ORIGINAL RESEARCH

Prevalence of metabolic syndrome in females in reproductive age group

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ABSTRACT

Background: this study was conducted to assess the prevalence of metabolic syndrome in females in reproductive age group. **Material and methods:** Patients fulfilling the inclusion criteria after thorough screening were included in the study. Complete physical and systemic examination was performed. Each patient's anthropometrical measurements were obtained with emphasis on the measurement of height, weight, waist circumference, body mass index (BMI).. Fasting plasma glucose levels, lipid profile (total cholesterol, low density lipoproteins (LDL), very low-density lipoproteins(VLDL), triglycerides, high-density lipoproteins (HDL) were measured along with electrocardiogram(ECG) was done.

Results: Prevalence of metabolic syndrome was seen in 31.33% of study subjects whereas 68.66% did not have metabolic syndrome. In the present study, the highest prevalence of metabolic syndrome was found in the age group 36-49 years (44.68%) followed by 26-35 years (34.04%) and 18-25 years (21.27%). The mean age of the patients with metabolic syndrome and without metabolic syndrome was 42.4 years and 36.2 years. The mean age of the patients with metabolic syndrome was significantly higher than those not having metabolic syndrome. The association of metabolic syndrome with increasing age was found to be significant. Most of the patients having metabolic syndrome presented with a chief complaints of infertility (66%) followed by irregular cycles (23.4%) and hirsutism(10.6%). Most of the patients without metabolic syndrome presented with a chief complaints of irregular cycles (56.31%) followed by infertility (42.71%)and hirsutism(0.97%). The association was found to be significant.

Conclusion: In conclusion, the prevention of metabolic syndrome among women who are prone to neglect their health due to work and family demands and multiple-role playing is highly important. Prolonged research is imperative to form effective intervention strategies.

Keywords: females, metabolic syndrome, reproductive

INTRODUCTION

Over the last fifty years, severe changes have been observed in the human environment, behaviors, and lifestyles. These changes have not only helped in improving the living condition of the societies but at the same time they have also posed numerous threats to the health of the people and metabolic syndrome is one of them.[1] Metabolic syndrome (MetS) means the presence of multiple risk factors for cardiovascular disease (CVD).[2] Metabolic syndrome is summarized as a problem in energy utilization and storage. It is diagnosed when three of the following medical conditions are positive: central obesity, high blood pressure, increased fasting glucose levels, low high-density lipoprotein (HDL) levels, and high serum triglycerides. It was first described in 1921 and was modified multiple times.[3] The report from the National Cholesterol Education Program's Adult Treatment Panel III (ATP III) identified 6 components of metabolic syndrome that are related to CVD: abdominal obesity, atherogenic dyslipidemia, raised blood pressure, insulin resistance, glucose intolerance, a pro-inflammatory state, and a prothrombotic state.[4]

The clustering of these factors is often attributed to Gerald Reaven, who popularized the term 'Syndrome X' in 1988; however, these factors have been investigated in various combinations for more than 80 years. The aggregation of these features into a single entity provides clinicians with a tool by which they can identify a significant segment of the

population at increased risk for developing type 2 diabetes mellitus (T2DM) as well as increased cardiovascular morbidity and mortality.[5] In addition to serving as a predictive tool for the development of cardiovascular disease and type 2 diabetes, MS identification allows for the development and evaluation of targeted lifestyle interventions to combat the rising burden of non-communicable diseases.[6] Metabolic and hormonal disturbances related to both being underweight and excessive body mass may adversely affect female procreative health. It concerns both decreased ability to conceive and complications of pregnancy. Low body mass may lead to ovulatory disorders[7],and suppressed fetal development resulting in decreased birthweight.[8-10] Overweight and obesity may also cause ovulatory disorders and subfecundity.[11] However, contrary to being underweight, excessive body mass is linked to an increased risk of macrosomia.[12,13]

