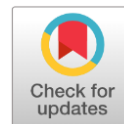


## Differential Prevalence of Depression Symptoms in Obese Versus Non-obese Women with Polycystic Ovary Syndrome

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### Abstract:

**Background:** Polycystic ovarian syndrome (PCOS) is a prevalent chronic endocrine disorder that effects on women ovaries. It is characterized by mental health issues including depression and obesity. Hence the purpose of this particular study was to determine whether depressive symptoms were more common in obese PCOS women or in non-obese women.

**Methodology:** The current study involved a cross-sectional design where the participants were 200 women with PCOS, and they were further divided into the obese and non-obese groups on the bases of their BMI. The depressive symptoms were assessed with the Beck Depression Inventory – II (BDI-II). Raw data were interpreted biostatistically by applying chi-squared test and logistic regression to determine the association between symptoms of obesity and depression by using a software known as SPSS.

**Results:** The women of obese group with polycystic ovarian syndrome had a mean score of moderate ( $35.12 \pm 0.01$ ) and severe depressed symptoms than the non-obese PCOS women ( $22.11 \pm 0.03$ ). The applications of the logistic regression model revealed that the obesity could be considered to have a statistically significant ( $P \leq 0.05$ ) impact on the depression symptoms.

**Conclusion:** Through the research that the study carried out it was discovered that obesity could be causatively related to depression in women with PCOS. These results point to the importance of the proposed features of PCOS as a complex disorder that requires a holistically oriented treatment approach that involves not only physical but also psychological factors.

**Keywords:** PCOS, obese, depression, prevalence, Treatment, Hyperandrogenism, Endocrine disorder, Beck Depression Inventory-II



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## INTRODUCTION

The Polycystic Ovary Syndrome (PCOS) is a complex endocrine disease affecting women of child bearing age, and its global prevalence has been estimated to varying between 5-10%. The condition characterized by increased testosterone levels, anovulation, and polycystic ovaries[1]. It has also been linked to metabolic diseases such Type 2 diabetes, insulin resistance, and obesity. Further, they experience physical and health related issues, and are at higher risk of developing psychological illnesses, majorly depression[2]. There are several conditions that are linked with obesity and PCOS is known to affect half of women that are obese. Obesity in PCOS patients is associated with insulin resistance and hyperandrogenism leading to aggravating effects on the general health and psychological well-being of the patients[3]. Mood disorders have been found to be abundant, particularly depression, in women with PCOS. In community samples, prevalence rates of depression range from 28% to 64%. Obesity is one of the unfavorable metabolic variables that is known to be correlated with depression risk in both PCOS-affected women and the general population[4]. Previously, we have found a connection between women with PCOS who had insulin resistance and depression, suggesting a "metabolic pathway" for depression in this clinical population[5]. However, long-term depression risk factors in women with PCOS have not been identified. Many of the clinical characteristics of PCOS gradually lessen with age. Both the frequency of menses and biological hyperandrogenism decrease. On the other hand, it's unclear how PCOS's metabolic symptoms change as people age[6]. According to recent research, obese women with PCOS have gradual increases in insulin resistance and dyslipidemia over time,

whereas their slim counterparts experience less of these changes[7]. The objective of current study was to investigate the relationship between women's PCOS and depressive symptoms, with a focus on the influence of obesity. Several studies found that women with PCOS and obesity were more likely to have clinically significant depression symptoms[8, 9]. Healthcare practitioners should promote a holistic approach to care while keeping this population's mental health challenges in mind. Obesity, ovarian dysfunction, and hyperandrogenism are prominent symptoms of polycystic ovary syndrome (PCOS), which can be distressing[10]. This study was carried out to investigate the concept that women with PCOS who have unfavorable metabolic characteristics are at a higher risk of developing persistent depression, as well as to describe depression symptoms throughout time.

