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# The role of obesity in the development of polycystic ovary syndrome (PCOS) in Iraqi women

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## ABSTRACT

This study was conducted to evaluate the role of obesity in the development of PCOS and the relationship between menstrual dysfunction and different clinical parameters such as FSH, LH, infertility, hirsutism and testosterone. The study was carried out on 120 individuals with PCOS age ranged from (15-45) years old. The statistical analysis results showed a significant positive correlation coefficient ($p>0.05$) between fasting blood sugar, FSH level and obesity. A highly significant correlation coefficient ($P<0.01$), between LH, testosterone levels and obesity, a significant positive correlation coefficient ($p>0.05$) was between menstrual dysfunction and galactorrhea, diabetes mellitus and FSH level, but a highly significant positive correlation coefficient ($p<0.01$) between menstrual dysfunction and hirsutism, infertility, acne, obesity, LH level and testosterone. The results also showed a significant positive correlation coefficient ($p>0.05$) between FSH level, testosterone and fasting blood sugar (FBS) but a highly significant positive correlation coefficient ($p<0.01$) between FSH and LH levels.

**Keywords:** Polycystic ovary syndrome, obese women, infertility, T2DM

## 1. INTRODUCTION

Obesity and polycystic ovary syndrome (PCOS) represent 2 common metabolic disorders that are associated with subfertility. According to the World Health Organization (WHO), in 2010, they estimated that 76.7% of females in the United States older than 15 years were considered overweight or obese (body mass index (BMI) > 25). This epidemic has reproductive implications, as obesity is associated with subfertility (Wise *et al*., 2010; Luke *et al*., 2011). Specifically, obese women (BMI > 30) are 3 times more likely to suffer infertility than women with a normal BMI (Bellver *et al*., 2010). POS is the most common endocrine disorder in women, with prevalence as high as 15% when diagnosed by Rotterdam criteria (Fauser *et al*., 2012). Obesity complicates the diagnosis of PCOS with a reported 61% to 76% of patients with PCOS considered obese (BMI > 30) in the United States and Australia (Fauser *et al*., 2012). Women with PCOS are subfertile, and this may be heightened by the effect of obesity, metabolic, inflammatory, and endocrine abnormalities on ovulatory function, oocyte quality, and endometrial receptivity (Fauser *et al*., 2012). It is well established that the endometrium in patients with PCOS is dysfunctional, as women with PCOS are anovulatory or oligo-ovulatory and have suboptimal regulation by estrogen and suboptimal or absent progesterone, which puts them at increased risk for the development of endometrial hyperplasia and cancer (Giudice *et al*., 1992; Macklon *et al*., 2008; Haoula *et al*., 2012). PCOS is commonly associated with a high prevalence of hyper insulinemia, insulin resistance, and obesity. These patients are at an increased risk of metabolic syndrome, type 2 diabetes mellitus (T2DM), cardiovascular disease, and unopposed estrogen effects on the endometrium (Azziz *et al*., 2009). Moreover, an increased luteinizing hormone (LH) and luteinizing hormone to follicular stimulating hormone ratio (LH/FSH) is also observed (Azziz *et al*., 2009; Preethi & Juneius, 2018). This LH/FSH ratio value is much dependent on the assay used to measure the hormones. These patients should be evaluated for the risk of developing metabolic syndrome and its components including T2DM, hypertension, and hyperlipidemia (Goodman *et al*., 2017).

## 2. MATERIALS AND METHODS

### Study population

The study included 120 women with PCOs age ranged from 15-45 years old.

### Blood samples collection

Five milliliter of blood samples were aspirated from patient's cubitus vein. Blood samples were centrifuged at 3000 round per minute for ten minutes.

### Methods

Detection of PCOS by hormonal analysis: Serum was collected by using micropipette. The serum was used for the measuring of follicle stimulating hormone (FSH), Luteinising hormone (LH) and Testosterone. FSH concentration was measured in the serum of samples by using Immune Radiometric Assay (IRMA), while LH was measured by using combines enzyme immunoassay sandwich method with final fluorescent detection. Testosterone hormone was also measured by using enzyme immunoassay combination method with final fluorescent detection.