As the metabolic syndrome is a combination of individual metabolic risk factors, therefore its prevalence is highly dependent on the cut-off points used for the definition of every single component of this syndrome. A large variation has been found in the global prevalence of metabolic syndrome ranging from 7.1% to 41.6% across studies.[14,15] The prevalence of metabolic syndrome is quite high worldwide - 35% in the USA, 24.9% in Latin America, and 20.7%–37.2% in the gulf countries as per ATP III criteria. According to a meta-analysis based on 21 cohort studies from the United States and Europe, the prevalence of metabolic syndrome ranges from 23% to 46% according to WHO or NCEP criteria.1 Furthermore, according to a systematic review the prevalence of metabolic syndrome in South Asia was 26.1% and 29.8% as per ATP III and IDF criteria.[16] Hence, this study was conducted to assess the prevalence of metabolic syndrome in females in reproductive age group.

MATERIAL AND METHODS

This cross-sectional study was conducted in the Department of medicine, Govt. Medical College Amritsar, Punjab, India. After approval from the institutional ethical committee study group included 150 non pregnant women of child bearing age (18–49 years). The results were statistically analysed.

DIAGNOSTIC CRITERIA

ADULT TREATMENT PANEL III (ATP III) OF NATIONAL CHOLESTEROL EDUCATION PROGRAM (NCEP) CRITERIA FOR METABOLIC SYNDROME: (NCEP: ATP III 2001 CRITERIA)[17,18]

Three or more of the following:

1. Central obesity : Waist circumference >102 cm (M), >88 cm (F)
2. Hypertriglyceridemia: trigylcerides more than or equal to 150 mg/dl or specific medication.
3. Low HDL cholesterol <40 mg/dl and <50 mg/dl respectively or specific medication 4. Hypertension: Blood pressure more than or equal to 130 mmHg systolic or more than or equal to 85 mmHg diastolic or specific medications. 5. Fasting plasma glucose more than or equal to 100 mg/dl or specific medication or previously diagnosed type 2 diabetes or specific medication.

Inclusion criteria:

1. Gender: Females
2. Age group: 18-49 years
3. Non pregnant

Exclusion Criteria

1. Pregnant Female
2. Patients not giving written consent to participate in the study.
3. Patients suffering from chronic systemic disease like renal, liver, heart failure and malignancy.
4. Patients on long term corticosteroid therapy.
5. Familial hypercholesterolemia including familial hypertriglyceridemia.

PROCEDURE

Patients fulfilling the inclusion criteria after thorough screening were included in the study. All the patients and their relatives were informed about the study in the vernacular language. Written consent was taken. In the present study, female subjects were assigned to three age groups as follows: 18–25 years, 26-35 years, and 36– 49 years. Demographic and clinical data were obtained from the clinical histories: age, education, occupational activity, alcohol consumption, smoking, drug intake, basic health data (medical disorder, oral contraception use, obstetric history, presence of thyroid disease, diabetes mellitus), sedentary lifestyle (defined as performing less than 30 minutes of moderate exercise 3 days per week) and any illness in the family. Complete physical and systemic examination was performed. Each patient's anthropometrical measurements were obtained with emphasis on the measurement of height, weight, waist circumference, body mass index(BMI).. Fasting plasma glucose levels, lipid profile (total cholesterol, low density lipoproteins (LDL), very low-density lipoproteins (VLDL), triglycerides, high-density lipoproteins (HDL) were measured along with electrocardiogram(ECG) was done.

STATISTICAL ANALYSIS

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Results on continuous measurements were presented as Mean ± SD (Min-Max) & categorical as Frequency (Percentage). Normality of the data was assessed using Shapiro Wilk test/ Kolmogorov-Smirnov test. Inferential statistics like Chi-square test/Fischer Exact test and Independent t test was used to check difference between the groups. The significance of level adopted was 5%.

