Association of Menstrual Disturbance with Lipid Profile and Food Habits in Female University Students

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ABSTRACT: Adolescence is the turning point where the hormonal and metabolic changes take place, menstruation begins and fertility is achieved. A large proportion of females suffer to some extent menstrual abnormalities, almost 75% of adolescent girls experience dysmenorrhea worldwide. A number of risk factors are considered to be associated with dysmenorrhea and other menstrual abnormalities include urban lifestyle, fast food intake and less consumption of vegetables and fruits, dyslipo-metabolism, hormonal and psychological disturbances.
Apparently healthy female students with ages ranging from 19-23 were selected for this study and were divided into three groups based on their BMI. Their anthropometric parameters were recorded; lipid indices were investigated and surveyed for their food habit and for different menstrual abnormalities.
Comparatively higher values for lipid indices were observed in the lower and higher weight groups, this difference was significant among the normal weight group and higher weight group. Similarly, the percentage of subjects suffering abnormal menstrual flow and its duration, irregularities of the cycle, and dysmenorrhea were higher in both the lower and higher weight group in comparison to subjects in the normal-weight group.
Female subjects with either lower or higher body weight than normal suffer more from menstrual irregularities, disturbance in lipid profile and unhealthy food intake are also associated with dysmenorrhea and other menstrual disturbances.

Keywords: young girls, dysmenorrhea, lifestyle, Dietary patterns, hormonal disbalance.

Abbreviations: BMI; Basal metabolic index, HDL; high density lipoprotein, LDL; low density lipoprotein, mm Hg; millimeter of mercury, BP; Blood Pressure,

I. INTRODUCTION

Adolescence is a high-risk category since significant physical and emotional changes arise at this stage. Menarche is a hallmark of the biological process of puberty [1] in adolescent girls leads to reproductive capacity. Menstrual disorders are common in adolescents and can lead to stressful conditions [2]. Menstruation, a fertility indicator, is a natural physiological condition manifested by intermittent vaginal bleeding due to uterine mucosal shedding [3]. Menstruation is not easy, even though it is a natural physiological process. About any woman suffers from one or more menstrual complications, including missing a period, variations in cycle duration, changes in menstrual blood flow, color, consistency, intense discomfort and other menstrual signs such as nausea, vomiting, bloating, loss of appetite, lower abdominal cramps, acne, mood fluctuations, irritability, and breast tenderness, etc [4]. Dysmenorrhea or painful menstruation is one of the most common ailments of adolescent girls and almost 75% of young girls worldwide experience menstruation-related problems or dysmenorrhea [5]. It can be classified as primary dysmenorrhea and secondary dysmenorrhea. The primary type is characterized by painful menstruation without any perceptible evident of pelvic abnormality, while the second type is associated with extreme painful menses which are due to the pathological condition of pelvic such as endometriosis [6]. Globally the prevalence of dysmenorrhea varies in the range between 50-90% with a high incidence of 89.9% in Iranigirls [7] followed by 88% in Australian girls [8]. A wide range of risk factors such as lifestyle, social, biological and psychological factors are associated with dysmenorrhea [6]. The busy and urban lifestyle directly affects our eating habits and now a day the increasing intake of junk and fast food, spices, coffee, and other beverages are directly associated with our health and metabolism. While hormonal balance play a pivotal role in the women reproductive health which in turn depend on the quality of food and its metabolism. Many

researchers reported the early age onset of menarche in girls due to the eating of fast food regularly [9].

Menstrual irregularities are a common characteristic of eating disorders that are multifaceted and arise from a dynamic interplay of several causes [10]. Dietary patterns are linked closely the human quality of life, and adolescence is a possible group for significant growth and maturation that requires extra nutrients and energy-rich food [11]. In recent years, teen dietary patterns have changed [12] in their ingestion of nutrients and requirements, such as widespread fast food eating, skipping food intake [13, 14]. The association between dietary patterns and menstrual dysfunction has become an important concern in the world [15]. Aside from food habits, physical exercise, everyday routine and work stress also have a direct or indirect effect on the reproductive cycle of women.

