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Prevalence of Metabolic Syndrome in Women of Reproductive Age Group with Polycystic Ovarian Syndrome in Tertiary Care Hospital, Kolkata

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ABSTRACT

A complex mixed condition is what is known as polycystic ovarian syndrome or PCOS. A variety of clinical features similar to heterogeneous clinical signs and symptoms, such as obesity, oligomenorrhea or amenorrhea, infertility and hyperandrogenic disorders, as well as chronic anovulation, polycystic ovaries and hyperandrogenism (clinical or biochemical) are its defining characteristics. The current study's objectives are to examine the clinical profiles of PCOS patients and to assess and investigate the prevalence of metabolic syndrome in women with polycystic ovarian syndrome who are in the reproductive age range. The cross-sectional study ran from February-January 2021-2022. One hundred sixty two women in the Department of Gynecology and Obstetrics who are in the reproductive age range of 15-49 years old. K.P.C. Hospital and Medical College, Jadavpur. We discovered that 8 (11.11%) of the 162 female patients had a positive family history of PCOS, with 12 of them having sisters with the condition and 6 having moms. A family history of hypertension was present in just 26.54% of patients. There was a family history of diabetes mellitus in 79 patients. Just 17% of the patients had dyslipidemia in their families. Forty three individuals reported a history of "obesity" in either their mother or father. Of the study participants, 45.10 percent reported having a positive family history of metabolic syndrome. The finding is statistically significant with a p-value of less than 0.00001. This study emphasizes how important it is for women with PCOS who visit the outpatient department to have a thorough metabolic syndrome examination. A frequent disorder among women in the reproductive age range, PCOS is the reason for 1 in 4 patient visits to gynecologists. Metabolic syndrome, polycystic ovary syndrome and screening.

INTRODUCTION

A complex mixed condition is what is known as polycystic ovarian syndrome or PCOS. A variety of clinical features similar to heterogeneous clinical signs and symptoms, such as obesity, oligomenorrhea or amenorrhea, infertility and hyperandrogenic disorders as well as chronic anovulation, polycystic ovaries and hyperandrogenism (clinical or biochemical) are its defining characteristics[1]. PCOS is associated with psychological challenges and metabolic issues in addition to infertility. According to published research the prevalence of PCOS in women who are of reproductive age varies from 2-20% annually[2]. The illness is a diagnosis of omission and throughout time, other classifications have emerged. According to the PCOS Consensus Workshop Group, funded by the Rotterdam ESHRE/ASRM, patients are diagnosed with PCOS when two out of three criteria are met[1] Anomalous or oligoovulate[2] Hyperandrogenism's biochemical or clinical manifestations. The presence of polycystic appearance on ultrasonography in at least one ovary, along with the rule out of alternative causes. The American Association of Clinical Endocrinologists (AACE) and the Androgen Excess and PCOS Society (AES) published a best clinical practices guideline in 2015 that states that equilibrium dialysis techniques should be used to determine free testosterone levels as they are more sensitive than total testosterone measurements in establishing hyperandrogenism. In PCOS patients the value of androgens other than testosterone is rather modest. In clinical practice and research, the term "metabolic syndrome" (also known as "syndrome X" or "insulin resistance syndrome)" is widely used to describe a group of several related risk factors of metabolic origin that arise from underlying insulin resistance and support the development of atherosclerotic cardiovascular vascular disease. Central obesity, hypertriglyceridemia, low levels of high-density lipoprotein (HDL) cholesterol, hyperglycemia and hypertension are among the main characteristics of the metabolic syndrome. Revised definition of the American Heart Association/National Heart Lung Blood Institute (AHA/NHLBI) (ATP III 2005). One of the primary modifications to this concept is the use of the World Health Organization to define the differences in central obesity among different ethnic groups. According to NCEPATP III criteria, multiple sclerosis (MS) is defined as having three or more anomalies related to the following[1]. Women with waist circumferences larger than 88 cm. Serum glucose when fasting at least 110 mg dL^{-1}. serum triglycerides while fasting of at least 150 mg dL^{-1}. Less than 50 mg dL^{-1} of serum high-density lipoprotein cholesterol (HDL-C). minimum blood pressure of 130/85 mm Hg[3]. The 2005 ATP-III definition underwent a little modification that made the presence of abdominal obesity a prerequisite for the diagnosis of Metabolic Syndrome. This was merged into the new definition by the International Diabetes Federation (IDF) which also includes scientific and clinical requirements[4]. Approximately 25% of people worldwide suffer from metabolic syndrome. Compared to persons without the syndrome, they have a three times higher risk of having a heart attack or stroke and a doubled risk of dying from it. Individuals who have metabolic syndrome are five times more likely to develop type 2 diabetes in the future. India is experiencing an increase in the prevalence of obesity and diabetes mellitus as a result of changing lifestyles and urbanization. According to recent data the metabolic syndrome affects roughly one-third of metropolitan residents in India's major cities. One of the main risk factors for metabolic syndrome is PCOS and 40-50% of PCOS cases also have metabolic syndrome. Numerous studies have established that, in comparison to control groups, women with PCOS are generally more likely to develop metabolic problems and cardiovascular disease[5]. Up to 70% of afflicted women experience protracted disruptions or go undetected until the illness is recognized[6]. Currently, those who have PCOS are always more likely to have dyslipidemia, obesity and hypertension, which increases their risk of cardiovascular illnesses[7].