Results

Table 1: PREVALENCE OF METABOLIC SYNDROME IN THE STUDY

Metabolic Syndrome	N (150)	Percentage
Present	47	31.33%
Absent	103	68.66%

Prevalence of metabolic syndrome was seen in 31.33% of study subjects whereas 68.66% did not have metabolic syndrome.

Table2: AGE DISTRIBUTION IN FEMALES WITH METABOLIC SYNDROME

Age Group (years)	Metabolic Syndrome present		Metabolic syndrome absent		TOTAL	
	N (47)	Percentage	N (103)	Percentage	N (150)	Percentage
18–25	10	21.27%	42	40.77%	52	34.66%
26-35	16	34.04%	49	47.57%	65	43.33%
36-49	21	44.68%	12	11.65%	33	22%
Mean age	42.4±6.23		36.2±6.64		39.8±6.40	
P value	0.001					

In the present study, the highest prevalence of metabolic syndrome was found in the age group 36-49 years (44.68%) followed by 26-35 years (34.04%) and 18-25 years (21.27%). The mean age of the patients with metabolic syndrome and without metabolic syndrome was 42.4 years and 36.2 years. The mean age of the patients with metabolic syndrome was significantly higher than those not having metabolic syndrome. The association of metabolic syndrome with increasing age was found to be significant.

Table 3: CHIEF COMPLAINTS IN PATIENTS WITH METABOLIC SYNDROME

Chief complaints	Metabolic Syndrome present		Metabolic syndrome absent		
	N (47)	Percentage	N (103)	Percentage	P value
Infertility	31	66.0%	44	42.71%	0.008
Hirsutism	5	10.6%	1	0.97%	0.005
Irregular cycles	11	23.4%	58	56.31%	<0.001

Most of the patients having metabolic syndrome presented with a chief complaints of infertility (66%) followed by irregular cycles (23.4%) and hirsutism(10.6%). Most of the patients without metabolic syndrome presented with a chief complaints of irregular cycles (56.31%) followed by infertility (42.71%) and hirsutism (0.97%). The association was found to be significant.

Table 4: MARITAL STATUS

Marital status	Metabolic syndrome present		Metabolic syndrome absent	
	N (47)	Percentage	N (103)	Percentage
Married	36	76.59%	54	52.42%
Unmarried	11	23.40%	49	47.57%

In the present study out of the subjects having metabolic syndrome, 76.59% were married whereas 23.4% were not married. Out of the subjects not having metabolic syndrome 52.4% were married whereas 47.5% were unmarried subjects.

Table 5: INFERTILITY IN MARRIED PATIENTS WITH METABOLIC SYNDROME

Marital status	Metabolic syndrome present		Metabolic syndrome absent		Pvalue
	N (47)	Percentage	N (103)	Percentage	
Married	31	65.95%	44	42.71	0.008

Amongst patients having metabolic syndrome 31 married patients had infertility. Amongst patients not having metabolic syndrome 44 patients who were married had infertility. The difference was significant as thep-valueis0.008.

Table 6: FAMILY HISTORY IN FEMALES WITH METABOLIC SYNDROME

Family history of		Metabolic syndrome present		Metabolic syndrome absent	
		N (47)	Percentage	N(103)	Percentage
Diabetes	Yes	13	27.65%	22	21.35%
	No	34	72.34%	81	78.64%
Hypertension	Yes	10	21.27%	6	5.82%
	No	37	78.72%	97	94.17%
Obesity	Yes	15	31.91%	32	31.06%
	No	32	68.08%	71	68.93%

Women with metabolic syndrome had a family history of obesity in 31.91% of subjects, diabetes in 27.65%, and hypertension in21.27%.

Table7: EDUCATIONLEVEL

Education level	Metabolic syndrome present		Metabolic syndrome absent		Total	
	N(47)	Percentage	N(103)	Percentage	N(150)	Percentage
Illiterate	2	4.25%	3	2.91%	5	3.33%
Primary & High school	11	23.39%	28	27.17%	39	26%
Graduate, Postgraduate & Professional qualification	34	72.34%	72	69.90%	106	70.6%

Most of the patients with metabolic syndrome were graduates, postgraduates with professional qualifications (72.34%) followed by primary & high school (23.39%) and 4.25% were illiterate. In total most of the subjects were graduates, postgraduates with the professional qualifications (70.6%) followed by Primary & High school (26%) and3.33%wereilliterates.