### Statistical analysis

The statistical analysis was conducted and the correlation coefficient was studied between different parameters depending on the standard statistical methods. For the analysis of differences found in the effect of PCOS on different symptoms (t-test) was used, the relationship between PCOS and symptoms was considered significant at (0.05) and highly significant at (0.01) (Daniel, 1983).

## 3. RESULTS

Table (1) showed a significant positive correlation coefficient ($p>0.05$) between fasting blood sugar, FSH level and obesity. Table 1 demonstrated a highly significant correlation coefficient ($P<0.01$), between LH, testosterone levels and obesity. Table (2) also showed a significant positive correlation coefficient ($p>0.05$) between FSH level, testosterone and fasting blood sugar (FBS) but a highly significant positive correlation coefficient ($p<0.01$) between FSH and LH levels. In table (3), there is a significant positive correlation coefficient ($p>0.05$) between menstrual dysfunction and galactorrhea, diabetes mellitus and FSH level, but a highly significant positive correlation coefficient ($p<0.01$) between menstrual dysfunction and hirsutism, infertility, acne, obesity, LH level and testosterone, also a significant positive correlation coefficient ($P<0.05$) between menstrual dysfunction and galactorrhea.

**Table 1** Correlation between obesity and different parameters

| Degree of significance | Correlation | Parameters | Symptoms |
|---|---|---|---|
| p>0.05 | +ve | Fasting Blood Sugar (FBS) | Obesity |
| p>0.05 | +ve | FSH Level | Obesity |
| P<0.01 | +ve | LH level | Obesity |
| P<0.01 | +ve | Testosterone level | Obesity |
| P<0.05 | +ve | LH/FSH | Obesity |

**Table 2** Correlation between FSH and different parameters

| Degree of significance | Correlation | Parameter | Hormone level |
|---|---|---|---|
| P<0.01 | +ve | LH level | FSH level |
| p>0.05 | +ve | Testosterone level | FSH level |
| p>0.05 | +ve | FBS | FSH level |
| P<0.01 | -ve | LH\FSH | FSH level |

**Table 3** Relationship between menstrual dysfunction and other symptoms and hormonal changes

| Degree of significance | Correlation | Parameter | Symptoms |
|---|---|---|---|
| P<0.01 | +ve | hirsutism | Menstrual dysfunction |
| P<0.05 | +ve | galactorrhea | Menstrual dysfunction |
| P<0.01 | +ve | infertility | Menstrual dysfunction |
| P<0.01 | +ve | acne | Menstrual dysfunction |
| P<0.01 | +ve | obesity | Menstrual dysfunction |
| p>0.05 | +ve | diabetes mellitus | Menstrual dysfunction |
| p>0.05 | +ve | FSH level | Menstrual dysfunction |
| P<0.01 | +ve | LH level | Menstrual dysfunction |
| P<0.01 | +ve | testosterone | Menstrual dysfunction |

Menstrual dysfunction was observed highly in the age (26-35) of PCOs women, while in the age (36-45) and age (15-25) women have less menstrual dysfunction (Figure 1).