## MATERIALS AND METHODS

Present research was a cross-sectional study and it was conducted in Ghurki trust and teaching hospital from March, 2023 to May, 2024. This study was carried out in strict accordance with the guidelines and regulations of the institutional review board of Lahore-UBAS a project of LM&DC ref no. ERC/2023/37B, and all participants were freely requested to give informed permission. The final sample included 200 women, aged 18-45 years, diagnosed with the PCOS comparing with Rotterdam criteria. Participants were categorized into two groups for this study, the target population was the obese group, which is constituted by individuals with a BMI of 30 and above and the non-obese group, which has a BMI of less than 30. Regarding inclusive criteria women of aged 18-45 years and have PCOS diagnosed based on the Rotterdam criteria were included for current study. The

other selective parameter was to identify those women who do not have any chronic medical complication. Pregnant or breastfeeding, with endocrine disorders and those who were using Antidepressant medication within the last 30 days were excluded. Additional parameters such as the participant's age, BMI, WHR, and FPG were identified. Depressed symptoms were measured using the Beck Depression Inventory-II (BDI-II), a validated and accurate self-report assessment of depressed symptoms. Raw data was analyzed using SPSS version 22. In the current analysis, descriptive statistics, such as frequency distributions and measures of central tendency and variability, were employed to describe the study participants'

socio-demographic and clinical features. These factors were cross-tabulated and tested using chi-square to determine the difference in depression prevalence between obese and non-obese women. Results on obesity and depressive symptoms were analyzed using logistic regression analysis conducted with age, IR, and hyperandrogenism as factors.

**RESULTS**

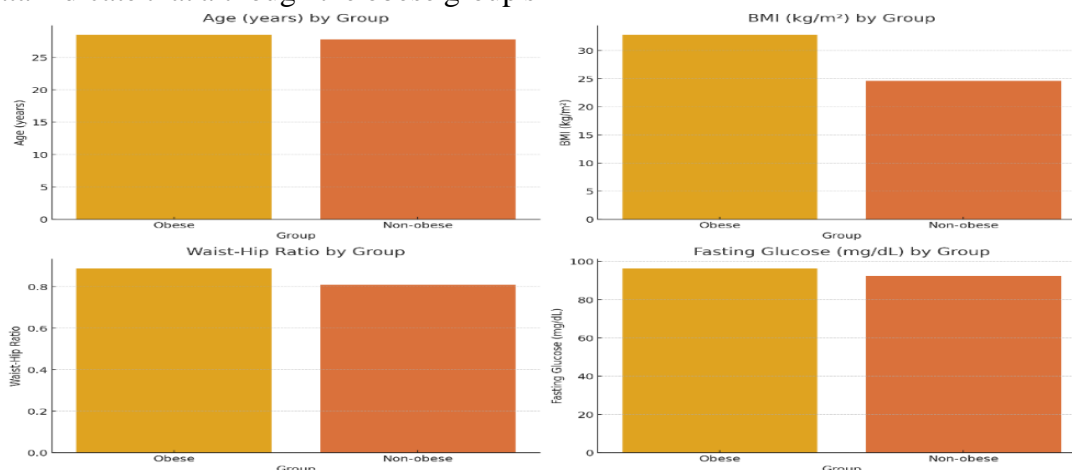
The Table-1 shows demographics and clinical characteristics of the subjects. Obese women ( $32.8 \pm 0.05$ ) ( $0.89 \pm 0.05$ ) had substantially higher BMI and Waist-Hip Ratio (WHR) than non-obese ( $24.6 \pm 0.01$ ) ( $0.81 \pm 0.04$ ) women.

**Table 1. Demographic and Clinical Characteristics of Participants**

Parameters	Obese (n=100) (Mean ±SD)	Non-obese (n=100) (Mean ±SD)	p-value (P≤0.05)
Age (years)	28.5 ± 0.03	27.8 ± 0.02	0.05
BMI (kg/m <sup>2</sup> )	32.8 ± 0.05	24.6 ± 0.01	0.001
Waist-Hip Ratio	0.89 ± 0.05	0.81 ± 0.04	0.001
Fasting Glucose (mg/dL)	96.5 ± 0.04	92.3 ± 0.01	0.002

The Fig-1 demonstrated that, with both bars around the same height, the average age of those in the fat group is comparable to that of the non-obese group. This graph shows that the obese group's Body Mass Index (BMI) is greater than the non-obesity groups, and the obese group's bar is noticeably taller. Overall, the data indicate that although the obese group's

BMI is much higher than the non-obesity group's, there are no discernible variations in the two groups' fasting glucose levels, age, and waist-hip ratio. The two groups' fasting glucose levels; the bars show that the values are roughly equal for the non-obese and obese groups, with almost equal heights.