Table 8 COMPARISON OF SBP

Component of MS		Metabolic syndrome present		Metabolic syndrome absent		P value
		N (47)	Percentage	N (103)	Percentage	
SBP >130 mmHg	Yes	26	55.31%	4	3.88%	0.004
	No	21	44.68%	99	96.11%	

Out of the subjects having metabolic syndrome high systolic BP was seen only in 55.31% of subjects while the rest had normal BP. Out of the subjects not having metabolic syndrome only 3.88% had high BP. Association was found to be significant.

Table 9 COMPARISON OF DBP

Component of MS		Metabolic syndrome present		Metabolic syndrome absent		P value
		N (47)	Percentage	N (103)	Percentage	
Diastolic BP >85 mmHg	Yes	28	59.57%	7	6.79%	0.0021
	No	19	40.42%	96	93.20%	

Out of the subjects having metabolic syndrome 59.57% had high diastolic BP & out of the subjects not having metabolic syndrome only 6.79% had high diastolic BP while 93.2% had normal diastolic BP. Association was found to be significant.

Table 10: COMPARISON OF TRIGLYCERIDE LEVELS

Component of MS		Metabolic syndrome present		Metabolic syndrome absent		P value
		N (47)	Percentage	N (103)	Percentage	
TG >150	Yes	16	34.04%	26	25.24%	0.0011
	No	31	65.95%	77	74.75%	

Out of the subjects having metabolic syndrome 34.04% had high TG & out of the subjects not having metabolic syndrome 25.24% of the subjects had high TG. Association was found to be significant.

Table 11: COMPARISON OF HDL-C LEVELS

Component of MS		Metabolic syndrome present		Metabolic syndrome absent		P value
		N (47)	Percentage	N (103)	Percentage	
HDL <50	Yes	29	61.70%	12	11.65%	0.0032
	No	18	38.29%	91	88.34%	

Out of the subjects having metabolic syndrome 61.7% had low HDL & out of the subjects not having metabolic syndrome only 11.65% had low HDL while 88.34% had normal HDL. Association of metabolic syndrome with low HDL was highly significant.

Table 12: CORRELATION OF BMI WITH HDL

	Parameter		P value
BMI	HDL	-0.107	0.19

On applying Pearson correlation on BMI and HDL a significant negative linear relationship was observed but the results were not significant. This means that as there is an increase in BMI, HDL will decrease.

Table 13: CORRELATION OF BMI WITH FBS

	Parameter	R	P value
BMI	FBS	0.309	0.00019

On applying Pearson correlation a significant positive linear relationship between BMI and FBS was observed. This means that as there is increase in BMI, FBS will also increase.

Table 14: FUNCTIONAL PROFILE OF PATIENTS

Functional profile	Metabolic syndrome present (47)	Metabolic syndrome absent (103)	P value
BMI (kg/m2)	22.30±4.66	20.15±4.64	0.002
Waist circumference	87.84±11.88	81.55±9.84	0.002
SBP (mm Hg)	128.12±18.90	116.2±16.28	0.0001
DBP (mm Hg)	83.39±10.45	75.13±9.33	0.0001
FBS (mg/dL)	115.11±43.54	93.14±15.90	0.0001
Serum TG (mg/dL)	150.12±26.97	113.74±21.06	0.0001
Serum HDL (mg/dL)	42.42±6.99	51.00±6.75	0.0001
Serum LDL (mg/dL)	64.07±13.95	93.32±32.33	0.0011
Serum VLDL (mg/dL)	28.12±4.64	40.86±16.88	0.0014
Serum Cholestrol (mg/dL)	153.34±38.17	182.78±37.58	0.0021

A statistically significant difference was seen as far as BMI, waist circumference, SBP, DBP, FBS, Serum TG, HDL, LDL, VLDL & cholesterol was concerned.