We want to know how common metabolic syndrome is in the reproductive age range of women with PCOS so that we may make the necessary lifestyle changes and use both pharmaceutical and non-pharmacological interventions to help prevent and treat severe cardiovascular diseases, strokes and other devastating conditions. Our study aims to determine the prevalence and assessment of metabolic syndrome in women in the reproductive age group who have polycystic ovarian syndrome. This information will be useful in preventing and treating major cardiovascular diseases, strokes and other deadly conditions by enabling appropriate lifestyle modifications and pharmaceutical and non-pharmacological interventions. More severe criteria of metabolic syndrome specified by the International Diabetes Federation (IDF) are utilized in the study because our ethnic population has a higher chance of developing the condition.

MATERIALS AND METHODS

Study design: Cross Sectional study.

Period of study: Feb-Jan 2021-2022.

Place of study: Department of Gynaecology and Obstetrics. K.P.C Medical College and Hospital, Jadavpur.

Sample size: Considering a confidence interval of 95%, level of confidence (z) = 1.96, absolute precision (e) =

0.05 and taking a prevalence of 10%[1-2] sample size was calculated using

$N = Z^2pq$, n= $(1.96)^{[2]}$ x 0.1 x 0.9 = 138.24 .
e^2 $(0.05)^{[2]}$
Adjusting for anticipated non response of 10 % N =138.24 = 153.6

0.9-162 women in reproductive age group between 15-49 years attending Gynaecology out-patient clinic at the KPC Medical College and Hospital with PCOS sign/symptoms will be include in the study.

Inclusion criteria:

- Patients presenting with the following in reproductive age group (15-49)
- Oligomenorrhoea
- Amenorrhoea
- Clinical hyperandrogenism presence of hirsutism Ferriman Gallway Score
- >8/acne/alopecia/virilisation) in all age groups
- Biochemical hyperandrogenism increased free testosterone levels >2 nmol/lit in adolescents
- USG polcystic ovary appearance-ovarian volume >10 cm^3 and/or atleast one ovary with 12 or more follicles each measuring 2-9 mm in diameter
- Women with increased BMI
- H/O infertility

Exclusion criteria:

- Etiologies mimicking PCOS
- Cushing syndrome
- Thyriod dysfunction
- Hyperprolactinaemia
- Drug or alcohol abuse
- Adrenal hyperplasia
- Women with oral contraceptive intake Previously diagnosed diabetes