**Fig-1: Graphical representation of Clinical Characteristics of Participants**

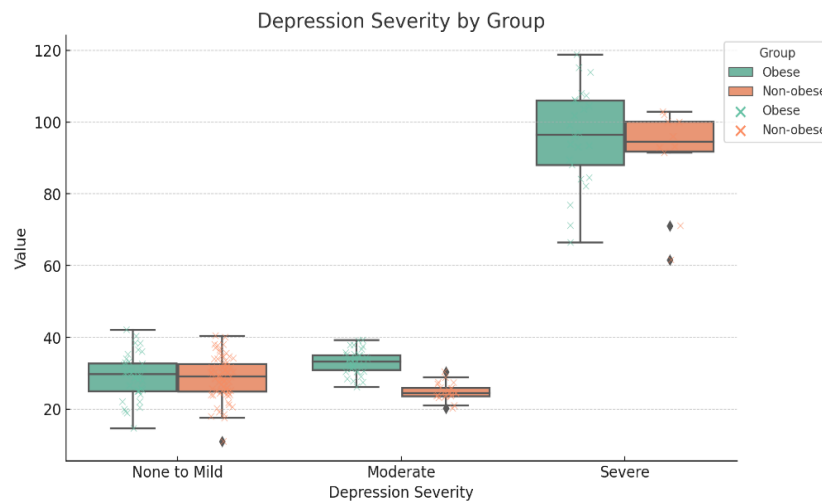
Table- 2 illustrates the proportion of obese and non-obese women who have one or more symptoms of depression. Obese women with PCOS experience more moderate to severe depression symptoms than non-obese women ( $p < 0.01$ ).

**Table 2. Prevalence of Depression Symptoms**

Depression Severity	Obese (n=100) (Mean ±SD)	Non-obese (n=100) (Mean ±SD)	p-value (P≤0.05)
None to Mild	40.10± 0.03	68.10± 0.05	0.01
Moderate	35.12± 0.01	22.11± 0.03	0.02
Severe	25.15± 0.05	10.09± 0.02	0.03

The Fig-2, a box plot chart labeled "Depression Severity by Group," showed how the depression severity of the non-obese and obese groups was divided into three categories: none, mild, moderate, and severe. The box plots for the two groups in the "None to Mild" category display distributions that are comparable, with somewhat higher values for those who are not obese. The values in the "Moderate" category

show comparable trends for both groups, with the obese group showing a somewhat greater variance. Compared to the non-obese group, the obese group exhibits much higher values in the "Severe" category, with a wider range and more outliers. This suggests that fat people have higher levels of variability and depression severity



**Fig-2: Prevalence of Depression Symptoms by groups**

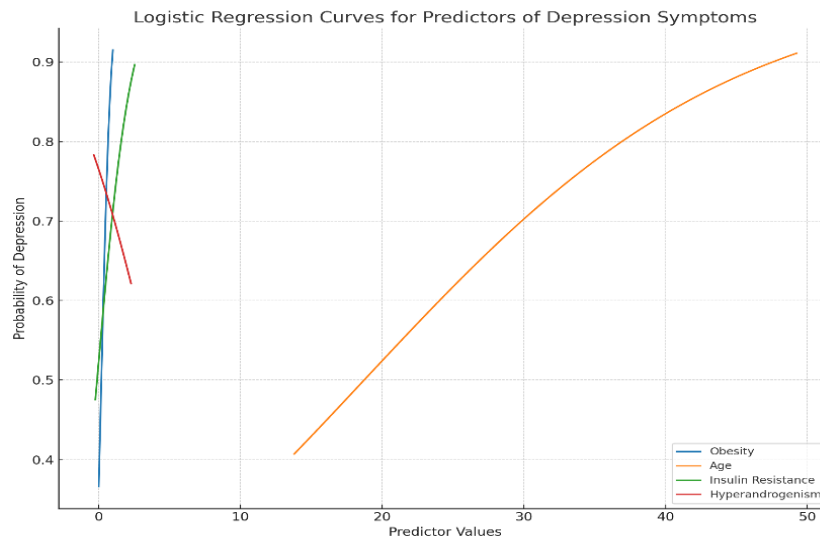
When age, insulin resistance, and hyperandrogenism were taken into account, the results of the logistic regression analysis (Table 3) showed that obesity was a significant predictor of both the risk of PCOS showed significant ( $P \leq 0.05$ ) results and moderate to severe depression symptoms were also significant ( $P \leq 0.05$ ).

