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Investigating the Burden and Predictors of Neurological and Gastrointestinal Symptoms in Women with Dysmenorrhea

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Abstract: Dysmenorrhea is one of the most common gynecological problems throughout the world. Dysmenorrhea is defined as pain in lower anterior pelvic area associated with periods. It can also be defined as difficulty in menstruation or painful menstruation due to reduction in blood flow and concomitant uterine ischemia.

The present study was cross sectional study conducted on 300 individuals (200 patients and 100 controls). The subject's profile, the anthropometric measurement (BMI, waist to hip ratio and percent body fats), vitals (B.P, pulse rate, pulse pressure) and stress score was recorded. The neurologic and GIT symptoms associated with dysmenorrhea, menstrual history, eating habits and personal medical history was also determined by using a questionnaire.

The participants of the study (age 18 to 24 years), mean 20.79 ± 1.56 with a mean BMI of 19.98 ± 3.72, mean W/H ratio of 0.80 ± 0.60, mean percent body fats of 23.15 ± 4.40, mean stress score of 19.81 ± 20.75. Various dysmenorrhea symptoms such as nausea, vomiting, abdominal bloating, aggressive behavior, depression, dull or cry mood, sleeplessness, irritability, headache, lack of control and guilty feeling shows a significant difference ($p < 0.05$) between patients and controls. Limitation of activities, menorrhagia, pain in abdomen, thighs, low back also shows a significant difference ($p < 0.0.5$) between patients and controls.

Hence, It is concluded that dysmenorrhea symptoms in Pakistani females associated with GIT and neurological symptoms were common in females such as abdominal bloating, aggressive behavior and mood disturbances.

Key words: Blood pressure, Body mass index, Dysmenorrhea, Gastro Intestinal Tract, Menorrhagia, Mood changes

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Introduction

Dysmenorrhea is one of the most common gynecological problems throughout the world. Almost all the menstruating females' experiences pain during menstruation but teenagers experience it more vigorously. The incidence of dysmenorrhea is not known, as it frequently goes unreported. Dysmenorrhea is reported in different countries of the world. One from every two women tolerates pain and cramps during menstruating but this pain begins after the ovulatory cycles begins. However, some women experiences dysmenorrhea with anovulatory cycles.

Dysmenorrhea is defined as pain in lower anterior pelvic area associated with periods. It can also be defined as difficulty in menstruation or painful menstruation due to reduction in blood flow and concomitant uterine ischemia. It can also be described as crampy, shooting, throbbing, or spasmodic conditions but always occur as a cyclical periodic pain. It usually involves cramps in the abdomen, begins just before the onset of menses and diminishes after 1-3 days of the cycle affecting more than half of the menstruating women [1]. Dysmenorrhea may be classified into mild, moderate and severe depending on the intensity of pain produced and the disabling effects produced by this problem. The quality of pain varies among individuals and those with severe pain have more negative effects. It can be classified into two major categories: Primary dysmenorrhea and secondary dysmenorrhea.[2].

Primary dysmenorrhea (PD) usually begins from the onset of menstrual cycle without any pelvic pathology such as endometriosis, uterine myoma, uterine fibroid, ovarian cyst, etc [3]. It usually associated with the onset of ovulatory cycles from six months to one year after the onset of menarche. Three out of four women with dysmenorrhea suffer from primary dysmenorrhea. Primary dysmenorrhea is most common among the girls. It usually occurs in teenage girls but as the age increases the intensity of pain decreases. The pain of primary dysmenorrhea usually starts a few hours before or just after the onset of a menstrual period and may last as long as 48-72 hours. This pain is just like labor pain with cramping in suprapubic region and may be accompanied by lumbosacral back ache, pain in the thigh, in the abdomen, or general ache [4]. Primary dysmenorrhea is always mediated by prostaglandins. Women's have a higher concentration of prostaglandins, PGF2 alpha (a potent myometrial stimulant and vasoconstrictor in the secretary endometrium), prostaglandin E2 and leukotrienes in their blood which contributes to cramps and pain [5]. It is also believed that a decline in the progesterone before the start of menstrual cycle begins the arachidonic acid release and cytokine release from the degradation of arachidonic acid. Severe myometrial contraction, vasoconstriction, uterine ischemia, and subsequent dysmenorrhic pain are resulted from the release of these cytokines [6]. Primary dysmenorrhea is further classified into spasmodic and congestive. Both of them differ from each other in terms of the occurrence time in menstrual cycle, pain quality and other symptoms. However, the females with menstrual pain experiences a variety of physical and emotional symptoms [7]. Most common symptoms associated with dysmenorrhea are nausea, vomiting, diarrhea, constipation, abdominal pain, dizziness, mood changes, fatigue, restlessness, sleeplessness, etc. Symptoms of dysmenorrhea accompany the onset of menstrual flow [8].

