi Medical University, participated in this cross-sectional survey. They were subjected to a pretested and structured questionnaire comprising 30 questions regarding their menstrual characteristics, risk factors of dysmenorrhea, and their weights and heights. BMI was calculated. Descriptive and analytical statistics were conducted using chi-square and ANOVA. A p-value of <0.05 was considered statistically significant.

Results: Based on this study, 88.4% of the students had PD, with 19% having mild, 45.2% having moderate, and 35.7% having severe dysmenorrhea. 78% of the students stated that dysmenorrhea makes it difficult for them to go about their everyday lives. Among the risk factors, family history, and intensity of bleeding were statistically significant. Any relation between age at menarche and duration of menstruation was not established. Among the modifiable factors i.e. diet, sleep, stress, and exercise, only sleep was considered statistically significant. Chiefly, no association was found between BMI and intensity of dysmenorrhea.

Conclusion: A high prevalence of PD was detected among young women between 18-24 years of age. Family history, intensity of bleeding, and an inactive lifestyle were found to be the important risk factors for PD. However, no correlation was observed between BMI and PD.

Keywords: Primary Dysmenorrhea, Prevalence, BMI, Risk Factors, Dysmenorrhea

Introduction

Dysmenorrhea poses a greater burden than other gynecological complaints [1]. Dysmenorrhea is defined as pain during menstruation and has 2 types: primary and secondary. Primary dysmenorrhea (PD) is described as menstrual pain that is not associated with an underlying organic disorder. It normally starts six to twelve months after menarche and lasts till menopause. Conversely, secondary dysmenorrhea typically appears beyond the age of 25 and is brought on by an underlying gynecological disease such as endometriosis, uterine fibroids, or pelvic adhesions [2]. It is the most common female problem, affecting 90% of adolescent girls and more than half of menstruating women [3]. In some women (3-33%), the pain is severe enough to restrict their daily activities, causing absence from school, lower academic performance, reduced quality of sleep, and adversely affects mood, causing stress and anxiety, ultimately causing a major decrease in the quality of life of those affected [4-6]. The global prevalence of dysmenorrhea varies significantly by region, ranging from 50-90% [7]. This variation is due to the lack of a uniform operational definition for dysmenorrhea to be used in epidemiological studies and the way it is measured. Despite its high prevalence, studies have reported that women being affected by PD do not report it, or seek medical help [8]. Many studies have shown that a variety of risk factors, including biological, psychological, social, and lifestyle factors, can be linked to PD. Biological factors include a positive family history, heavy and prolonged menstrual bleeding, menarche at an early age and

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menstrual cycle irregularity [9,10]. Somatization, psychological disturbance, and poor mental health, such as stress, anxiety, and depression come under psychological factors [11,12]. A lack of social support is one of the social factors [13]. Other factors include age < 20 years, null parity, smoking, lack of exercise, and a stressful lifestyle [5,14]. In terms of student dietary habits, it was discovered that a higher intake of fish, eggs, milk, fruits, and vegetables as sources of minerals, and a lower intake of wine, was linked to a lower prevalence of dysmenorrhea [14]. Coffee intake was identified as a significant risk factor for dysmenorrhea in a study conducted at Dumlupinar University [5]. PD is also linked with Body Mass Index (BMI). A study conducted in Saudi Arabia has shown that underweight subjects had a greater prevalence of moderate and severe dysmenorrhea than did obese subjects [15]. However, the evidence of how BMI affects PD is still controversial [16]. A few studies find no correlation between BMI and dysmenorrhea, whereas others find a higher prevalence of PD in underweight women, still other data points to a connection between raised BMI and PD [16-20]. Additionally, the results of Hong et al. indicate a U-shaped relationship between BMI and PD, indicating that females who are underweight or obese have an increased chance of experiencing PD [21]. As the evidence currently available is inconclusive to support the impact of BMI on PD, and the risk factors associated with it, which have been thoroughly researched on other populations, particularly stress, physical activity, family history, and diet, among university students of Pakistan, this study is designed to help provide some data to try to fill this existing gap.