Concerning the importance of diet in adolescents and its long-term effects that can influence the signs of menstruation in young women, a significant portion of the research has been done on the association between the lesser or more highly consumed nutritional elements and the common signs of menstruation. For instance, the lack of calcium and non-saturated fatty acids is associated with dysmenorrheal [16]. Recently, young people who do not consume breakfast experience considerably more from dysmenorrhea than those who eat breakfast, and a high-fiber diet is inversely correlated with dysmenorrhea. As studies indicate that various diets play a positive role in dysmenorrhea, recognition of their role is important [17].

On one hand, the prevalence and seriousness of menstrual dysmenorrhea and the dietary intake of women and girls are different in different cultures and societies. On the other hand, eating disorders, especially in young girls, are the major health problems and serve as a risk factor for ailments including depression, anxiety, obesity, osteoporosis, as well as menstrual disturbance like dysmenorrhea [18]. It is therefore very important to pay attention to the nutritional status of girls.

In this present study we associate the dysmenorrhea with lipid profile and food habit in female university students.

II. MATERIAL AND METHODS

A. Study design and participants

The present study is cross-sectional and carried out on girls enrolled in the Department of Physiology, University of Sindh, Pakistan. This study was conducted between August 2018 and November 2018. The including criteria are those randomly selected females that are willing to participate, age between 19-23 years, lower abdominal cramp, back pain and regular cycle during menses. The excluding criteria included a student age above 24 years, medical ailments, psychological issues, taken contraceptive pills, hormonal disturbance and gynecological issues. The females studying at the department of physiology was 150 and a total of 100 female students were agreed to

participate in the current study. Prior to the research informed consent was taken to all wailing participants.

B. Data collection

The data were obtained by skilled research associate from each class in 15-25 minutes using a pre designed and self-report questionnaire designed in the English language. The questionnaire was divided into two parts the first part consisted of the age, the onset of the menarche, the details of the menstrual cycle, duration, menstrual flow, length of cycle, number of days in which the period last and presence or absence of pain.

2nd part of questionnaire included the lifestyle, food frequency, food habit, weekly fast food, vegetable and fruit intake, coffee and other beverages consumption, skipping breakfast, physical exercise, and sleep duration. The Participants were divided into three groups on the bodyweight bases; underweight (UW), normal weight (N), overweight (OW).

C. Physical Parameter

The Anthropometric measurements weight, height, waist, hip, and blood pressure were measured. The Basal metabolic index (BMI) and the waist-hip ratio were calculated by standard protocols. A BMI below 18 is considered as underweight while above 25 is considered as overweight. Similarly for the age group of 18-23 years up to 0.77waist-hip ratio considered as normal. The blood pressure measured by sphygmomanometer and 120/80 mm Hg considered as normal.

D. Biochemical Parameter

5 ml Fasting blood was taken from each participant and transferred into a gel tube for blood glucose level and lipid profile. The blood sugar level, HDL, LDL, cholesterol, and triglycerides were measured by using the human diagnostic worldwide commercial kit in Micro lab300.

E. Statistical Analysis

The data were analyzed using the Statistical Software Package for the Social Sciences (SPSS), version 20. The data were described as n (%) for categorical variables and as the mean ± SD for numerical variables.

III. RESULT

In the present study, the mean age of the subjects was nearly equal in all the groups defined on body weight bases. More or less similar values were observed for the systolic and diastolic blood pressure for underweight and normal weight subjects, while these were higher in over weight group but the difference was not significant from the mean values for total subjects and normal weight group.

No significant intergroup differences were observed in the mean values for height, this difference was significant for weight and BMI among groups. The mean waist values for the overweight group were significantly higher in comparison to the total and normal weight group. Slightly higher values were observed for the waist to hip ratio but this increase was non-significant.

Table 1: Blood pressure and pulse rate in different groups.