Secondary dysmenorrhea is defined as painful menstruation associated with anatomic or pelvic pathology such as endometriosis, uterine fibroids, polyps, ovarian cyst, adenomyosis or infection. It is usually observed in women aged between 35- 40 years of age. Secondary dysmenorrhea can be treated and usually relieved by correcting the pelvic abnormalities. Like primary dysmenorrhea, the symptoms of secondary dysmenorrhea include irregular periods, bleeding between periods, pain between periods, vaginal discharge, heavy bleeding, dyspareunia, etc. One from every four women experiencing dysmenorrhea is secondary dysmenorrhea due to any pelvic pathology [9].

Majority of the women experiences a tolerable menses. But for the rest of women, the pain is very exhausting and tiring, limits the daily activities and such women need immediate medications to get free from pain. The quality of pain and its associated symptoms varies among individuals and those with severe pain have more negative effects. It interrupts with daily activities and most of the women show lack of interest in doing their task which will definitely reduces the quality of life. It is the most common problem among women occurring with different intensities and symptoms influencing the mental and physical health if remains untreated. It is also a major cause of impaired quality of life interrupting their educational and social life [10].

Methods

Study Design

This study is a cross- sectional study had been conducted on human female subjects from August 2023 to December 2023. It included 300 subjects. Out of which 200 were cases and 100 were controls. Only female subjects were included ranging between 18 – 24 years of age, belonging to different departments such as department of physiology, chemistry, botany, zoology, women studies, mathematics and faculty of arts from University Of Karachi.

Inclusion Criteria

Female subjects of age range between 18-24 years, History of Dysmenorrhea for the last 3 months consecutive, regular menstrual cycle, willingness to participate with informed consent and able to fill their questionnaire.

Exclusion Criteria

Diagnosed Gynaecological problems (PCOS, endometriosis, pelvic inflammatory diseases), history of chronic gastrointestinal diseases (IBS, peptic ulcer), known neurological disease (migraine, epilepsy)

Sample Size Calculation

The sample size was estimated for the study by using the total number of adolescents at the age of 18 and 24 years in the city, the 10 % individuals were taken at the acceptable margin of 2 % and we keep the 95 % confidence level, the number of subjects yield were 200.

The expected possible sample losses an addition 13 % was inducted with calculated sample, and thus finalized the total minimum sample size of 200 patients.

Data Collection

Selected participants were requested to fill a self administered questionnaire which was designed to collect the required data. The questionnaires were divided into six sections. The first section contains demographic data of the individual such as name, age, marital status, contact number, etc. The second section contains data related to body measurements such as weight, height, blood pressure, pulse rate, pulse pressure, waist circumference and hip circumference. The third section contains data related to menstruation such as personal and family history of menstruation. The fourth section contains data related to history of personal and family diseases. The fifth section of the questionnaire contains data related to personal habits and eating habits. In the last section, the stress score was calculated by using Holmes-rahe life stress inventory scale. The score below 150 represents less stress, between 150 - 300 represents moderate stress and beyond 300 represents severe stress. After completion, the questionnaires were collected from the participants immediately on the spot.

Anthropometric Measurement

The body mass index and waist to hip ratio of the subjects were measured by taking their weight, waist, hip and height measurement. Weight was measured by using a digital portable scale with capacity for 200 kg and precision of 0.01 kg with the subjects wearing no shoes and bags. Height was measured by using inelastic metric tape with scale of 0.5 cm. The subjects were instructed to stand straight and motionless, with hands flat on tights and head adjusted on the Frankfurt plane. Measurement of hip and waist was taken by inch tape.

Blood Pressure Measurement

Blood pressure of human subject can be measured by two methods. Direct method and indirect method. In this study blood pressure was measured by indirect method i.e. Ausculatory method. This method is based on sense of hearing. The pressure of upper side is the maximum pressure and is called the systolic pressure while the pressure of lower side is the minimum pressure termed as the diastolic pressure.

Pulse Rate Measurement

The pulse rate of a human subject can be measured by two methods. Manual method or Monitor method. In this study, pulse rate was measured by manual method.

Percent Body Fats Measurement

In this study we measured % body fats through Anthropometric indices and tool of skin-fold thickness.

Data Analysis

Standardized statistical programs including Independent T-test, ANOVA and Chi-square test was applied. Data analyzed by using SPSS 16.0. Mean and standard deviation computed for all quantitative parameters like BMI, W/H ratio, stress score, pulse rate, pulse pressure and percent body fats. For qualitative parameters, count and percentage reported using frequency tables were used. Pearson chi square test was used to see the association between parameters with patients and controls while independent T- test performed to compare the means of all quantitative parameters of patients and controls.