Materials and Methods

A pre-tested and structured online questionnaire prepared with reference to previous studies in the literature including the questions concerning women's menstrual characteristics, and the risk factors of PD was used for the survey. The questionnaire was divided into 3 parts beginning with the written informed consent from all the participants in which they were assured of the confidentiality of their responses to the succeeding questionnaire followed by socio-demographic and lifestyle characteristics of the women including name, age, gender, university, level of education, date of birth, marital status and place of residence. Elements related to reproductive and menstrual characteristics such as the age of menarche, duration of the cycle, estimated pain experienced by the women during menstruation, approximate daily flow, history of dysmenorrhea in the immediate family, and quantification of the degree of pain on Numeric Pain Relating Scale (NPRS) classifying mild dysmenorrhea between 1-3 points, moderate between 4-7 points and severe between 8-10 points were also included in this segment of the questionnaire. The subsequent part is comprised of questions specifying the characteristics of PD such as the location of the pain, the character of the pain, the effect of dysmenorrhea on daily activities, and modifiable risk factors; diet, physical activity, stress, and sleep. The third portion included the calculation of BMI. The height and weight were self-reported and BMI was calculated using the formula weight in kg divided by height in meters squared. Based on the BMI recommendations from the World Health Organization, it was categorized into four groups underweight (< 18.5), normal (18.5-24.9), overweight (25-29.99), or obese (≥ 30).

Inclusion and Exclusion Criteria

Women belonging to the age group 18-24, from 3 medical colleges, namely Army Medical College, Foundation University Medical College, and Rawalpindi Medical University, were included. Women diagnosed with any gynecological pathologies like uterine fibroids, endometriosis, or pelvic adhesions were excluded.

Ethical Review

This research project has been reviewed and approved by the Army Medical College Ethical Review Committee on July 4, 2021. The committee has evaluated the study's ethical considerations, ensuring that it complies with established guidelines for research involving human subjects.

Statistical Analysis

Data analysis was done with IBM SPSS 25. For all BMI groups, frequencies and percentages of the severity of dysmenorrhea were computed. The chi-square test of association and analysis of variance (one-way ANOVA) was applied. A value of p less than 0.05 was considered statistically significant.

Table 1: History and Characteristics of Dysmenorrhea (n=250)

	Frequency	Percent
History Of dysmenorrhea		
Yes	221	88.4
No	29	11.6
Pain Location		
Lower Abdomen	71	32.1
Lower Abdomen and back	148	67.0
Right side of abdomen	1	0.5
Left side of abdomen	1	0.5
Identify the character of pain		
Spasmodic	126	57.0
Sharp	60	27.1
Stinging	35	15.8
First experience of menstrual pain		
From first period	97	43.9
After 1-2 years	88	39.8
After 3-4 years	20	9.1
After 5-6 years	16	7.2
Length of pain		
1 day	65	29.4
2 days	126	57.1
3 days	16	7.2
Entire period	14	6.3
Effect on daily activities		
Yes	174	78.7
No	47	21.3
Pain starts for each period		
Previous day	91	41.2
First day	83	37.6
First or second day	47	21.3

Do any of the following activities affect pain?		
Type of Diet	34	15.4
Exercise	45	20.4
Sleep	73	33.0
Stress	69	31.2
Pain associated with any autonomic reaction?		
Nausea	56	25.3
Vomiting	19	8.6
Diarrhea	39	17.6
None	107	48.4
Pain is relieved by		
NSAIDS	103	46.6
Injections	2	0.9
Hot packs	98	44.3
Anti-spasmodic	18	8.2

Results

This study explored that 221 (88.4%) students were suffering from dysmenorrhea, with 42 (19%) having mild, 100 (45.2%) moderate, and 79 (35.7%) having severe dysmenorrhea. Several PD characteristics are shown in Table 1. The lower back and abdomen were indicated by the majority of participants (67%) as the most common sites of pain. For 44% of the individuals, the pain began with their first menstrual cycle. Of the respondents, 57.1% reported that their menstrual pain lasts for two days. For 46.6% of the participants, NSAIDS were beneficial for pain relief.