	Total	Under Weight	Normal	Over Weight
Age	21.02±1.67	21.11±1.76	20.99±1.55	20.95±1.97
Systolic BP	115.6±11.37	112.93±11.29	114.46±9.84	121.73±13.31
Diastolic BP	77.48±10.79	73.93±10.28	77±10.09	83.36±11.44
Pulse Rate	91.96±12.35	91.2±10.16	93.29±14.77	90.09±9.62

Mean ± S.D, superscript a and b indicating significance (p<0.05) difference with Total and Normal weight group respectively.

Table 2: Anthropometric measurements in different groups.

	Total	Under Weight	Normal	Over Weight
Height	153.32±7.04	152.43±8.97	153.93±6.72	153.21±4.93
Weight	52.14±13.11	39.33±5.22[a,b]	51.92±7.27	70.09±9.07[a,b]
BMI	22.11±5.12	16.89±1.16[a,b]	21.84±1.93	29.84±3.39[a,b]
Waist Standing	29.08±4.77	25.93±2.28[b]	28.46±3.98	34.73±4.13[a,b]
Hip Standing	36.84±4.46	33.33±2.47[a]	36.5±2.6	42.36±4.57[a,b]
WHR	0.8±0.1	0.78±0.04	0.78±0.06	0.82±0.07

Mean ± S.D, superscript a and b indicating significance (p<0.05) difference with Total and Normal weight group respectively.

Table 3: Lipid profile in different groups.

	Total	Under Weight	Normal	Over Weight
Sugar Test	90.62±12.54	90.47±12.88	89.5±13.21	93.27±11.21
Cholesterol mg/dl	161.14±14.66	161.47±10.97	156.38±14.41	171.09±15.58[b]
Serum HDL mg/dl	45.34±4.57	43±3.8[b]	47±4.43	44.91±4.68
Serum LDL mg/dl	91.9±11.74	93.87±9.16	86.98±10.84	99.96±12.33[b]
Serum Triglycerides mg/dl	119.48±12.87	123±12.85[b]	111.96±8.54	131.09±10.48[a,b]
ChHDL ratio	3.6±0.3	3.77±0.25[b]	3.33±0.18[a]	3.82±0.29[b]

Mean ± S.D, superscript a and b indicating significance (p<0.05) difference with Total and Normal weight group respectively.

Similar values were observed for the blood sugar level was observed for all the groups. Lipids and lipoproteins analysis revealed slightly elevated values for total cholesterol, serum LDL, serum HDL and serum Triglycerides, despite the direction of weight deviation from normal, i.e. in both the underweight and overweight groups. However, these differences were significant only for serum LDL between underweight group and normal weight, while it was significant between overweight and normal weight group for cholesterol and triglycerides. Significantly raised values for cholesterol HDL ratio were observed between normal weight group v/s underweight group and overweight group.

In this study it was observed that deviation in body weight from normal affect the normal menstrual cycle and increase the chance of dysmenorrhea, abnormalities in menstrual flow, its duration and cycle length were found more in subjects with lower as well higher weight groups in comparison to subjects with normal weight. Frequent consumption of fast food and less consumption of vegetables and fruits was found to be associated with menstrual cycle abnormalities. The differences are not much profound for the fruit intake variation. Subjects having regular exercise were found to have slightly higher chances of suffering the menstrual cycle abnormalities in comparison to the subjects having occasional no exercise or doing it occasionally.

IV. DISCUSSION

The cyclical hormonal and physical changes that are manifested in the form of the menstrual cycle are highly correlated with the reproductive health of females and any abnormalities not only affect the overall health of individuals but also interfere with social and recreational activities [19]. Dysmenorrhea is one of the major causes that result in absence from studies and work in early adolescent females [20, 21]. The assessment of dysmenorrhea prevalence is very greatly due to its perception as a physiological phenomenon and the degree of severity experienced by females and its interference with health and socioeconomic activities. Different studies have reported a varied level of prevalence of dysmenorrhea from 43% to 93% [22, 23]. Dysmenorrhea is often found to be associated with other menstrual cycle problems like abnormal blood flow, abnormal duration of blood flow, or length of the cycle are among the major ailments that women seek medical assistance [24].

Table 4: Association of dysmenorrhea, abnormal menstrual flow duration (AMFD), abnormal menstrual flow (AMF) and Irregular cycle length (ICL) with fast food, vegetable, fruit intake and exercise.