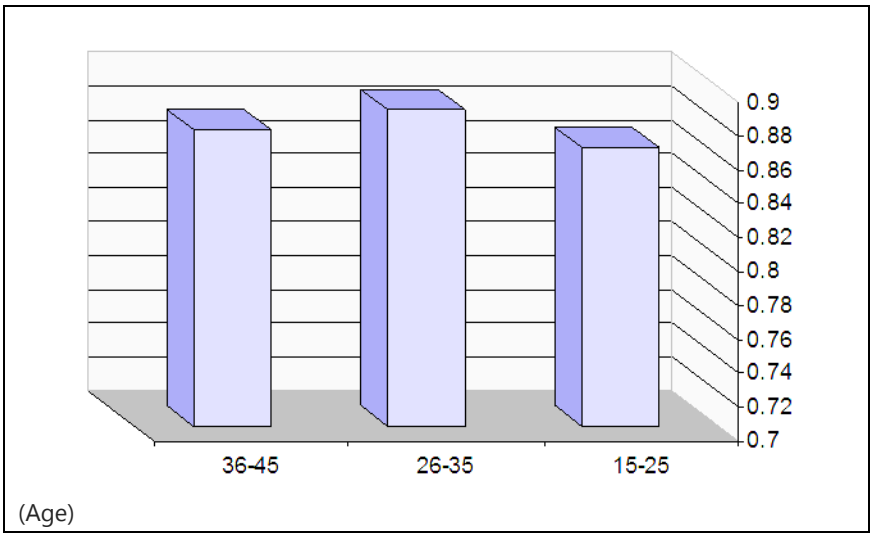


**Figure 1** Effect of patients age on menstrual dysfunction

Figure 2 showed the highest level of diabetes mellitus in PCOs women was in the age (36-45), while women with age (26-35) and (15-25) have lower level of diabetes.

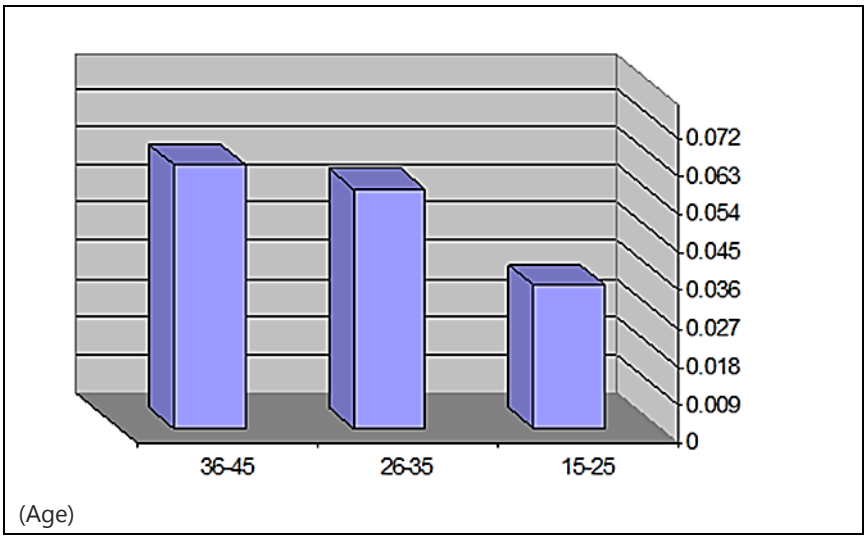


**Figure 2** effect of patient's age on diabetes mellitus

Figure 3 showed the level of prolactin in PCOs women was higher than that of normal women.

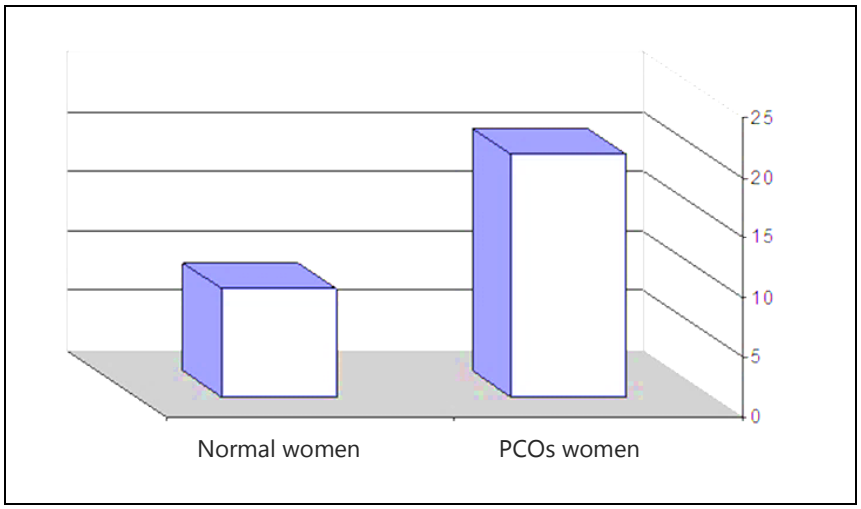


**Figure 3** Effect of PCOS on prolactin level

The level of LH in PCOs women was higher than that of normal women (Figure 4).