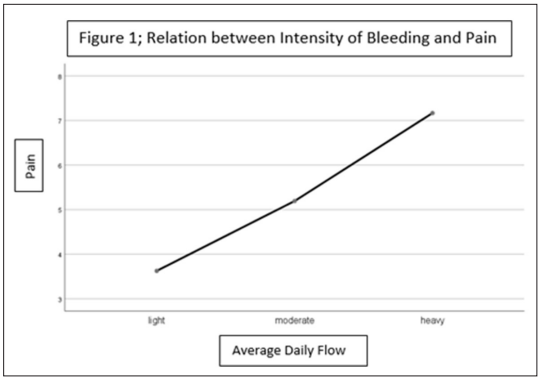

Figure 1: shows the relation of pain intensity with the intensity of bleeding. The intensity of pain increased with heavy menstrual flow. Statistical significance was established.

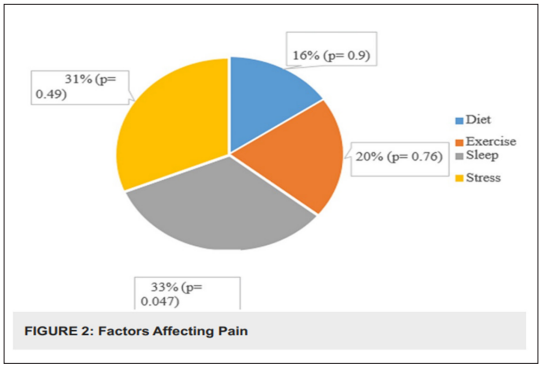

Figure 2: highlights the factors that influence pain. Pain was either relieved or aggravated by the type of diet in 16% of the subjects. 31% reported that stress increased pain intensity, while in 20% of the subjects, exercise affected pain. 33% revealed that sleep relieved pain.

The distribution of mild, moderate, and severe dysmenorrhea in underweight, normal weight, overweight, and obese groups is shown in Table 2. The prevalence of mild, moderate, and severe dysmenorrhea was greater in patients with a normal BMI (52.4%, 53%, and 53.2%, respectively) compared to other BMI groups. However, a statistical significance could not be established (p-value 0.06).

Table 2: Relation Between Body Mass Index (BMI) and Primary Dysmenorrhea (n=250)

BMI	Dysmenorrhea				P-value
	No Pain, n (%)	Mild Pain, n (%)	Moderate Pain, n (%)	Severe Pain, n (%)	
Underweight	2 (6.9)	11 (26.2)	24 (24)	27 (34.2)	0.06
Normal	24 (82.8)	22 (52.4)	53 (53)	42 (53.2)	
Overweight	2 (6.9)	7 (16.6)	20 (20)	8 (10.1)	
Obese	1 (3.4)	2 (4.8)	3 (3)	2 (2.5)	
P-value <0.05 is considered statistically significant					

Discussion

In this study, which involved 250 students between the ages of 18 and 24, it was explored that 221 (88.4%) had PD, of whom 42 (19%) had mild, 100 (45.2%) had moderate, and 79 (35.7%) had severe dysmenorrhea. The results align with recent review articles that suggest 16-90% of young females experience dysmenorrhea, with 2-29% experiencing pain severe enough to restrict their daily activities [16].

For young females, PD is one of the most common reasons for class absenteeism. 78.7% of the students in our study reported that having dysmenorrhea had a detrimental impact on their everyday activities and academic performance. These findings support earlier research that shows that class absenteeism and lack of concentration and focus influence the educational performance of the majority of dysmenorrheic females (60.4 percent) [4]. Furthermore, Minaleshewa et al. found that 51.4% of their PD respondents had a decline in academic performance, and 63% of them experienced social withdrawal [22].

