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## RESEARCH ARTICLE

# INTER-RELATIONSHIP OF POLYCYSTIC OVARIAN SYNDROME WITH BMI AND DIABETES

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### ABSTRACT

In recent years Polycystic Ovarian Syndrome (PCOS) is globally emerging disorder among women. The present study undertaken in Mumbai city was to create awareness about PCOS. The target age group was 10 – 40 years and above. The study also focussed on interrelationship between BMI and diabetes as associated factors with PCOS. We observed that 23.87% of PCOS positive subjects were overweight. From our study a possible correlation could be derived that PCOS is a hereditary syndrome. Hirsutism, acne, alopecia, obesity and irregular periods were reported as associated symptoms. About 23.87% PCOS positive subjects were suffering with diabetes. Level of awareness about PCOS was very poor in PCOS negative subjects. Hence, initiative needs to be taken for women to be provided with information about PCOS and encourage timely diagnosis.

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### INTRODUCTION

PCOS was first described as an entity by Dr. Stein and Dr. Leventhal in 1935. It was described as group of women with obesity, excess hair growth, and ovaries with multiple cysts. We now understand the cause of PCOS and know that it affects thin women as well as women who are overweight (Teede *et al.*, 2011). PCOS is the abbreviated form of Polycystic Ovarian Syndrome. Polycystic Ovarian Syndrome is the most common female endocrine disorder; it is a complex, multifaceted, heterogeneous disorder affecting approximately 5% - 10% of women of reproductive age.

It is a disorder with complex and multiple etiologies. The symptoms are classified into clinical, endocrinological and metabolic aspects. The clinical features include menstrual irregularities, hirsutism, acne and anovulatory infertility. The endocrine features include insulin resistance, obesity, lipid abnormalities and impaired glucose tolerance. PCOS is quite common in all age of women right from teenage to the menopause stage, but its prevalence is quite higher in the women at the reproductive age. PCOS has a link with ovarian tumour, in the final stage, endometrial cancer, cardiovascular diseases, diabetes mellitus, obesity etc which is a dangerous effect to the human beings (Cindy *et al.*, 2013). Hence, aim of our study was to create awareness about PCOS among women of age groups starting from puberty to menopause. We also aim

to find out interrelationship if any among PCOS with BMI and diabetes.

### MATERIALS AND METHODS

This project was undertaken within Mumbai City between July 2013 and June 2014. This study was a close ended-type questionnaire based survey. Placards and presentations were used as medium to convey information about PCOS in various institutions, hospitals, schools, banks, locality, etc and made the population aware from different backgrounds about the same. Simultaneously they were requested to fill the questionnaire. This required greater communication, interaction or intervention skills. Behaviour of research participants occurred in a private context where an individual could reasonably expect that no observation or reporting was taking place and was strictly confidential.

For the ease of analysis the data collected was categorized in four age groups viz. 10-20, 20-30, 30-40 and 40 & above. Statistical analytical tools like graph, chi square and Z test were employed to analyze data collected. Z test is used to check whether a null hypothesis stands true for a given set of population. Z test can only be used when population is normally distributed. Chi square test is used to check difference between the observed frequency and expected frequency for given set of data.

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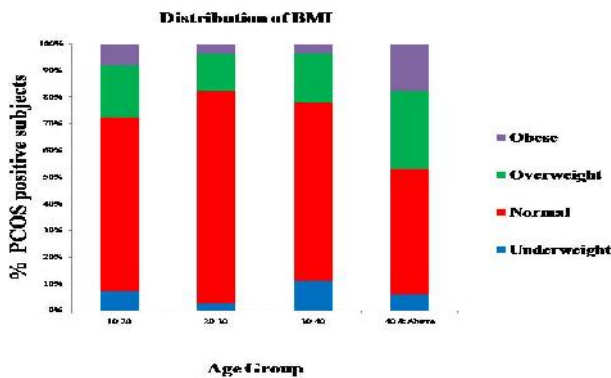
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**RESULTS**