**Table 3. Logistic Regression Analysis of Predictors of Depression Symptoms**

Predictor	Odds Ratio (OR) (Mean ±SD)	95% CI (Mean ±SD)	p-value (P≤0.05)
Obesity	3.15± 0.05	1.78± 0.01	0.001
Age	1.02± 0.01	0.98± 0.03	0.04
Insulin Resistance	1.27± 0.02	0.95± 0.02	0.01
Hyperandrogenism	1.12± 0.03	0.87± 0.04	0.02

The Fig-3 graph shows the logistic regression curves for age (green), obesity (blue), insulin resistance (orange), and hyperandrogenism (red) as different indicators of depressive symptoms. The likelihood of depression is displayed on the y-axis, while predictor values are represented on the x-axis. The graphs show how varying predictor values affect the chance

of depression. There is a definite increase trend in insulin resistance (orange), which is strongly positively correlated with feelings of sadness. The other predictors, on the other hand, (hyperandrogenism, age, and obesity) have comparatively flat or slightly changing curves, which suggests that their relationships with depression are weaker or inconsistent.



**Fig-3:** The logistic regression Curve used to predict symptoms of depression

The present study shows that, Obese women with PCOS syndrome have more severe medical complications as compared to non-obese women.

**DISCUSSION**

According to the present research, it can be concluded that the level of depressive symptoms in women with PCOS is associated with obesity. Compared to non-obese women with PCOS, obese-women had moderate to severe symptoms of depression[4, 11]. These

findings are in agreement with surveys that have demonstrated that values of depressed are higher in obese women with PCOS. The connection between obesity and depression in PCOS is complex, as it involves various factors. Obesity has been connected to inflammation, insulin resistance, and altered cortisol

metabolism, all of which have been postulated as contributing factors to depression onset[6, 12]. Chu Y *et al.*, (2022) stated that high depression symptom ratings in adults and adolescents have been linked to obesity itself. According to a meta-analysis, there is a strong correlation between depression and obesity among teenagers, and those who are obese have higher levels of depression than those who are not[6, 13]. In addition, women were more likely than men to exhibit signs of severe depression. Obesity throughout adolescence was predictive of depression in later life in females, and adolescents with obesity had a 1.6-fold higher chance of having major depressive disorder between the ages of 15 and 25 than adolescents without obesity[14]. One prevalent comorbidity of PCOS is obesity; adult PCOS women with heightened depressive symptoms also had higher BMIs[15, 16]. The higher incidence of depression symptoms persisted even when PCOS and no PCOS controls were matched on BMI, indicating that the rise in depression in PCOS is unrelated to BMI. The findings of Sruthi VL *et al.*, (2023) are very closely similar to the present study. Putting more emphasis on the weight domain, we found that there were differences between depressed and non-depressed women's relationships between weight-specific, Health-related quality of life (HRQOL) and BMI[17, 18]. Researchers found that among women who were not depressed, there was a steady decline in weight domain quality of life (QOL) ratings as BMI increased. In contrast, we were unable to find a statistically significant correlation among women who were depressed. It was confirmed that the relationship between BMI and felt weight distress varied depending on whether a woman was depressed or not by observing an interaction between the two variables[19]. A previous population-based study that discovered a synergistic effect between obesity

and mental health disorders in their negative impact on HRQOL supports the idea that obesity and depression interact as predictors of HRQOL, despite the fact that the majority of previous literature examining the interplay of BMI, depression, and HRQOL focuses on mutual correlations[20, 21]. The findings of present research showed that obese women with PCOS syndrome showed more severe medical complications than non-obese women which has so much similarities with the previous studies by different researchers.

## CONCLUSION

The current study stresses the significance of depressed symptoms in obese women with PCOS. These findings underline the need for more comprehensive PCOS care, encompassing metabolic and psychosocial issues. As a result, mental health screening and care should be integrated into women's PCOS care management methods.

### Conflict of interest:

No conflict of interest was faced during the research.

### Funding:

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### Authors contribution:

All authors contributed equally in this research and have read and agreed to the published version of the manuscript.

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