Lower abdomen and back were the most frequently reported sites of dysmenorrheic pain (67%) among the study participants. For 43.9% of the participants, pain began a year after menarche, while another 39.8% started experiencing pain 1-2 years after their first menstruation. For 57.1% of the participants, menstrual pain persists for two days. For each menstrual period, 41.2% of the subjects reported that pain starts a day before, while 37.6% feel it on the first day. 57% of the participants reported having spasmodic pain, whereas 27.1% reported sharp pain. 34% of participants in Kural et al.'s study reported diffuse lower abdomen pain, with the majority (68%) reporting spasmodic pain [23]. Uterine contractions caused by increased prostaglandin production in the menstruating uterus may cause spasmodic discomfort in these subjects [24]. Pain was associated with nausea in 25.3% and diarrhea in 17.6% of the subjects, while 48.4% reported that it was not associated with any autonomic reactions. Pain relief was achieved in 44.3% of our subjects with

hot packs and 46.4% of our subjects by the use of NSAIDs. This result supports the substantial correlation between prostaglandins and PD, as NSAIDs reduce pain by inhibiting the production of prostaglandins [24].

Many studies in the current literature have shown that a variety of modifiable and non-modifiable risk factors can be linked to PD. In our study, age at menarche, family history, average daily flow, duration of menstruation, and lifestyle factors are the considered risk factors. Early menarche, i.e. menarche before 11 years of age, was reported by 3.2 % of the subjects. Some studies reported a higher dysmenorrhea frequency in women who had menarche at an early age [7,14]. However, in our study, the age of menarche was not independently associated with dysmenorrhea ($p>0.05$). This might be due to the reason that only 8 subjects out of 221 had an early menarche, so the results cannot be generalized. Burnett et al. have reported similar results [25].

There was a positive association between a history of dysmenorrhea in the immediate family and the severity of PD in the current study ($p = 0.016$). Results of previous studies also support this association [7,9,13,16]. There are two possible reasons for this association; the first points to the girls' behavioral modeling after their mothers or sisters, and the second reason can be explained by genetic factors. The findings of a study conducted by Silberg et al. on 1200 pairs of monozygotic and dizygotic twin sisters indicated that PD was caused by both genetic and environmental factors [26].

A longer duration of menstruation (more than 7 days) was reported by 6.4% of the subjects, while 93.6 % had normal duration i.e. 3-7 days. Statistical significance was not established between the duration of menstruation and the intensity of dysmenorrhea (p-value 0.6). The significant difference between the percentages of subjects with normal and prolonged duration of menstruation may have distorted the results. In contrast, some studies in the literature reported a positive association between longer duration of menstruation and intensity of dysmenorrhea [9,13,14].

Subjects who frequently engage in physical activities and have an active lifestyle reportedly feel less pain, as compared to those who have a sedentary lifestyle, with little to no physical activity. A positive association was established between an active engagement in physical activity and lesser intensity of pain ($p = 0.015$). This finding is consistent with the previous studies and furthers the fact that maintaining a healthy and active lifestyle can reduce the intensity of PD [27,28].

In the current study, 9.6 % of subjects reported light flow, 83.2 % moderate, and 7.2 % heavy bleeding. A heavier intensity of bleeding was associated with a higher severity of PD ($p = 0.009$). Similar results were reported in previous studies [7,10,14]. In contrast, no correlation was found between the duration of the menstrual cycle and the intensity of pain, in a study conducted among 276 Japanese women aged 19 to 24 years [29]. The use of different scales for grading the severity of dysmenorrhea can explain this disparity.