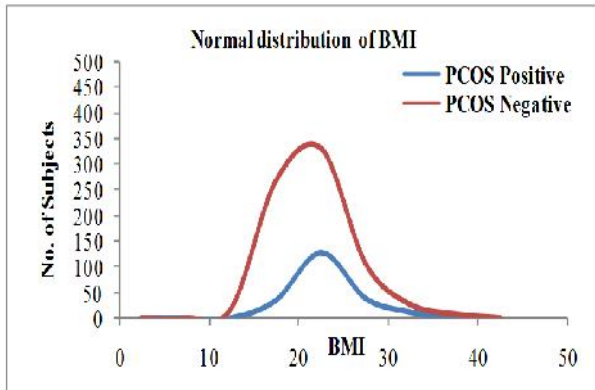
A total of 994 female subjects were evaluated in order to examine various parameters that affect PCOS. Age range of subjects is 10 – 40 years and above with mean age as 22.9807±9.2095 years. 222 out of 994 subjects reported positive for PCOS which translates to 22.33%. The calculated 95% confidence interval is 0.2233, 0.244996.

A confidence interval gives an estimated range of values which is likely to include an unknown population parameter, the estimated range being calculated from a given set of sample data. Which means in the population of India, the percentage of women’s suffering from PCOS is in the range of 22% - 24% which supports our findings.

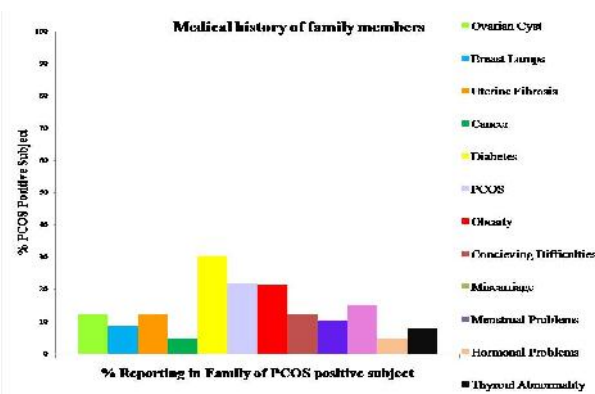
**BMI**



Graph 1 Age wise distribution of BMI



Graph 2 Normal distribution of BMI



Graph 3 Medical history of family members of PCOS positive patients

There is widespread variability in the prevalence of overweight (BMI 25 to 30 kg/m<sup>2</sup>) and obese (BMI >30 kg/m<sup>2</sup>) women in PCOS populations across different countries (Fausser et al., 2012). From the above (Graph 2) it is observed that BMI for PCOS affected subjects is almost normally distributed. Using normal Z test, observed value is -0.2857 which is less than tabulated value 1.65 at 5% level of significance. Therefore our study grants evidence that among obese women mean BMI does not differ significantly between PCOS positive and negative women.

**Family history of pcos positive subjects and their relation**

From the (Graph 3), it was observed that, most family members of PCOS positive subjects were suffering from Diabetes, PCOS and Obesity. The survey disclosed family members exposed to such disorders belonged to the maternal side of the subjects.

**Associated symptoms reported with PCOS**

In our survey we observed that adult diagnostic criteria have become refined but adolescent diagnosis remains obscure. Paediatric healthcare providers find it difficult to screen for PCOS in adolescent females with normal weight. In our study hirsutism, cystic ovaries and male pattern baldness were mostly reported in adolescent age for PCOS diagnosis. In the later age group acne, irregularity of periods and obesity are mostly considered as hint for diagnosis of PCOS. In the age group of 40 & above acne along with hirsutism is important hint for undergoing diagnosis. Our result is in accordance with (Fausser et al., 2012) which states that lack of distinct clinical symptoms reiterates the importance for increased awareness by the paediatric primary care provider to have PCOS in the differential diagnosis when clinical factors present in the early stages of puberty.

**Diseases along with PCOS**

From our study diabetes and thyroid abnormality was reported by majority of PCOS positive subjects. 23.87% of PCOS positive subjects reported diabetes as another disorder accompanied along with PCOS. Thyroid abnormality was reported by 9.09% of PCOS positive subjects. The clustering of insulin resistance, obesity, hypertension, and dyslipidemia has been termed ‘the metabolic syndrome’ (Sharpless, 2003). As national attention is focused on the emerging epidemic of type-2 diabetes and obesity, more energy is being directed toward earlier detection, improved therapies, and potential prevention. One condition commonly detected in a younger age group and associated with a high risk of progression to diabetes is polycystic ovary syndrome (PCOS).