DISCUSSION

Metabolic Syndrome (MetS) is a clustering of specific risk factors, namely, central obesity (waist circumference >88 cm), raised blood pressure(>130/85 mmHg), impaired fasting glucose(>100 mg/dL), raised triglycerides(>150 mg/dL), and low levels of high-density lipoprotein-cholesterol (HDL-C <50 mg/dL). This constellation is triggered by insulin resistance and its resultant hyperinsulinemia. The two most important and universally agreed causes of insulin resistance are increased body fat (particularly central obesity) and physical inactivity. Other causes include certain genetic/pro-genetic factors, an unhealthy atherogenic diet, tobacco use, and excessive alcohol intake. Within 3 decades of the initial description of MetS by Reaven, various defining criteria have been developed, by leading international professional bodies, the most commonly used being the one given by the Adult Treatment Panel III (ATP III) report of the National Cholesterol Education Program (NCEP) [NCEP-ATP-III]

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Three or more of the following:

1. Central obesity: Waist circumference >102 cm (M), >88 cm (F)
2. Hypertriglyceridemia: triglycerides more than or equal to 150 mg/dl or specific medication.
3. Low HDL cholesterol <40 mg/dl and <50 mg/dl for men and women respectively, or specific medication.

4. Hypertension: Blood pressure more than or equal to 130 mmHg systolic or more than or equal to 85 mmHg diastolic or specific medications.
5. Fasting plasma glucose more than or equal to 100 mg/dl or specific medication or previously diagnosed type 2 diabetes or specific medication.

The updated guidelines were recently released by the American College of Cardiology (ACC) and the American Heart Association (AHA). MetS have been well documented to increase the risk of ischemic heart disease (IHD) by two to three times and of type 2 diabetes mellitus (T2DM) by five times. The worldwide prevalence is on the increase, with the overall global prevalence estimated to be 20% to 25% of the adult population. In our country, various epidemiological studies undertaken across the country have consistently shown a high prevalence, which is likely to be as much as one-quarter of the adult population, with increasing age and female gender being at higher risk.[21]

So the present study was conducted to determine the prevalence of metabolic syndrome among women of the reproductive age group.

In the present study, the Prevalence of metabolic syndrome was seen in 31.33% of study subjects whereas 68.66% did not have metabolic syndrome. While India has one of the highest prevalences of MetS, background rates vary according to the degree of urbanization, region, socioeconomic and dietary factors. The prevalence of MetS in the Indian PCOS population is reported to be 37.5%, with central obesity as one of its significant predictors.[22] In a study by Prema and Vaidehi[23], 146 women aged 15 to 40 years diagnosed with PCOS, the prevalence of metabolic syndrome was 38.4%. The findings of our study are compatible with previous studies conducted in India[24,25] but are not consistent with the corresponding rate in Europe.[26] The prevalence of metabolic syndrome was lower (23%) in American women.[27] In Asia, this figure was 11% in China.[28] The discrepancy in prevalence rates of metabolic syndrome across the world with different ethnic groups is probably due to their different nutrition patterns.[29] Although hereditary factors play an important role in metabolic syndrome, higher prevalence in this country might be referred to the people's lifestyle with low mobility and high-fat foods accompanied by increased consumption of fast foods.[1]

According to our study, the prevalence of metabolic syndrome in the reproductive age of 36-49 years was a maximum of 44.68%, which was similar to the study done by Mohammadbeigi et al[30] who also reported a maximum prevalence of metabolic syndrome in the age group 45-49 years (70.6%). In a study by Prema and Vaidehi[31] the occurrence of metabolic syndrome was more in the age group 26 to 35 years (62.33%).