The study explored that pain during menstruation was influenced by four factors; diet, exercise, sleep, and stress. 34 subjects (15.4%) reported that the type of diet during menstruation either aggravated or relieved their pain. Hot beverages like tea, warm foods, fruits, vegetables and eggs reportedly relieved pain, while cold beverages like soft drinks, ice cream, and caffeinated products like coffee aggravated pain. Faramarzi et al. reported that dysmenorrhea was two times higher in women with high caffeine intake, while a study conducted among Spanish university students revealed that consumption of cola drinks was a statistically significant risk factor [9,13]. Some studies in the literature have established association of dysmenorrhea with poor mental health, stress, anxiety, and depression [6]. 69 subjects (31.2%) mentioned increased intensity of pain during stress. Results of a study by Hong Ju et al. revealed a positive association between perceived stress, related to work or general life events, and the risk of dysmenorrhea [16]. The molecular mechanisms linking work stress to dysmenorrhea are not completely understood, however, it potentially includes a cascade of neuroendocrine reactions. Stress-related hormones, including adrenaline and cortisol, appear to influence prostaglandin synthesis and/or binding in the myometrium [11]. In the current study, 45 students (20.4%) reported that their pain was influenced by exercise, while 73 (33.0%) revealed that their pain was relieved during sleep.

Among diet, sleep, stress, and exercise, only sleep was statistically significant ($p = 0.047$). Pain is a perception rather than a sensation, and during sleep, the pain sensitivity might be lowered in the case of mild pain. Some studies reported that severe dysmenorrheic pain significantly reduced the quality of sleep, therefore, sleep was not a relieving factor in that case. However, some studies reported that inconclusive evidence was found for these modifiable factors [16].

The present study revealed that the severity of dysmenorrhea was not associated with body mass index (pvalue 0.06). This finding is in line with a few previous studies [12,17]. Sundell et al found that the severity of dysmenorrhea was not associated with either height or weight [12]. However, a limitation of the present study was that, out of all study participants, 56.4% were females of normal weight, 25.6% underweight, 14.8% overweight, and only 3.2% obese. There may have been a bias in the results due to this unequal distribution of subjects in different BMI groups.

On the other hand, previous studies have reported different associations with BMI. Studies by Mohapatra et al. and Rafique et al. show a significant association between PD and low BMI [15,19]. However, the exact pathophysiological mechanisms behind this link remain unclear. Given that a certain amount of body fat is necessary for healthy menstrual cycles and ovulation, and that a lack of fat can cause ovulatory, menstrual, and reproductive issues, it is possible that irregular menstruation and disturbed ovulation can change the estrogen/progesterone ratio, which in turn can increase prostaglandin production and cause PD [15]. Snehalata et al. found a positive correlation between PD and higher BMI in their subjects and showed that the severity of PD increased with increasing BMI [20]. A U-shaped association between BMI and PD was found in Hong et al.'s prospective study, indicating that females who are underweight or overweight/obese are more likely to experience PD [21].

This study assessed the severity of PD using the NPRS, associated it with BMI, and investigated additional PD risk factors. However,

this study's cross-sectional design meant that it was unable to determine the impact of either increasing or decreasing BMI on PD. Additionally, no medical examinations or investigations were performed; the diagnosis of PD was made solely based on the patient's history. The impact of additional confounding variables, such as irregular menstrual cycles, oral contraceptive pill use, parity, smoking, and alcohol intake, was not taken into account. Furthermore, the study of pain is challenging because firstly, pain is a subjective matter, and people's perceptions of pain are influenced by a variety of circumstances when determining its intensity. Secondly, different studies on dysmenorrhea used different scales to score its intensity, and so comparison of the results with other studies can be affected.

Conclusion

This study concludes that PD affects a significant percentage of young females, negatively impacting their everyday activities and academic performance. Additionally, it was shown that the majority of respondents' pain was reduced by NSAIDs, therefore, confirming that PD is caused by increased prostaglandin synthesis. Our results showed that family history of dysmenorrhea and heavy intensity of menstrual bleeding are the important risk factors. In addition, we did not find any correlation between BMI and PD. However, concerning lifestyle and eating habits, based on our results and previous reports, further studies are necessary to provide or confirm recommendations on the most advisable diets or lifestyle changes for reducing the risk of suffering from dysmenorrhea.

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