RESULT

We looked examined the relationship between age and the prevalence of metabolic syndrome. Four age groups were created out of the patients. Table 1 60% of all metabolic cases were in the age range of 36-45 years old, when the majority of individuals with metabolic syndrome were found. In the age range of 26-35 years, there were 21 cases with metabolic syndrome or 32% of the total. In the 15-25 year old age range, we discovered 3 cases or roughly 5%. Two cases or 3% of all the metabolic syndrome cases in my study, are in the 46-49 age group. The chi-square test was used to analyze the age groups and the results suggest that the prevalence of metabolic syndrome rises with age (p-value = 0.002, statistically significant). Table 2 89.2% of PCOS cases with elevated waist circumference are associated with components of the metabolic syndrome. 33.8% of patients with metabolic syndrome have elevated blood triglycerides. Hyperglycemia during fasting is observed in 66.1% of individuals with metabolic syndrome. Of the patients with metabolic syndrome, 63.1% had elevated systolic or diastolic blood pressure Table 3 and 4. The aforementioned table and bar chart demonstrate how, in our study the prevalence of metabolic syndrome rises with BMI in the PCOS population and the p-value indicates that this relationship is significant.

Table 5 According to the above table, those with metabolic syndrome who are obese (90%) or severely obese (100%) are more likely to have high TGs. This suggests that even slight weight loss can result in significant changes to metabolism. Table 6 Age group, systolic blood pressure, diastolic LDL, HDL, TGL and fasting blood glucose level were the factors analyzed. With the exception of cholesterol, every other variable was statistically significant in explaining the difference between patients with and without metabolic syndrome. Women were not statistically significant, and the co-relation was determined to be statistically significant, with p-values for all the variables being less than .05.

DISCUSSIONS

This study has a sample size of 162. These 162 females with polycystic ovarian syndrome diagnoses had a range of presenting conditions.

Prevalence: Our study's 40.3% metabolic syndrome prevalence among PCOS women was comparable to those of Amrita Giri *et al*.'s findings from Nepal. Metabolic syndrome was present in 50 (47.1%) of the 106 women with polycystic ovarian syndrome (37.59-56.60 at 95% Confidence Interval)[8].

Hildrum *et al*.'s 2007 study found that the prevalence of the IDF-defined metabolic syndrome was 29.6% as opposed to 25.9% when utilizing the 2005 ATPIII criteria[9]. which is consistent with the current investigation. Anita Rani *et al*.'s study from North India in 2021 discovered that metabolic syndrome affected 31% of PCOS-affected patients. Our study is comparable to this[10].

Primary complaints: According to our study, of the 162 participants, monthly irregularity is the most common reason for a PCOS woman to visit a hospital. Of these, 66% reported menstrual irregularity as their primary or secondary complaint, with oligomenorrhea and amenorrhea. About 6% came with acne and hirsutism. According to Alaknanda *et al*.[11] 54% of cases were primary infertility. Forty six percent of patients in the Joshi *et al*. trial were married and 43% of them reported having trouble becoming pregnant. Forty seven of the 120 PCOS women in the

Table 1: Age group and metabolic syndrome

	Metabolic syndrome			
Age group	Present	Absent	Total	Prevalence
15-25 years	03	09	12	25.00%
26-35 years	21	37	58	36.20%
36-45 years	39	47	86	45.34%
46-49 years	02	04	06	33.33%
Total	65	97	162	

Table 2: Distribution of parameter

Parameter	Present number (N = 65)	Percentage
Increased waist circumference	58	89.2
Elevated S.TGL	22	33.8
Low S.HDL	45	69.2
Fasting hyperglycaemia	43	66.1
Systolic and diastolic BP	41	63.1

Table 3: Twelve patients (11.11%) had a positive family history of PCOS, with six of them having a hi BMI category

	Present	Percentage	Absent	Percentage
PCOS	18	11.11%	144	88.89
Hypertension	43	26.55%	119	73.45
Diabetes	79	48.77%	83	51.23
Dyslipidemia	28	17.29%	134	82.71
Obesity	43	26.54%	119	73.45
Metabolic syndrome	73	45.10%	89	54.90