Results

The overall subjects under study were between 18 and 24 years of age, with a mean age of 20.79 years. Overall 66.66% females were patients of dysmenorrhea and 33.33% females were controls. BMI was found to be 19.98 ± 3.72 kg/m2 in overall population. The overall mean values of anthropometry, vitals and stress score are given in table-1. As discussed in methodology, in our data there were two types of parameters the quantitative and qualitative. The qualitative parameters include sign and symptoms of dysmenorrhea, menstrual history, eating habits, personal medical history, physical activity and stress. The quantitative parameters includes, Anthropometric measurements (BMI, W/H ratio, and percent body fats), Stress score, Blood pressure (systolic and diastolic blood pressure), pulse rate and pulse pressure. The qualitative as well as quantitative parameters were compared between patients and controls.

Age and Anthropometric Indices

The participants belong to age group 21 were more in the study while participants at age 24 remained less in number. The mean BMI was 19.98 ± 3.72 kg/m2. More participants of our study shows the BMI valued 18 while BMI above 30 was found in few of the participants. The mean W/H ratio was 0.80 ± 0.60. Maximum participants of our study shows the W/H ratio of 0.82 and less number of participant shows the W/H ratio of 0.96 (Figure-4). The data of percent body fats shoes the mean value of 23.15 ± 4.40. Most of the participants were having 20 percent body fats while the extreme value of 15 % is shown in few participants.

Stress Score and Blood pressure

The stress score was found with mean value of 19.81 ± 20.75. The minimum value stress score was 0.00 while maximum value of stress score was 114 in overall participants. The data of systolic blood pressure shows the mean value of 107.63 ± 0.60 mmHg. Most of the participants were having 110 mmHg of systolic blood pressure while few participants have systolic blood pressure of 85, 140 and 180 mmHg. The mean value of diastolic blood pressure was 73.21 ± 0.45 mmHg. Maximum participants of our study show the diastolic blood pressure of 70 mmHg and less number of participant's shows the diastolic blood pressure of 50 and 120 mmHg.

Pulse Rate and Pulse Pressure

The mean pulse rate was found with the mean value of 76.21 ± 8.14 beats/min. Maximum participants of our study shows the pulse rate of 70 beats/min while less number of participants shows the pulse rate of 110 beats/min. The average pulse pressure was found to be 34.64 ± 11.04 mmHg. Maximum participants of our study show the pulse pressure of 30 mmHg while pulse pressure of 40mmHg is found in less number of participants (Table 1).

Table 1: Mean value along with standard deviation of Anthropometric indices, Stress score, B.P, pulse rate, pulse pressure, and percent body fats

Parameters	Mean	Median	Std. Deviation
Age	20.7900	21.000	1.56227
BMI	19.9847	19.100	3.72574
WHR	0.8070	0.80000	0.6089
Systolic BP	107.632	110.0000	0.604050
Diastolic BP	73.2167	70.0000	0.45378
Pulse rate	76.2167	76.0000	8.14893
Pulse pressure	34.6400	35.0000	11.04096
% Body fats	23.1583	22.1500	4.40244
Stress score	19.8133	20.0000	20.75881

Comparison of Age, Anthropometric Indices, vitals and stress score in Patients and Controls

The comparison of Age and anthropometric indices (BMI, W/H ratio and percent body fats and vitals) displays no significant difference of age, WHR, BMI, systolic blood pressure, diastolic blood pressure, stress score, percent body fats and pulse rate and pulse pressure with (p= > 0.050) in both patients and controls (Table 2)

Table 2: Comparison of Quantitively parameters in patient and control group

Parameters	Group	N	Mean	Std. Deviation	p-value
Age (years)	Controls	100	20.7700	1.50993	0.876
	Dysmenorrhea	200	20.8000	1.59143	
Body mass index (kg/m2)	Controls	100	19.7450	4.01546	0.432
	Dysmenorrhea	200	20.1045	3.57656	
Waist to hip ratio	Controls	100	.8097	.05827	0.583
	Dysmenorrhea	200	.8056	.06227	

Systolic blood pressure (mmHg)	Controls	100	108.582	10.36523	0.293
	Dysmenorrhea	200	107.152	11.43597	
Diastolic blood pressre (mmHg)	Controls	100	72.6000	6.94422	0.337
	Dysmenorrhea	200	73.5250	8.27901	
Percent body fats %	Controls	100	22.4600	4.40913	0.052
	Dysmenorrhea	200	23.5075	4.36830	
Pulse rate (beats/min)	Controls	100	75.6500	11.56744	0.531
	Dysmenorrhea	200	76.5000	10.78665	
Pulse pressure mm Hg	Controls	100	36.3100	7.73905	0.584
	dysmenorrhea	200	33.8050	8.23871	
Stress score points	**Controls**	100	18.1300	15.96502	0.321
	dysmenorrhea	200	20.6550	22.77144	

*P value: <0.05 considered as significant using independent sample T- test.