		Dysmenorrhea		AMFD		AMF		ICL		Total
		NO	Yes	No	Yes	No	Yes	No	Yes	
Fast food	≤2/w	28(62.22%)	17(37.78%)	35(77.78%)	10(22.22%)	36(80%)	9(20%)	30(66.67%)	15(33.33%)	45
	>2/w	28(50.91%)	27(49.09%)	20(36.36%)	35(63.64%)	20(36.36%)	35(63.64%)	28(50.91%)	27(49.09%)	55
Vegetable	≤2/w	34(69.39%)	15(30.61%)	26(53.06%)	23(46.94%)	27(55.1%)	22(44.9%)	32(65.31%)	17(34.69%)	49
	>2/w	22(43.14%)	29(56.86%)	29(56.86%)	22(43.14%)	29(56.86%)	22(43.14%)	26(50.98%)	25(49.02%)	51
Fruit intake	≤2/w	34(62.96%)	20(37.04%)	33(61.11%)	21(38.89%)	31(57.41%)	23(42.59%)	35(64.81%)	19(35.19%)	54
	>2/w	22(47.83%)	24(52.17%)	22(47.83%)	24(52.17%)	25(54.35%)	21(45.65%)	23(50%)	23(50%)	46
Exercise	≤2/w	41(62.12%)	25(37.88%)	37(56.06%)	29(43.94%)	36(54.55%)	30(45.45%)	38(57.58%)	28(42.42%)	66
	>2/w	15(44.12%)	19(55.88%)	18(52.94%)	16(47.06%)	20(58.82%)	14(41.18%)	20(58.82%)	14(41.18%)	34
Total		56	44	55	45	56	44	58	42	100

All the subjects were divided into three groups i.e. Underweight, Normal and Overweight on the basis of BMI. No significant difference has been observed in the systolic and diastolic blood pressure between UW (underweight) and N (Normal weight) groups, comparatively little higher values have been observed for the OW group for both the SBP and DBP. Obesity and its underlying consequence the increased body fats indicate the energy metabolism status of an individual and the hormonal changes that follow this change in the body also interfere with the reproductive functions of the body [25, 26]. The waist to hip ratio is considered as a better indicator of abdominal fat deposition, which is more consequential for the development of obesity related complications including menstrual abnormalities [27]. On the basis of mean values observed in all the three groups it has been observed that no difference present in first two groups, while a little higher value is evident for the OW group, the value is still lower than the value suggested by WHO criteria for obesity which is 0.85 for females.

The physiological cyclical variation in the hormones may cause changes in serum lipid levels and its metabolism. The estrogen major sex hormones involved in the cyclical changes of menstruation also affect the level of HDL and LDL cholesterol positively [28]. Higher total cholesterol to HDL cholesterol is associated with an increased risk of heart diseases. It has been observed that any drift of weight from the normal recommended range negatively affects the lipid profile, it is evident from the mean values for all the lipid profile parameters (Table 3) i.e., total cholesterol HDL, LDL and triglycerides. Although the difference not much significant but total cholesterol, LDL and triglyceride are higher in both UW and OW groups in comparison to normal weight group. This can be observed by the marked difference in the values for total cholesterol to HDL ratio. It has also been noted that the disturbance in the lipid profile is similar in both the group. As the disturbance in lipid profile is associated with the development of many diseases, it is suggested that both overweight and underweight women be considered for the same level of preventive measures for the future. No significant difference has been observed in the values for blood sugar in all of the three groups. Young age student females are more prone to deficiency anemia due to their increased physiological demands of growth and bad food intake habits. In the present study, it has been observed that subjects in UW group are anemic having low hemoglobin levels which is being improved with the increase in BMI.

Bodyweight is considered as phenotypic presentation of overall body health, loss and gain in body weight are associated with the irregularities of menstrual cycle [26]. The answer for this association maybe lies in the association of change in body weight with the change in hormonal levels including the hormones involved in maintaining the menstrual cycle. In this study, it has been observed that subjects with lower and higher BMI having a higher frequency of dysmenorrhea and irregularities of menstruation (Table 2). The difference is more prominent between subjects having lower BMI than subjects having BMI in a normal range. Practice to lose weight through dieting was found strongly associated with menstrual disturbances like heavy bleeding and dysmenorrhea [29].