Table 4: BMI Category with Metabolic syndrome

BMI Category	Metabolic syndrome present (N = 65)		Metabolic syndrome absent (N = 97)		p-value
Normal (18.5-22.99)	04	6.15%	45	46.39%	<0.00001
Overweight (23-24.99)	03	4.61%	09	9.27%	
Pre-obese (25-29.99)	32	49.23%	33	34.02%	
Obese (30-39.99)	20	30.77%	08	8.24%	
Morbidly obese (>40)	06	9.23%	02	2.06%	

Table 5: BMI category with patient with metabolic syndrome (N), presence high TGs level (n) and prevalence (n/N*100) (%)

BMI category	Patient with metabolic syndrome(N)	Presence high TGs level (n)	Prevalence (n/N*100) (%)
Normal(18.5- 22.99)	04	1	25%
Overweight(23-24.99)	03	1	33.33%
Pre-obese(25 -29.99)	32	21	65.62%
Obese(30-39.99)	20	18	90.00%
Morbidly obese(>40)	06	06	100%

Table 6 Biochemical parameter (mg dL) with metabolic syndrome

	Metabolic syndrome present (N = 65)		Metabolic syndrome absent (N = 97)		
Biochemical parameter (mg dL)	Mean	SD	Mean	SD	p-value
Serum TG	129	23.4	106	14.5	<0.001
Serum HDL	46.9	06.2	56.4	5.4	<0.001
Total LDL	103.5	19.2	91.3	11.7	<0.001
Total cholesterol	164.1	25.7	161	13.1	Not significant
FBS	104.2	17.3	88.9	13.3	<0.001

Ramanand et al.[12] study were married and 44.68% of these women reported having trouble becoming pregnant. The majority of research participants (46%) were nulligravida and primary infertility (42%) which is similar to the findings of Ramanand *et al*.'s study, was the main complaint.

Age: In this study, 40.3% of the PCOS study population had metabolic syndrome. The majority of patients with metabolic syndrome or 39 out of 40, were in the 36-45 age range. This group accounts for 60% of all metabolic cases. The age group of 26-35 years old had 21 cases of metabolic syndrome or 32% of all cases. We discovered 3 cases or around 5%, in the 15-25 age range. Two cases or 3% of all the metabolic syndrome cases in my study, are in the 46-49 age bracket. The chi-square test was used to analyze the age groups. The results indicate that the prevalence of metabolic syndrome rises with age, with a statistically significant p-value of 0.002. This indicates that among PCOS patients, growing older is a significant risk factor for metabolic syndrome. The mean age of people with metabolic syndrome is 27.56, while the mean age of people without metabolic syndrome is 26.31, despite the fact that the prevalence of metabolic syndrome rises with age. Our results were consistent with another study that found that the prevalence of MS increased with age, with a significantly higher rate than the 6.7% MS prevalence in women between the ages of 20 and 30 and the 15% prevalence in women between the ages of 30 and 40 reported by the Third National Health and Nutrition Examination Survey (NHANES III)[13]. These findings are consistent with statistics published by Teimuraz *et al*., which showed that in less than 20

years, 20-30 years and 30-39 years[14], respectively, 23%, 45% and 53% of the population. According to a September 2018 study by Indu *et al*., 37.2% of people had MS. The most prevalent age range was 25-35 years old. Increased waist circumference >88 cm was linked to PCOS-consistent USG findings low HDL, elevated FBS >110 mg dL^{-1} and high blood pressure >130/85 mm Hg were all statistically significant. and deduced from the findings that it can be applied to build a metabolic syndrome screening program, especially in low-resource settings in developing nations.

BMI: According to our research the prevalence of metabolic syndrome rises in PCOS patients with higher BMIs. Prevalence of pre-obesity is 49.23%, while severely obese PCOS (40 and above) accounts for 75% of cases. The percentage of pre-obesity in the study by Kalra *et al*.[15] was 44%, which is similar to the 46% in the current study.