GIT Manifestations of Dysmenorrhea in Patients and Controls

Using Chi-square test it was revealed that nausea is significantly increased in patients as compared to controls with (p=0.001), vomiting also significantly increased in patients as compared to controls with (p=1.000), constipation is non significant in patients and controls with (p=1.000), loss of apatite is also non significant in patients and controls with (p=1.062), abdominal bloating is significantly increased in patients as compared to controls with (p=0.001), regurgitation is non significant in patients and controls (p=0.305) and belching is also non significant in patients and controls during menstruation (p=0.305) (Table 3, Figure 1 and 2).

Table 3: GIT Manifestations of Dysmenorrhea in Patients and Controls

Characteristics		**Groups**				**P value**
		Controls		**Dysmenorrhea**		
		N	**%**	**n**	**%**	
Nausea	yes	5	5.0%	38	19.0%	0.001*
Vomiting	yes	6	6.0%	35	17.5%	0.007*
Diarrhea	yes	8	8.0%	16	8.0%	1.000
Constipation	yes	10	10.0%	19	9.5%	1.000
Loss of apatite	yes	13	13.0%	45	22.5%	0.062
Abdominal bloating	yes	15	15.0%	67	33.5%	0.001*
Regurgitation	yes	0	0.0%	4	2.0%	0.305
Belching	yes	0	0.0%	4	2.0%	0.305
P-value < 0.05 considered as significant using Pearson chi-square test of independence.						

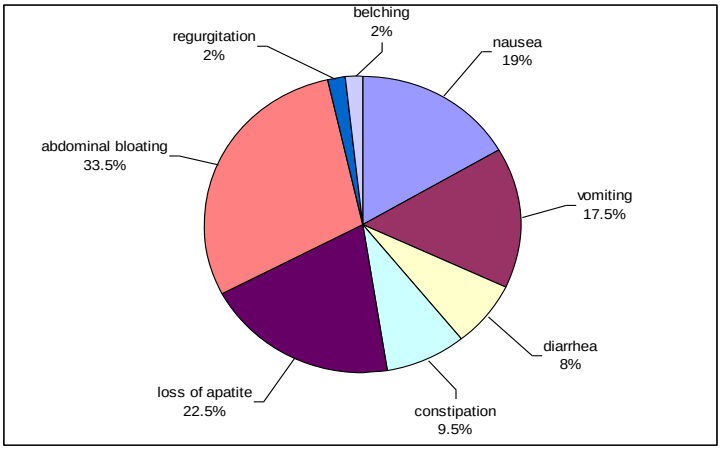

Figure 1: GIT Manifestations of Dysmenorrhea in Patients

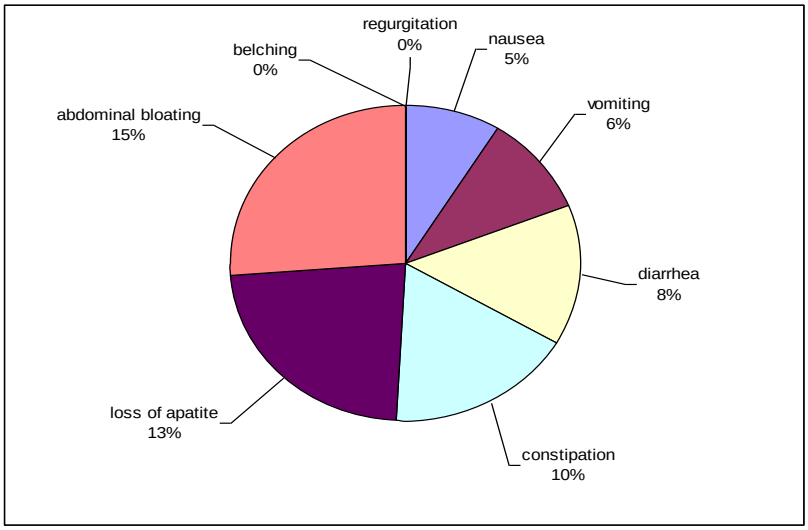

Figure 2: GIT Manifestations of Dysmenorrhea in Controls

Neurologic Manifestations of Dysmenorrhea

Using Chi-square test it was revealed that aggressive behavior is significantly increased in patients as compared to controls with (p=0.047), depression is also significantly increased in patients as compared to controls with (p=0.007), dull or cry mood is significantly increased in patients as compared to controls with (p=0.000), sleeplessness also significantly increased in patients as compared to controls with (p=0.000), irritability is significantly increased in patients as compared to controls with (p=0.002), headache also significantly increased in patients as compared to controls with (p=0.003), lack of control is significantly increased in patients as compared to controls with (p=0.002) and guilty also significantly increased in patients as compared to controls with (p=0.029).Where as, anxiety is non significant in patients and controls with (p=0.050), light headedness is also non significant with (p=0.399), restlessness is non significant with (p=0.052), food craving is also non significant with (p=0.656), fainting is non significant with (p=0.305), dizziness is also non significant with (p=0.132), unreasonable behavior is non significant with (p=0.052) and hypersensitivity to touch, sound , light and smell all are non significant with (p=0.279) (Table 4, Figure 3 and 4).