Most of the patients with metabolic syndrome presented with a chief complaint of infertility(66%) followed by irregular cycles(23.4%) and hirsutism (10.6%). Those without metabolic syndrome presented with irregular cycles (56.31%) followed by infertility (42.71%) and hirsutism (0.97%). Alaknanda et al[32] showed the presence of Primary infertility in 54%of cases. Joshi et al[33] in their study reported 43% of infertility. Another study done by He et al[34] in which metabolic syndrome was identified in 410 of 1508 infertile women with polycystic ovary syndrome (27.2%). Patients with metabolic syndrome had longer infertility duration (4.0 ± 2.2 vs 3.7 ± 2.2, P = .004) compared with those without metabolic syndrome. During ovarian stimulation, those with metabolic syndrome required significantly higher and longer doses of gonadotropin and had lower peak estradiol levels, fewer retrieved oocytes, available embryos, a lower oocyte utilization rate, and ovarian hyperstimulation syndrome than those with the nonmetabolic syndrome.

In the present study, the prevalence of metabolic syndrome was more in married women accounting for 76.59% whereas, it was only 23.4 % in the females who were not married. Meher and Sahoo[1] in their study found a positive association of metabolic syndrome with marital status and currently concerning marital status, married women and women belonging to widowed, divorced, and separated categories were 2.29 times and 2.24 times respectively more likely to have this syndrome as compared to the never-married group.

Women with metabolic syndrome had higher infertility rates(65.95%) as compared to those without metabolic syndrome who had lower rates of infertility (42.71%). The results are consistent with the study by Joshi et al[33] in which 46% of patients were married and 43% complained of infertility. Ramanand SJ et al[35] in the study on 120 PCOS women, 47 were married and 44.68% of married women complained of infertility.

In our study, 31.19% had a family history of obesity, 27.65% had diabetes, and 21.27% had hypertension. The results are consistent with the study done by Mohammadbeigi et al.[30] In their study, they reported that a family history of obesity and hypertension was observed in 40.4% of patients. In the study done by Kim H and Cho Y[36] focusing on women, it was also found that DM or hypertension, as well as a family history of DM, increases the risk of metabolic syndrome. Therefore, it is necessary to educate people on the importance of the active prevention of metabolic syndrome through healthy lifestyle management in case of DM or hypertension and the accompanying family history of the disease.

Most of the patients with metabolic syndrome were Graduates, Postgraduates and with Professional qualifications (72.34%) followed by primary & high school (23.39%), and, 4.25% were illiterate. In total

most of the subjects were Graduates, Postgraduates and with Professional qualifications (70.6%) followed by Primary & High school (26%), and 3.33% were illiterates. This is in contrast to the study conducted by Stephens et al.[37] They analyzed the role of education across a wide spectrum of educational levels (from primary school to doctoral degree), they showed that higher education correlates to significantly better metabolic health when compared to lower levels, and is associated with significantly less risk for waist circumference, systolic blood pressure, glucose, glycosylated hemoglobin, triglycerides, high-density lipoprotein, and metabolic syndrome; but not for diastolic blood pressure, basal insulin, uric acid, low-density lipoprotein, and total cholesterol.

80.85% of the patients with metabolic syndrome had a sedentary lifestyle and the association was highly significant. Edwardson et al[38] in their study showing similar results found that people who spend higher amounts of time in sedentary behaviors have greater odds of having metabolic syndrome. Reducing sedentary behaviors is potentially important for the prevention of metabolic syndrome.

In the present study majority of females with metabolic syndrome were either overweight (21.28%) or obese (76.59%). In the age group, 18-25 years most of the patients were obese (70%) followed by overweight (20%) and one patient had a normal BMI. In the age group 26-35 years most of the patients were obese (81.25%) followed by overweight (18.75%). In the age group 36-49 years most of the patients were obese (76.19%). Among the health status and health behavioral factors that affect the prevalence of metabolic syndrome, this study shows higher BMI than normal, increases the risk of developing metabolic syndrome relatively. Obesity was increasingly observed in younger years of life(<35 years). Our results were consistent with the study by Mohammadbeigi et al[30] which also reported that most of the cases with metabolic syndrome were either overweight or obese (53.5%). Piruthiviraja and Kalaiselvi[39] in their study of the prevalence of metabolic syndrome among reproductive-aged women with polycystic ovarian syndrome reported that the prevalence of MetS increases as body mass index increases in the PCOS population, i.e., 2.6%, 37%, and 95.7% for normal, overweight, and obese women, respectively.