Analysis of various parameters of metabolic syndrome: The study findings indicate that 89.2% of PCOS patients had an increased waist circumference, 33.8% had an elevated serum triglyceride, 66.1% had hyperglycemia during fasting, 69.2% had low serum HDL and 63.1% had elevated blood pressure.

In their 2012 study, Mandrelle *et al*. discovered that among patients with metabolic syndrome, 45.8% had an increased waist circumference, 93.3% had low serum HDL, 40% had elevated serum triglycerides, 25% had fasting hyperglycemia and 63.1% had elevated blood pressure. As a result, our study and the previous study are equivalent. Sidra *et al*. recently revealed in 2019 that their study found that of the patients with metabolic syndrome, 80% had increased waist circumference, 80% had low serum HDL, 19.3% had elevated serum triglyceride, 63.2% had fasting hyperglycemia and 19.8% had elevated blood pressure[16]. The data above closely resembles our study's data. In our study the mean waist circumference was 94.8 cm in the group with metabolic syndrome and 81.5 cm in the group without metabolic syndrome and PCOS, with a mean difference of 11.3 cm. 129 mg dL^{-1} is the mean TG value in the group with metabolic syndrome and 106 mg dL^{-1} in the group without metabolic syndrome. With metabolic syndrome the mean HDL value is 46.9 mg dL^{-1} in non-metabolic syndrome, it is 56.4 mg dL^{-1}. Analogously, the average total cholesterol in the metabolic group is 164.1 mg dL^{-1}, while in the non-metabolic group, it is 161 mg Dl^{-1}.

Fasting hyperglycemia: The MS criterion is a fasting plasma glucose of 100 mg dL^{-1} or above. 66.1% of the 65 patients with metabolic syndrome had hyperglycemia during fasting. These 26 patients had this condition. The mean fasting glucose value is 104.2 in the group with metabolic syndrome and 88.9 in the group without metabolic syndrome. This is a statistically significant mean difference of 13.3 with a p-value of 0.00001. The current study found that 66.1% of participants had fasting hyperglycemia, with a mean of 103.1±17.4. Given the strong correlation between PCOS and Metabolic Syndrome, steps must be made to mitigate the health risks associated with the condition. The initial step in this direction is to do a Metabolic Syndrome screening on PCOS patients. The minimal screening approach entails a clinical examination focused on MS assessment, including regular blood pressure readings and measurements of the waist circumference. Furthermore, blood tests must be carried out regardless of phenotype and BMI in order to assess for dyslipidemia and glucose intolerance. To lessen the burden of disease in the future, early intervention such as food control, exercise and lifestyle modification can be recommended. These actions have a significant impact on HDL levels in addition to lowering BMI and the core pattern of fat distribution.

CONCLUSION

India has succeeded in keeping communicable diseases including polio, malaria and Cholera under control in the twenty-first century. The metabolic syndrome has proven to be a helpful paradigm for identifying risk factors. In other words, it highlights the tendency for certain CVD risk factors to cluster in these patients who are susceptible to them. People around the world are leading sedentary lives due to urbanization and technological advancements that have made living more peaceful, even as the world's economy grows deprived of a lot of exercise. A hibernating individual is referred to as a "couch potato." Since diabetes is the leading cause of death worldwide, it is imperative that we fight obesity and sedentary lifestyle-related illnesses including diabetes and atherosclerotic cardiovascular diseases in India the "Diabetic capital of the world."

The current study emphasizes the necessity of thorough metabolic syndrome assessment for PCOS-afflicted women visiting the outpatient department. One in four patients visiting a gynecologist have PCOS a common illness that affects women in the reproductive age group. PCOS is a disorder linked to obesity and a sedentary lifestyle. The treating physician has an obligation to check for metabolic syndrome and provide guidance. Changing to a healthier lifestyle not only helps with ovulatory and menstrual symptoms but it also guards against future heart problems and other serious illnesses. A health education program encourages people to modify their lifestyle choices in an effort to delay the beginning of the illness.