Table 4: Neurologic Manifestations of Dysmenorrhea in Patients and Controls

Characteristics	Group				P value
	Controls		dysmenorrhea		
	N	%	N	%	
Anxiety	8	8.0%	33	16.5%	0.050
Aggressive behavior	10	10.0%	38	19.0%	0.047*
Depression	6	6.0%	34	17.0%	0.007*
Light headedness	3	3.0%	11	5.5%	0.399
Dull or cry mood	16	16.0%	82	41.0%	0.000*
Sleeplessness	3	3.0%	49	24.5%	0.000*
Irritability	9	9.0%	48	24.0%	0.002*
Restlessness	19	19.0%	59	29.5%	0.052
Food craving	9	9.0%	15	7.5%	0.656
Headache	6	6.0%	38	19.0%	0.003*
Fainting	0	0.0%	4	2.0%	0.305
Dizziness	11	11.0%	37	18.5%	0.132
Lack of control	0	0.0%	16	18.0%	0.002*
Guilty	3	3.0%	13	6.5%	0.029*
Unreasonable behavior	6	6.0%	28	14.0%	0.052
Hypersensitivity to touch	3	3.0%	13	6.5%	0.279
Hypersensitivity to smell	3	3.0%	13	6.5%	0.279
Hypersensitivity to sound	3	3.0%	13	6.5%	0.279
Hypersensitivity to light	3	3.0%	13	6.5%	0.279

P-value < 0.05 considered as significant using Pearson chi-square test of independence.

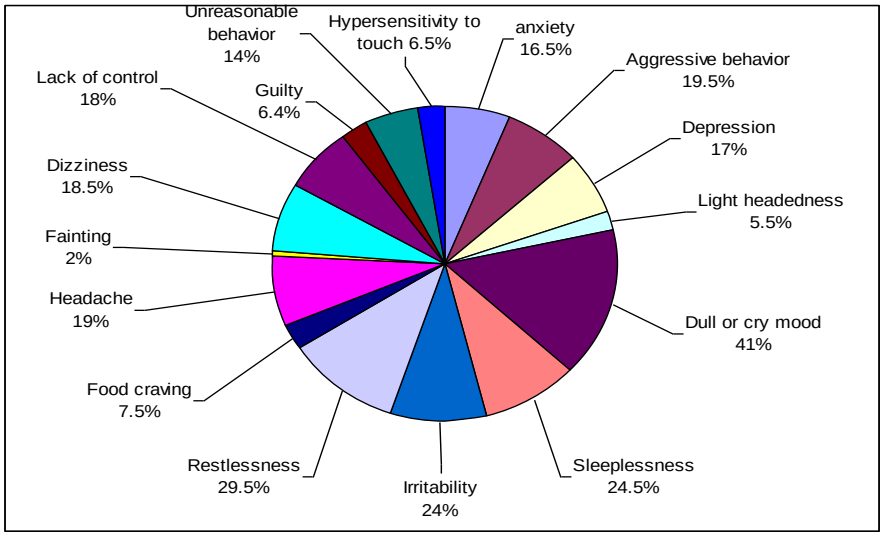

Figure 3: Neurologic Manifestation of Dysmenorrhea in Patients.

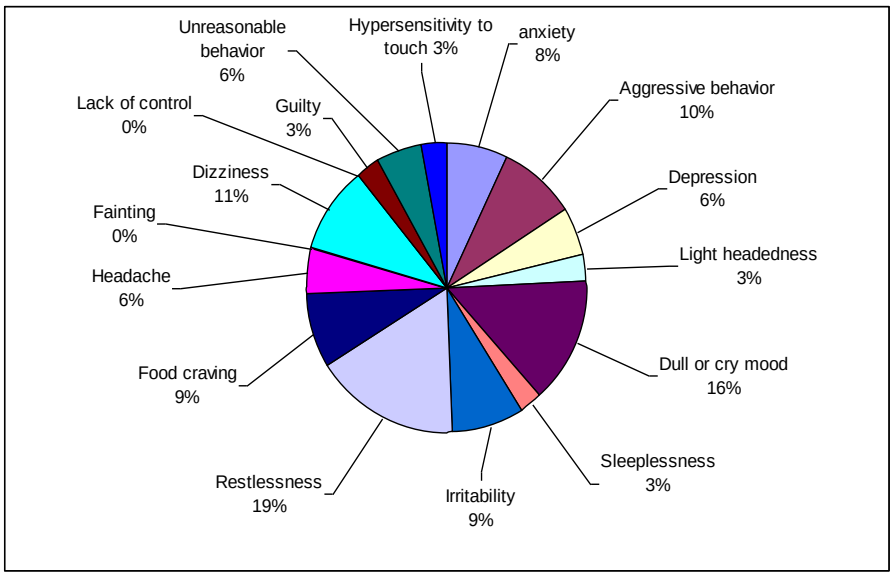

Figure 4: Neurologic Manifestation of Dysmenorrhea in Controls.

