Obesity and Dysmenorrhea in young girls: Is there any link?

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ABSTRACT

Dysmenorrhea is one of the most common gynaecological complaints in young women who visit to clinicians. The etiology and pathophysiology of dysmenorrhea have not been fully elucidated. Although in literature obesity has also been considered as one of the factors for dysmennorhea, much work has not been done to study this association. In the present study, effort was put to evaluate the prevalence of dysmenorrhea and obesity among young girls and further see if any correlation exists among them. To meet the goal, 1400 adolescent and young girls (17-22 years.) of different educational institutes were recruited. Their body measurements were taken and details regarding their menstrual status like the age at menarche, number of days of blood flow and how many days they suffer from pain, etc. were noted down. The prevalence of obesity and dysmenorrhea was assessed. The lipid profile of 200 selected girls (100 with dysmennorhea and 100 normal) was done. The girls with dysmenorrhea were observed having higher rate of obesity as compared to normal girls but the differences were statistically not significant. Similarly, the status of lipid profile was bad among girls with dysmenorrhea but the differences between normal girls and dysmennorheal girls were statistically significant. The results reflect that obesity may be one of the factors but not the culprit behind dysmenorrhea. Research at biochemical levels like the study at the levels of prostaglandins is needed along with other environmental factors before coming to some conclusion.

Key Words: Obesity, dysmenorrhea, young girls, menstruation, painful menses.

INTRODUCTION

Obesity: Obesity is on the rise among young generation. As of 2008, the World Health Organization claimed that 1.5 billion adults, 20 and older, were overweight and of these over 200 million men and nearly 300 million women were obese (http://www.who.int/mediacentre/factsheets/fs311/en/, retrieved on March 14th, 2014). The pandemic is so great that, it has even spawned a new word "globesity" or worldwide obesity. The United States had the highest rate of obesity, until obesity rates in Mexico surpassed that of the United States in 2013. More than one-third of U.S. adults (35.7%) are obese. In 2010, the Centers for Disease Control and Prevention (CDC) reported higher numbers once more, counting 35.7% of American adults, and 17% of American children as obese (http://www.cdc.gov/obesity/data/adult.html, retrieved on March 14th, 2014). The prevalence

of severe obesity (BMI> 40 kg/m2) tripled during the 11-year period from 1990 to 2000 (Freedman et al., 2002).

Childhood overweight has more than doubled since 1986 in the United States: -15% of 6 to 19 year olds are overweight (Ogden *et al*., 2002). In 2011, more than 40 million children under the age of five were overweight (http://www.who.int/mediacentre/factsheets/fs311/en/, retrieved on March 14th, 2014). Obesity has tripled in boys and doubled in girls over the last 25 years (Nicklas *et al*., 2001; Rocchini, 2002), whereas, the relative weight of obese children increased from 144% in 1986 to 155% in 1998 (Strauss and Pollack, 2001), despite increased health consciousness and awareness of the hazards of obesity. Studies in USA show that over the past 20 years overweight and obese young girls have doubled while the increase in boys was less than 25%. The percentage of adolescents aged 12-19 years who were obese has increased from 5% to nearly 21% over the last 30 years (NCHS, 2012; Ogden et al., 2012). The overall prevalence of overweight and obesity in Iranian adolescent girls was reported as 18.6% and 5.9%, respectively by Maddah and Nikooyeh (2010).

Female obesity is more prevalent and thus has greater epidemiological importance: Mothers transmit the disease epigenetically and genetically. Maternal obesity affects maternal health, pregnancy outcome, and fetal, neonatal, childhood, and ultimately adult morbidity and mortality. The increasing prevalence of severe obesity in girls reaching reproductive capacity at younger ages is particularly disturbing because untreated obesity contributes to the perpetuation and spread of the disease through maternal-fetal non-genomic transmission. Thus, it is urgent to target girls and young women for prevention and treatment of obesity (Kral, 2004). Obesity is always associated with hypertension, type 2 diabetes mellitus (T2DM) and dyslipidemia. According to Haslam and James (2005), obesity increases the likelihood of various diseases, particularly heart disease, T2DM, breathing difficulties during sleep, certain types of cancer, and osteoarthritis.

Obesity in India has reached epidemic proportions in the 21st century and is following a trend of other developing countries that are steadily becoming more obese. According to reports of National Family Health Survey (NFHS) - III (2005-06), in India, Punjab ranks one with 33.9% of population being obese and obesity prevalence is higher among women. In one study conducted in Amritsar, the prevalence of overweight and obesity among college going girls was observed as (28.2%) and 15%, respectively (Sidhu and Prabhjot, 2004). In our

previous study, the prevalence of obesity among women of Jalandhar aged 30-60 years was observed as 85.71% (Khokhar *et al*., 2010).