**Awareness**

From our study it was observed that level of awareness was found to be 30% which is very low in PCOS negative subjects. Thus, it becomes essential to undertake programs to spread awareness about this disorder among the women, as it may even lead to adverse effects like miscarriages and infertility. However, the level of awareness was 100% among PCOS positive women.

## DISCUSSION

### BMI

It was observed that in PCOS affected women, the number of overweight subjects is less than number of subjects with normal weight. This may be due to the fact that the population of the study consists of more subjects in the age group 10-30, who are usually weight conscious. Also regular exercise may be one of the reasons for controlled weight as reported in our study. In PCOS positive subjects 14/222 i.e. 6.30% had a BMI less than 18.5 which indicates that they are underweight. From the statistics we could say that women who are affected with PCOS may be prone to an increase in weight. A sudden increase in weight is an indicative parameter of PCOS which tells us that women experiencing the same should undergo a screening process. From statistical analysis, it is observed that PCOS and BMI are highly dependent on each other. PCOS affected subjects with weight related problems may suffer from infertility and pregnancy complications. Treatment of obesity through lifestyle intervention, proper exercise is a key treatment strategy in PCOS. Overweight or obesity affects approximately 23.87% of PCOS positive subjects as per our study. Women with PCOS are more likely to have greater upper-body fat distribution compared with weight-matched controls. Greater abdominal or visceral adiposity is associated with greater insulin resistance, which could exacerbate the reproductive and metabolic abnormalities in PCOS (Fauser *et al.*, 2012).

### Family history of PCOS positive subjects and their relation

PCOS and diabetes were the main disorders reported by PCOS positive subjects prevailing among their family members. Both the disorders were mostly reported from maternal side. Thus, there might be some co-relation among them. Our results are in accordance with (Legro *et al.*, 1998) which states that PCOS has a genetic basis because a high number of female relatives of PCOS patients are affected. These studies have suggested that because of familial aggregation of hyperandrogenemia in first degree relatives of PCOS patients, it is a genetic trait (Gonzalez *et al.*, 2003).

### Associated symptoms reported with PCOS

From our study symptoms associated with PCOS were male pattern baldness, cystic ovaries, hirsutism, acne, menstrual irregularity and obesity. The difficulty of diagnosing PCOS in adolescence is the mere awkwardness of the adolescent stage of development. There are many hormonal transitions taking place that could also manifest such as increased acne due to skin oil composition changes or irregular menses for the first year of menarche as the body's hormones are adjusting during puberty (Matzke, 2011).

### Diseases alongwith PCOS

An interesting observation made in our study was that diabetes was reported in younger age of 16. Our study is in accordance with (Emans *et al.*, 2005) which states that PCOS has lifelong implications of increased risk of diabetes mellitus, obesity,

insulin resistance, infertility, impaired quality of life, and secondarily, cardiovascular disease. Thus, PCOS cannot only be on the radar of family and adult healthcare providers. There is growing evidence that PCOS is also a paediatric syndrome. Because some females reach menarche as early as 8-9 years old, PCOS needs to be a topic of concern for health care providers early in a child or adolescent's reproductive health (Fauser *et al.*, 2012).

## CONCLUSION

PCOS is complex syndrome which affects women of all age. PCOS not only affects metabolic functions but also takes physical and psychological toll. Implications of PCOS are lifetime including endometrial cancer, ovarian cancer, breast cancer, etc. Another concern our study raises is risk of type 2 diabetes with PCOS. India is seen as next diabetes capital, there is a need to focus on causes and concerns that can lead to it. Thus, early and timely diagnosis is the key for its treatment. Awareness among young girls is required as they are the primary target. Awareness can be spread through healthcare providers by conducting presentations, workshops, seminars, etc at various places to educate the female population about this chronic syndrome.

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