Menstrual History of Patients and Controls

The Pearson chi square test shows that menarche age is non significant among patients and controls because the p value is >0.05. Both the patients and control have approximately the same age at menarche. Similarly, there is no significant difference in length of cycle in patients and controls with p value >0.05. The duration of periods in the study also appears non significant as both the patients and controls have almost same duration of periods with p value >0.05. The intensity of pain appears to be significant with p value <0.05 because controls do not experiences any kind of pain during menstruation but patients experiences different intensities if pain during menstruation (Table 5).

Comparison in Location of Cramps between patients and controls

The Pearson chi square test reveals that most of the participants under study have their menstrual cramps located in the abdomen, thighs and low back as it appears to be significant with p value

<0.05. While few participants have their cramps located in the legs and experiences general ache as it appears non significant with p-value >0.05. The data is shown in Table 5.

Table 5: Menstrual History of Patients and Controls

Characteristics		Group				P value
		Controls		dysmenorrhea		
		N	%	n	%	
Age of menstruation	8-13yrs	17	17%	59	29.5%	0.050
	13-16yrs	73	73%	128	64%	
	>16yrs	10	10%	13	6.5%	
Length of cycle	<21 days	26	26%	42	21%	0.321
	21-35days	72	72%	148	74%	
	>35 days	2	2%	10	5%	
Duration of periods	1-3 days	22	22%	39	19.5%	0.793
	4-7 days	73	73%	148	74%	
	>7 days	5	5%	13	6.5%	
Intensity of pain	no pain	100	100%	0	0%	0.000*
	Mild	0	0%	49	24.5%	
	Moderate	0	0%	95	47.5%	
	Severe	0	0%	56	28%	
Location of cramps	Abdomen	17	17%	123	61.5%	0.000*
	Thighs	7	7%	54	27%	0.000*
	Low back	11	11%	76	38%	0.000*
	Legs	14	14%	46	23%	0.068
	General ache	3	3%	18	9%	0.058
Heavy bleeding	Yes	23	23%	55	27.5%	0.485
Limitation of activities	Yes	6	6%	104	52%	0.000*
Regularity of periods	Yes	89	89%	177	88.5%	1.000
Family history of menstrual symptoms	Yes	31	31%	106	53%	0.000*
Past abdominal / pelvic surgery	Yes	3	3%	4	2%	0.690
P-value < 0.05 considered as significant using Pearson chi-square test of independence.						

Comparison of Heavy Bleeding, limitation of activities and regularity of periods in patients and controls

The Pearson chi square test shows most of the participants in the study do not experience heavy bleeding during menstruation in both patients and controls and appears to be non significant with p value >0.05. The Chi-square test also reveals that most of the patients of dysmenorrhea limit their activities during menstruation as compared to the controls and appears significant with p value <0.05. All the participants under study show that is no significant difference in regularity of periods with p value >0.05. Both the patients and controls have regular periods. The data is shown in Table 5.

Comparison between family history of menstrual symptoms and pelvic surgery in patients and controls

The Pearson chi square test shows that patients of dysmenorrhea have family history of dysmenorrhea symptoms as compared to controls and appears to be significant with p value <0.05. While no significant difference of past abdominal or pelvic surgery appears among patients and controls with p value >0.05. The data is shown in Table 5.

Comparison of Stress, Eating Habits and Physical Activity in Patients and Controls

The Chi-square test reveals that both the patients and controls were equally under stress and the results reveal no significant difference (p value is 0.670 which is greater than 0.05). Eating habits including daily intake of breakfast and tea were also same in patients and controls. There is no significant difference between them with p value >0.05.The physical exercise appears to be significant suggesting that all controls which are having no pain do not perform any kind of exercise as compared to controls with p value <0.05. Chi square also reveals a significant increase in rarely performed physical exercise in patients as compared to controls with p value <0.05. Similarly there is also a significant increase in some timed perform physical exercise in patients as compared to controls with p value <0.05. However, there is no significant difference in daily performed exercise in both patients and controls with p value>0.05. The data is shown in Table-6.

Personal Medical History

The Chi square test shows that obesity is non significantly increased in controls as compared to patients with p value >0.05. While there is no significant difference for ovarian cyst in patients as compared to controls with p value >0.05. However, menorrhagia appears to be significant as it is increased in patients as compared to controls with p value <0.05. Pelvic inflammatory disease also appears to be non significant because there is no significant difference in patients and controls with p value >0.05. The data is shown in Table 6.