The overall body weight and in general the health status is also determined by the food habits and the nutritional value of the food consumed. The type of food is taken defines not only BMI but also the biochemical parameters like lipid profile, hormone level, stimulate or suppress various sorts of immune response and inflammatory processes. In the present study, the subjects were observed for their food habits and co-occurrence of dysmenorrhea and other associated problems observed among all of the three groups. Food from outside the home and especially the fast have been found associated with adverse health effects, a tendency to weight gain, abnormal lipid profile, increased resistance to insulin, immune response and support inflammatory processes[30, 31, 32].

It has been observed that subjects taking fast food with a frequency greater than twice a week suffer dysmenorrhea twice than the subjects having fast food

with frequency less than presented in Table 4. Although the overall lipid contents in the blood were not much elevated, however, the composition is found to be drifted toward bad cholesterol i.e., the LDL cholesterol found to be higher and HDL cholesterol levels are lower in both UW and OW groups. This makes a milieu supporting the inflammation and invasion of white blood cells, may this lead to the overproduction of prostaglandins and other cytokines responsible for the higher degree of pain and dysmenorrhea and disturb the hormonal priming of endometrium resulting in oligo amenorrhea, and shorten or lengthen the menstrual cycle.

Several studies have investigated the preventive effects of vegetable intake on the development of inflammation, immunity, cardiovascular diseases, inflammatory bowel diseases and various cancers. Vegetables besides providing low fat nutrition, are also a good source of fibers, vitamins and antioxidants. The major green pigment the chlorophyll of vegetables is one of the abundant anti-oxidant we consume. Similarly, fruits are also a premium source of these rare nutrients [33, 34]. C reactive proteins a member of family of heat shock proteins is considered as a marker for the inflammation, secreted by the liver in response of inflammatory cytokines. It has been reported that it is inversely related to the intake of vegetables and fruits intake [35]. It is revealed by several studies that a healthy intake of fruits, vegetables and dairy products is associated with less disturbed menstruation and dysmenorrhea [36]. The results of the present study are in the coherence of these studies. It has been observed that vegetable intake is inversely associated with dysmenorrhea and other menstrual irregularities. However, differences are not that prominent as for the intake of fast food.

Lake of fruit intake was found to increase dysmenorrhea episodes [37]. No such difference has been observed when results were examined for the variable intake of fruits. This may be reasoned as our consideration of food intake is not likely the one that meetsthe actual nutritional requirements. The fruit intake perception in our where about is taking an apple or a banana which is not sufficient to provide the proper amount of the nutrient to exert the protective effects.

Physical exercise is considered as positive stress and used as a regime against the development of many diseases. Although exercise results in positive physiological effects on the body and various sorts of exercise result in many biochemical and hormonal changes in the body, especially modulate the secretion of estrogen and progesterone. In the present study it has been observed that subjects having regular exercise are less prone to abnormal menstrual flow, but interestingly have a higher tendency toward abnormalities in the length of menstrual bleeding. It also has been observed that the subjects taking regular exercise experience more painful menstruation than the subjects taking less or no exercise. This may be the results of sex hormone secretion modulation by the exercise and prompt need to proper design of exercise program for the reproductive age women.

V. CONCLUSION

In the present study, it has been observed that overall health and food habits affect the reproductive process in young women. The nutritional demands of the women population following education must have to be defined properly and their food habits have to be modified. The foods away from home and a western style of food i.e., the higher fast-food intake devoid of vegetables and fruits make them more prone to menstrual irregularities like dysmenorrhea, irregular menstrual bleeding and menstrual cycles.

Conflict of interest: There is no conflict of interest.

Future plan: Analyzing more biochemical parameters related to hormonal and metabolic disturbance may lead to better understanding and establishment of more precise relation between factors like food habits, physical exercise and lipid metabolism with menstrual abnormalities.

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