Dysmennorhea

Dysmenorrhea, especially primary dysmenorrhea has always been a problem for young women during their menstrual cycles. Day by day more cases are being noticed. It may be due to open mindedness of the present generation which makes them share it with their fellow mates or may be that its occurrence is increasing day by day. Dysmenorrhea is one of the most common gynaecological complaints in young women who visit to clinicians. It is painful menstrual cramps of uterine origin. Many risk factors have been associated with more severe episodes of dysmenorrhea like; earlier age at menarche, long menstrual periods, heavy menstrual flow, smoking and positive family history (Harlow and Park, 1996). The etiology and pathophysiology of dysmenorrhea have not been fully elucidated. In young women, this symptom is frequently caused by hormonal disorders in ovarian function (Deligeoroglou, 2000). The increase in prostaglandins in the endometrium following the fall in progesterone in the late luteal phase results in increased myometrial tone and excessive uterine contraction (Speroff, 1997; Eden, 1998). Studies of the natural history of this condition are sparse.

A much greater number of young people suffer from illnesses which hinder their ability to grow and develop to their full potential. Many young women suffer from menstrual disorder, dysmenorrhea which makes them suffer a lot and affects their daily routines. Jamieson and Steeque (1996) reported 90% of American women suffering from dysmenorrhea whereas, Banikarin *et al* (2000) observed 85% of US women complaining dysmenorrhea. Similarly, the occurrence of dysmenorrhea was observed as 56.4% among Chinese women (Zhou *et al*., 2010).

Not much data is available on the prevalence of dysmenorrhea at the national level. Singh *et al* (2008) studied the prevalence of dysmenorrhea in girls of Madhya Pradesh and reported that in underweight category 61.53%, while in overweight 91.67% subjects were suffering from dysmenorrhea. Similarly, Aggarwal and Aggarwal (2010) reported the prevalence of dysmenorrhea as 79.67% among women of Gwalior and among them 37.96% suffered from acute dysmenorrhea.

Objective of the study

World over and also in India, lots of data is available regarding the prevalence of obesity in children and adolescent (from 11, 12 years to 17, 18 years). But obesity in young girls (from age 17, 18 to 22, 23) has not been extensively studied. If life style changes are assumed to be the major cause of obesity, this phase of life is very important. Young girls are

either preparing themselves to enter in the professional phase or in countries like India, they are about to enter in matrimony phase. In the present study, we tried to evaluate;

i)   The prevalence of dysmenorrhea among young girls.

ii) To assess the prevalence of obesity among them.

iii) To see if any correlation exists between obesity and dysmenorrhea.

Although in literature obesity has also been considered as one of the factors for dysmennorhea, much work has not been on this association.

METHODOLOGY

This cross-sectional study was done from March, 2012 to March, 2013. The work was planned to be done in two phases. In the first phase, field work was done. In field work, 1400 adolescent and young girls (17-22 yrs.) of different educational institutes were studied. Before interviewing them, a questionnaire was constructed requiring all the needed information like, number of days the uterine cramps persist, days of their menstrual cycle etc. Their body weight and height was measured with standardized methods and noted down in the proforma. Their body mass index (BMI) was calculated and obesity was assessed as per WHO guidelines (WHO, 2000). The prevalence of dysmenorrhea was calculated in non-obese and obese girls. In the second phase, lipid profile of selected 200 obese girls (dysmenorrheal=100; Normal=100) was done as per statistician's suggestions. After ensuring fasting for 12 hours, blood sample of 5 ml was collected in sterile tubes from anti-cubital vein under aseptic conditions from the selected normal as well as subjects with dysmenorrhea having matching BMIs. The blood samples were taken by the technician hired from a nearby hospital. Blood samples were allowed to stand and then centrifuged. Serum was separated, aliquots were made and serum samples were stored in freezer for the estimation of lipid profile. Lipid profile was estimated from the stored blood samples using the commercially available kits. Total serum Cholesterol (TC) was determined by enzymatic (CHOD-PAP) colorimetric method (Allain et al., 1974) and Triglyceride (TG) by enzymatic (GPO-PAP) method (Jacobs and VanDenmark, 1960). High density lipoprotein (HDL-C) was estimated by precipitation method (Gordon and Gordon, 1977) and Low density lipoproteins (LDL-C) by Friedewald formula (Friedwald et al., 1972). The statistical package for social sciences (SPSS) version 16.0 (Chicago, IL, USA) was used to enter and analyze the data on a personal computer. The statistical analysis was carried out using chi-square and Student's t-test. A value of $P < 0.05$ was considered statistically significant.