Central obesity (waist circumference >88 cm) was seen in 100% of subjects having metabolic syndrome. Piruthiviraja and Kalaiselvi[39] in their study reported that central obesity (waist circumference ≤ 88 cms) was noted in 22.31 %. The prevalence of increased waist circumference in metabolic syndrome according to sidra et al[40] is 80%.

The onset of menarche and reproductive function prerequisites the existence of a critical adipose mass, which, through leptin, sends a message to the hypothalamus that the woman's energy stores are sufficient to support a pregnancy. The age of menarche is correlated to risk factors for metabolic disease and this association worsened when obesity was present.[41] On the other hand, obesity leads to menstrual abnormalities, chronic anovulation, subfertility, and in the case of pregnancy to a higher frequency of abortions, gestational diabetes, and pre-eclampsia.[42]

In the present study, 63.82% of the subjects having metabolic syndrome had high FBS (> 100 mg/dL). 55.31% of the subjects having metabolic syndrome had systolic BP >130 mmHg. 59.57% of the subjects having metabolic syndrome had diastolic BP >85 mmHg. 34.04% of the subjects having metabolic syndrome had TG >150mg/dL. 61.7% of the subjects having metabolic syndrome had low HDL(<50 mg/dL). In comparison of the number of patients having increased waist circumference, FBS, SBP, triglycerides, and decreased HDL in between patients with metabolic syndrome and without metabolic syndrome no significant difference was found.

Antony et al[43] studied 250 women in the reproductive age group, diagnosed with PCOS. The prevalence of individual components of MetS was: waist circumference >80 cm in 58%, TG level >150 mg/dL in 12.8%, and blood pressure ≥130/85 mmHg in 3.6%.

Apridonidze et al[44] in their study of Prevalence and Characteristics of the Metabolic Syndrome in Women with Polycystic Ovary Syndrome reported that of the abnormalities present in affected women with PCOS, low HDL-C occurred most frequently (68%), followed in descending order by elevated BMI (67%), high blood pressure (45%), hypertriglyceridemia (35%), and high fasting serum glucose (4%).

On comparison of waist circumference, FBS, SBP, triglycerides, and HDL in between patients with metabolic syndrome and without metabolic syndrome according to age groups, no significant difference was found.

On applying the pearson correlation a significant positive linear relationship between BMI and triglyceride was observed. This means that as there is an increase in BMI, triglyceride will also increase. On applying the pearson correlation on BMI and HDL a significant negative linear relationship was observed but the results were not significant. This means that as there is increase in BMI, HDL will decrease.

Studies have shown a direct relationship between increasing BMI and raised TC, LDL-C, and TG and an inverse correlation with HDL-C. This correlation between BMI and lipoprotein levels, especially LDL-C, has been proposed to be a strong contributing risk factor for cardiovascular diseases in obese individuals. Nevertheless, the sample size of obese and morbidly obese individuals in these studies is lacking to draw a conclusion regarding the expected lipid parameters in this population.[45,46] Recently

conducted observational studies validated a correlation between BMI and TG or HDL-C in obese patients, except LDL-C levels. These results have raised the question of a possible "obesity paradox" where LDL-C levels may elevate or decline with extreme BMI levels.[47,48]

Conclusion

In conclusion, the prevention of metabolic syndrome among women who are prone to neglect their health due to work and family demands and multiple-role playing is highly important. Prolonged research is imperative to form effective intervention strategies.

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