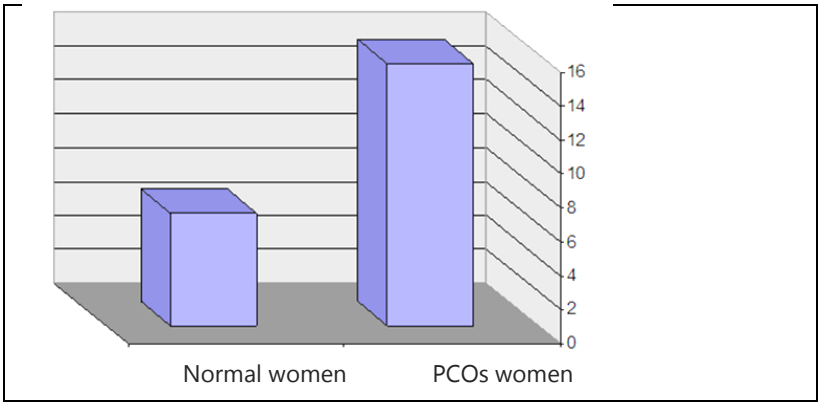


**Figure 4** Effect of PCOS on LH level

## 4. DISCUSSION

Polycystic ovary syndrome, one of the most common endocrine disorders, affects approximately 6 percent of women of reproductive age (Franks, 1995). The syndrome is the most frequent cause of anovulatory infertility, with its underlying etiology unknown. The classic description of the syndrome, which includes clinical findings of amenorrhea, hirsutism and bilaterally enlarged ovaries, is representative of more advanced cases (Stein and Leventhal, 1935). Polycystic ovary syndrome is now recognized as a heterogeneous syndrome. Affected women often have signs and symptoms of elevated androgen levels, menstrual irregularity and amenorrhea (Bachmann, 1998). This study investigated the elevation in the levels of hormones such as FSH, LH, Testosterone and Prolactin in PCOS women in addition to the relationship between obesity and these hormones, these results may explain the presence of unwanted hair (hirsutism) in PCOS women due to hyper secretion of testosterone. Our data reported that there is a significant positive correlation coefficient ($p>0.05$) between fasting blood sugar, FSH level and obesity. A highly significant correlation coefficient ($P<0.01$), between LH, testosterone levels and obesity, this result is similar to the result of Holte *et al*.,(1994) who found that PCOS women have higher fasting glucose levels than the controls. There is a significant positive correlation coefficient ($p>0.05$) between menstrual dysfunction and galactorrhea, diabetes mellitus and FSH level ,but a highly significant positive correlation coefficient ($p<0.01$) between menstrual dysfunction and hirsutism, infertility, acne, obesity, LH level and testosterone, this result is in agreement with the result of author Saucedo *et al*., (2016) who found that A correlation was observed between LH-FSH ratio and total antral follicle count ($p<0.001$) and with insulin resistance. Our results also showed a significant positive correlation coefficient ($p>0.05$) between FSH level, testosterone and fasting blood sugar (FBS) but a highly significant positive correlation coefficient ($p<0.01$) between FSH and LH levels. Our result was in disagreement to the result of Takeuchi *et al*., (2004) who found no difference among women with hyper prolactinemia, women with hypothalamic amenorrhea, and non-obese normal women. The result may be due to the hypersecretion of gonadotropin releasing hormone (GNRH) from hypothalamus or increasing in the secretion of LH-stimulating hormone and FSH-stimulating hormone from pituitary gland. The elevation in testosterone level may explain the hirsutism in PCOS patients.

## 5. CONCLUSION

The present study demonstrated that obesity highly associated with the presence of PCOS clinical symptoms such as the elevation in the levels of FSH, LH, Testosterone and menstrual dysfunction.

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