RESULTS:

(i) Prevalence of Dysmenorrhea

Table 1 depicts the prevalence of Dysmenorrhea among the young girls. It is observed that 55.71% (780) of the girls reported painful menstrual flow during their periods, whereas, rest 44.29% (620) were having normal periods.

Table 1. Prevalence of dysmennorhea (age-wise) among the study subjects

Category	Age Groups (Years)				
	17-17.9	18-18.9	19-19.9	20-20.9	21-22
Dysmenorrhea (Test) N=780 (55.71%)	112 14.39%	134 17.18%	181 23.21%	102 13.07%	251 33.38%
Normal (Control) (N=620) (44.29%)	149 24.03%	131 21.13%	104 16.77%	113 18.23%	123 19.84%

The table further reveals the increase in the prevalence of dysmenorrhea with age in the initial years i.e. 17-17.9 years followed by 18- 18.9 years and then 19- 19.9 years (14.39%, 17.18%, 23.21%, respectively). But decrease in the prevalence of dysmenorrhea was observed in 20-20.9 year's group (13.07%) which was again followed by the increase in 20-21 years (33.38%).

(ii) Prevalence of Obesity

Table 2 presents the prevalence of obesity among the studied sample. Overall, the prevalence of overweight and obesity among the young girls was observed as 23.85%. Among control subjects (not having dysmenorrhea), 22.90% were underweight, 55% were non-obese, whereas 22.10% were overweight and obese. Among test group (subjects reporting dysmenorrhea), 21.03% were underweight, 53.71% were non-obese, whereas, 25.26% were overweight and obese. There was statistically insignificant difference among both the groups.

Table 2. Prevalence of Obesity among young girls as per WHO (2000) guidelines.

Category	Underweight %	Non-Obese %	Overweight & Obese %	Chi Square (χ^2)
Control Group (620)	22.90 (142)	55 (341)	22.10 (137)	(χ^2)=2.23 df=1, P>0.05
Test Group (780)	21.03 (164)	53.71 (419)	25.26 (197)	
Total Sample (1400)	21.86 (306)	54.29 (760)	23.85 (334)	

(Figures in parentheses are the number of subjects)

The subjects having dysmenorrhea were further assessed as per the number of days of cramps during their periods (**Table 3**). On average, the girls under study reported their blood flow ranging from 4 to 5 days. It was observed that 28.21% percent of girls reported pain for one day only, whereas, 42.31 percents of the girls reported pain for two days. Similarly, 7.4% of subjects suffered pain for 3 days, whereas, 6.15% reported pain for all days of the menstrual flow. On the other hand, 16% of the girls did not give some meaningful reply.

Table 3. Number of days of cramps among subjects with Dysmenorrhea

Number of Days of blood flow	Number (N=780)	Percentage
1	220	28.21
2	330	42.31
3	57	7.40
4-5	48	6.15
No mention	125	16.0

Table 4 presents the Mean± SD of TC, LDL-C, HDL-C and TG among obese subjects of control and test subjects. The mean values of cholesterol among control and the test group were 151.25±7.45 mg/dl and 162.50±11.53 mg/dl, respectively and the difference was statistically significant. The mean values of LDL-C among control subjects was noticed as 98.75±6.69 mg/dl, whereas, this figure among test group was 103.25±6.10 mg/dl. The difference between the groups was again observed as significant. Similarly, the mean values of HDL-C were observed as 30.25±1.49 mg/dl and 33.00±2.36 mg/dl among control and test subjects, respectively with statistically significant difference among the groups. In similar way, the mean values of TG were 111.25±4.18 mg/dl among control and 118.75±7.48 mg/dl among subjects in test group and the difference between the groups was again observed as statistically significant. There seems a trend of unhealthy status of lipid profile among subjects with dysmenorrhea as compared to normal subjects as the differences were statistically significant.

Table 4. Mean ± Standard Deviation of Total Cholesterol (TC), Triglycerides (TG), Low Density Lipoproteins Cholesterol (LDL-C) and High Density Lipoproteins Cholesterol (HDL-C) among Obese Normal (control) and Obese Test groups.