Table 6: Stress, eating habits, physical exercise and personal medical history patients and controls.

Characteristics		**Group**				**P value**
		Controls		**dysmenorrhea**		
		n	**%**	**N**	**%**	
Stress level using Holmes Rahe Scale						
Under stress	Yes	74	74%	153	76.5%	0.670

Stress management	Yes	73	73%	148	74%	0.793
Eating habits						
Breakfast	Yes	80	80%	140	70%	0.072
Tea	1 time a day	19	19%	49	24.5%	0.128
	2 time a day	33	33%	84	42%	
	3 time a day	11	11%	17	8.5%	
	4 time a day	2	2%	5	2.5%	
	5 time a day	3	3%	1	0.5%	
Physical exercise	No	40	40%	29	14.5%	0.000*
	Rarely	25	25%	76	38%	0.037*
	Sometime	22	22%	72	36%	0.018*
	Daily	13	13%	23	11.5%	0.709
Personal Medical History						
Obesity	Yes	18	18%	20	10%	0.65
Ovarian cyst	Yes	2	2%	2	1%	0.063
Menorrhagia	Yes	0	0%	17	8.5%	0.001*
Pelvic Inflammatory Disease	Yes	0	0%	2	1%	0.554
P-value < 0.05 considered as significant using Pearson chi-square test of independence.						

Discussion

It is a fact that almost every woman in Pakistan experiences pain during menstruation. Some experience it without pain while others experience it with the onset of pain and for some women it becomes severe to bear together with the menstrual symptoms. Dysmenorrhea is a world wide problem faced by the menstruating women. It gives rise to a variety of symptoms mainly the GIT and Neurologic symptoms. The occurrence of these symptoms may occur before or during the onset of menses. A number of factors have been related with menstrual pain.

Our study investigated that anthropometric indices, vitals and stress score were not associated with dysmenorrhea in both patients and controls because the p value of all these factors appears to be (> 0.05). A study found that dysmenorrhea had a strong relation with BMI. Its severity increases with the increase in BMI [11, 12]

It was found that nausea and vomiting is strongly associated with dysmenorrhea. Nausea and vomiting was considered to be the most commonly observed symptoms in dysmenorrhic females. ([13]. It is believed that the excessive production of prostaglandins during menstruation leads to the contraction of uterus wall, causing more cramps and nausea [14].

Abdominal bloating in the present study was found to be significant and is associated with dysmenorrhea. Lower abdominal cramping and bloating is one of the most common dysmenorrhea symptoms [15]. As estrogen affects synthesis of bile (that is responsible for intestinal lubrication). During menstrual period a drop in estrogen leads to decrease in bile synthesis. As a result waste

material which is present in small intestine becomes hard and dry, ultimately results in abdominal bloating [15].

The neurologic manifestations which were found to be associated with dysmenorrhea were aggressive behavior, depression, irritability, headache, lack of control, and guilty in our study. While the most commonly occurring symptoms were dull or cry mood and sleeplessness. Aggressive behavior and lack of control was found to be associated with dysmenorrhea in our study. It may be due to studies stress as all the participants in our study were university students [16].

Depression and dull mood was also found to be associated with dysmenorrhea in our study. It is associated with low levels of progesterone which leads to bad mood. On the other hand increased level of estrogen also causes changes in mood and depression (Rafia Bano et. al, 2013). Irritability was also found to be associated with dysmenorrhea in our study. It occurs because of a decline in estrogen level [17].

Headache was also found to be associated with dysmenorrhea in our study. The cause behind this is that a drop in estrogen prior to menses may give rise to headache [15]. Anxiety, light headedness, food craving, restlessness, fainting, dizziness, unreasonable behavior, hypersensitivity to touch, sound, light and smell were found non significant in our study suggesting that these symptoms were not associated with dysmenorrhea. Our study also found that sleeplessness was associated with dysmenorrhea. As progesterone is responsible for sleep induction but its level drops suddenly as menstruation begins resulting in sleeplessness. However, when it rises during ovulation, the person sleeps as usual [15].

The feeling of guilty is also found to be associated with dysmenorrhea in our study. However, the exact cause is not known [17]. Our study reveals that the age of menstruation did not appears to be significant as there was no significant difference in the age of menarche in both patients and controls. Those females having their menarche at an age of about 11 yrs or less possess 23% higher risk of having menstrual pain as compared to the females having their menarche at an age greater than 11 yrs. This shows that dysmenorrhea strongly associated with age of menarche [18].