REFERENCES

1. Cárdenas-Sánchez, J., A.A. Erazo-Valle-Solís, C. Arce-Salinas, E. Bargalló-Rocha and V.B. Piña *et al.*, 2022. Consenso Mexicano sobre diagnóstico y tratamiento del cáncer mamario. octava revisión. colima 2019. Gaceta. Mexicana. Oncolog. A., 18: 1-141.
2. Habib, L., M. Gois, J. Gilmar, C. Santos, J. Maria and G. Dias., 2016. The prevalence of metabolic syndrome in the different phenotypes of polycystic ovarian syndrome. Int. J. Neurol., 9: 199-208.
3. Health, NIo., 2001. Third report of the national cholesterol education program expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III). executive summary bethesda, MD, national institutes of health, national heart, lung and blood institute, https://pubmed.ncbi.nlm.nih.gov/11368702/.
4. Sharma, N., 2017. Axillary nodal staging with contrast-enhanced ultrasound. Springer. Open. Choice., 2: 259-263.
5. Wild, R.A., M. Rizzo, S. Clifton and E. Carmina, 2011. Lipid levels in polycystic ovary syndrome: Systematic review and meta-analysis. Fertil. Sterility, 95: 1073-1079.
6. Park, V.Y., E.K. Kim, H.J. Moon, J.H. Yoon and M.J. Kim, 2018. Value of ultrasound-guided fine needle aspiration in diagnosing axillary lymph node recurrence after breast cancer surgery. Am. J. Surg., 216: 969-973.
7. Cooney, L.G., I. Lee, M.D. Sammel and A. Dokras, 2017. High prevalence of moderate and severe depressive and anxiety symptoms in polycystic ovary syndrome: A systematic review and meta-analysis. Hum. Reprod., 32: 1075-1091.
8. Giri, A., A. Joshi, S. Shrestha and A. Chaudhary, 2022. Metabolic syndrome among patients with polycystic ovarian syndrome presenting to a tertiary care hospital: A descriptive cross-sectional study. J. Nepal Med. Assoc., 60: 137-141.
9. Hildrum, 2007. Age specific prevalence o metabolic syndrome by IDF criteria HUNT 2 study., https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-7-220
10. STabassum, R., F. Imtiaz, S. Sharafat, S. Shukar-ud-din and U. Nusrat, 2021. Prevalence and clinical profile of insulin resistance in young women of poly cystic ovary syndrome: A study from Pakistan. Pak. J. Med. Sci., 29: 596-593.
11. Alakananda, Bishnu, P. Das and I. Goel, 2017. A study on clinical profile of patients with polycystic ovarian syndrome., https://www.ijsr.net/archive/v6i10/ART20177437.pdf.
12. Ramanand, S., B. Ghongane, J. Ramanand, M. Patwardhan, R. Ghanghas and S. Jain, 2013. Clinical characteristics of polycystic ovary syndrome in Indian women. Indian J. Endocrinol. Metab., 17: 138-145.
13. Ford, E.S., W.H. Giles and W.H. Dietz, 2002. Prevalence of the metabolic syndrome among us adults. JAMA, 287: 356-359.
14. Apridonidze, T., P.A. Essah, M.J. Iuorno and J.E. Nestler, 2005. Prevalence and characteristics of the metabolic syndrome in women with polycystic ovary syndrome. J. Clin. Endocrinol. and Metab., 90: 1929-1935.
15. Kalra, A., S. Nair and L. Rai, 2006. Association of obesity and insulin resistance with dyslipidemia inIndian women with polycystic ovarian syndrome. Indian. J. Med. Sci. 60: 447-453.
16. Sidra, S., M.H. Tariq, M.J. Farrukh and M. Mohsin, 2019. Evaluation of clinical manifestations, health risks, and quality of life among women with polycystic ovary syndrome. Plos. one., Vol. 14. 10.1371/journal.pone.0223329.