Category	Obese Control (Normal) N=100	Obese Test (Dysmenorrhea) N=100	Value of 't-test'	p-value
TC (mg/dl)	151.25±7.45	162.50±11.53	-6.95	<0.001
LDL-C(mg/dl)	98.75±6.69	103.25±6.10	-3.91	<0.001
HDL-C(mg/dl)	30.25±1.49	33.00±2.36	-8.36	<0.001
TG(mg/dl)	111.25±4.18	118.75±7.48	-7.45	<0.001

DISCUSSION:

Obesity is on the rise among all the age groups. It is emerging as a global problem in all sections of the society. The changing life style is the major culprit other than the genetic factor. The prevalence of obesity is increasing in children, adolescents and adults. The latest data from WHO shows that worldwide there are some 1.6 billion adults who are overweight with a BMI above 25kg/m^2. Of these, at least 400 million adults are obese. Obesity, an increasingly prevalent and difficult-to-treat condition, affects more women than men. As per van der Merwe (2008), latest prevalence figures for obesity within the European region confirm that in most countries, the number of obese women surpasses the number of obese men, sometimes being double than men. Overweight and obesity are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer.

Dysmenorrhea is a medical condition among women where they suffer from uterine cramps during menstruation. Almost half the women suffer from this problem every month for at least 1-2 days. Painful menses in women with normal pelvic anatomy, usually beginning during adolescence is called as primary dysmenorrhea (Avasarala *et al*., 2008). Dysmenorrhea is characterized by crampy pelvic pain beginning shortly before or at the onset of menses and lasting 1–3 days (Durain, 2004).

The present study found a high prevalence of dysmenorrhea (55.71) among young females and this figure is consistent with previous studies reporting prevalence between 28% and 89.5% (Burnett *et al*., 2005; Pitts *et al*., 2008; Nur and Sumer, 2008; Polat *et al*., 2009). A reason for the variation in these estimates may be the use of selected groups of women, and the absence of a universally accepted method of defining dysmenorrhea, which was probably as greatly responsible for the disparity as the methods of collecting data, the study definitions

of dysmenorrhea and pain, and the study populations themselves (Tangchai *et al.,* 2004). In this study, 6% of girls complained severe dysmennorhea lasting for all the days of the menstrual flow, whereas 7.4% of the girls were having their uterine cramps lasting for 3 days.

Certain risk factors can also make menstrual cramps worse, such as a woman's weight, other lifestyle factors and certain reproductive health conditions, such as cervical stenosis. Studies show that women who are clinically overweight or obese suffer from more menstrual pain compared to those who maintain a healthy weight. There are some theories that smoking, obesity, early onset of menstruation and alcohol consumption are related to more dysmenorrhea, but these remain controversial. Prostaglandins are released as the endometrium sloughs which causes uterine contractions. According to researchers, overweight and obesity increase biosynthesis of the prostaglandins and consequently increase the severity of dysmenorrhea. Haidari *et al.* (2011) in their studies observed that anthropometric parameters like waist-hip ratio and waist circumference are related to the severity of dysmenorrhea. Ju *et al*. (2013) have also reported obesity as one of the modifiable factor responsible for dysmenorrhea. In our studies, we observed 25.26% of overweight and obesity among girls with dysmenorrhea, whereas 22.10 % of the normal girls were observed as overweight and obese. The prevalence of obesity is comparatively on higher side in test group as compared to the control group but the difference between the groups was statistically insignificant. We further assessed the status of lipid profile among our selected samples belonging to control and test group. The mean values of TC, TG and LDL-C which are considered as non-friendly components of lipid profile, were observed as higher, whereas the levels of HDL-C which is considered as the friendly component of lipid profile, were lower in girls with dysmenorrhea as compared to the girls with normal menstrual cycle. The status of lipid profile was observed as unfavourable among girls with dysmenorrhea as compared to the girls with normal menstrual cycle and even the differences were observed as statistically significant among the groups. Although the difference in the prevalence of obesity among the control and test groups was statistically insignificant but the status of lipid among the test group as compared to the control group reflects some role of obesity in the etiology of dysmenorrhea.

In the present scenario, it is difficult to come to the conclusion that obesity and dysmenorrhea are linked together but, they may be so. The research at the levels of prostaglandins is recommended as this hormone is the main culprit in causing dysmenorrhea. How and if this

hormone level is affected in case of obese subjects and especially among girls reporting dysmenorrhea, needs to be investigated before coming to some conclusion.

Conclusions and suggestions: It is concluded from the present findings that obesity may be responsible for higher rate of dysmenorrhea among girls. Slightly higher rate of obesity among girls with dysmenorrhea and unhealthy status of lipid profile among subjects reporting dysmenorrhea simply reflects that obesity may be one of the factors but not the sole factor behind it. Research at biochemical levels like the study at the levels of prostaglandins is needed along with other environmental factors before coming to some conclusion.

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