Similarly, duration of menstruation was also found to be non significant as there was no significant differences among patients and controls. Dysmenorrhea becomes more severe as the duration of menstruation increases. As progesterone is helpful in maintaining the duration of cycle but due to increase level of progesterone, women experiences more dysmenorrhea [19]. Subjects who were taken as controls did not feel any kind of pain during menstruation where as the subjects who were taken as patients feel pain of varying intensities like 24.5% mild, 47.5% moderate and 28% severe pain. It suggests that dysmenorrhea intensity vary from individual to individual depending upon the amount of prostaglandins produced. A study investigated that out of 664 dysmenorrhic females, 55.3% experiences mild pain, 30% experiences moderate pain while 14.8% of them experiences severe pain during menstruation [20].

Our study also investigated that dysmenorrhea cramps are mostly located with in abdomen, thighs and low back. It can be caused because all of the participants were university students and they have to travel a long distance by walking from department to department with in the university. However, cramps in legs and general ache were almost same in the patients and controls and show no significant difference.

It was also found that dysmenorrhea causes limitation of daily routine activities. Dysmenorrhea symptoms produce a negative effect on the quality of life by causing work absenteeism or school absenteeism [21]. The intensity of dysmenorrhea symptoms exaggerated women daily life routine and causing them to take long time rest and makes them disable to do any work [22].

The regularity of periods was not associated with dysmenorrhea because the women having regular periods and those that do not have regular periods, both of these groups experiences dysmenorrhea in our study. The females having dysmenorrhea with irregular menses were 63.7% as compared to the non-dysmenorrhea females which were 55.7%. A decline in the level of estrogen and progesterone is responsible for irregular periods either due to obesity, unhealthy diet or with certain disease conditions like PCOs, cancers, etc [23]. The family history of menstrual symptoms was strongly associated with dysmenorrhea in our study. It can be due to genetics linked between the female and her mother. Dysmenorrhea is 3.5 times more in females with a family history of dysmenorrhea. This describes the genetic susceptibility towards dysmenorrhea [24].

A strong association of physical exercise with dysmenorrhea has been investigated in our study. Decrease in physical activity was found to be associated with dysmenorrhea as our controls perform more exercise as compared to controls. This occurs because our females have a sedentary life style. However, it was found that posterior pituitary hormone i.e. anti diuretic hormone produces its effects by constricting the blood vessels. This hormone becomes active during exercise or any physical activity. Therefore, by producing the vasoconstriction and reduction in the pelvic blood flow, it decreases the synthesis of prostaglandins [24].

Our study also reveals that menorrhagia as a personal medical illness was associated with dysmenorrhea where as obesity, ovarian cyst and pelvic inflammatory disease found no association with dysmenorrhea. In Pakistani population menorrhagia occurs due to the anovulatory dysfunctional uterine bleeding.

In the present study, stress levels assessed using the Holmes–Rahe Life Stress Inventory did not show a statistically significant difference between dysmenorrheic patients and controls. This finding suggests that stress alone may not be an independent predictor of dysmenorrhea, but it may act as a modifying or aggravating factor for symptom severity. Since all participants were university students, exposure to academic workload, examinations, and psychosocial stressors was common in both groups, which may explain the similar stress scores observed. However, the increased prevalence of neurological manifestations such as aggressive behavior, irritability, lack of control, depressive mood, and sleeplessness among dysmenorrheic females indicates that stress may influence the psychological response to menstrual pain rather than its occurrence. Previous studies have reported that stress can amplify pain perception through neuroendocrine mechanisms involving cortisol, prostaglandins, and central pain sensitization. Therefore, even in the absence of a direct statistical association, stress management strategies may play an important role in reducing the severity of dysmenorrhea-related neurological symptoms, particularly in young women exposed to academic stress [25].

This study was performed basically to create awareness about GIT and Neurologic manifestation in dysmenorrhic females as our population is experiencing number of symptoms during menstruation and to investigate the factors associated with it such as anthropometric indices, vitals, stress, etc. As dysmenorrhea is affecting a large number of Pakistani populations, from the information provided in this study, they become aware of these manifestations. This study also contributed to women health by providing the knowledge about factors associated with dysmenorrhea in Pakistan.

Conclusion

This study concludes that dysmenorrhea is highly prevalent among young Pakistani women, particularly university students, and is significantly associated with a wide range of neurological and gastrointestinal manifestations. Symptoms such as abdominal bloating, nausea, aggressive behavior, depression, irritability, headache, sleeplessness, lack of control, and mood disturbances were

significantly more common in dysmenorrheic females compared to controls. While anthropometric indices, vital parameters, and overall stress scores did not show a significant association with dysmenorrhea, lifestyle-related factors such as limited physical activity, family history of menstrual symptoms, and menorrhagia were important contributing factors. The findings highlight that dysmenorrhea not only affects physical health but also has a substantial impact on mental well-being, daily activities, and quality of life. Early identification, stress management, lifestyle modification, and awareness programs are essential to reduce the burden of dysmenorrhea and improve women's reproductive health.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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