RESEARCH PAPER

The Correlation between Luteinizing hormone, Follicle stimulating hormone, Testosterone, and Prolactin Level at Different Depression Level in Polycystic Ovary Syndrome Patients

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ABSTRACT:

Polycystic ovary syndrome is an endocrine disorder in which the number of cysts in women’s ovaries is dramatically increased. It is a principle factor behind different symptoms and problems. Although non-life threatening, it may lead to some disease processes in later life. This study aimed to examine the alterations of luteinizing hormone, follicle stimulating hormone, testosterone and prolactin levels with increased levels of depression in polycystic ovarian syndrome (PCOS) patients. Psychological assessment of 50 women of reproductive age was performed using Beck’s Depression Inventory. In PCOS patients, depression induced LH and prolactin levels and markedly lowered FSH with a maintenance of an expected normal LH/FSH ratio. No change in testosterone was noted. Few symptoms of hirsutism were seen.

Conclusion: It seems that LH level is clearly increased and FSH level decreased significantly in comparison with their normal ranges. Prolactin tests were markedly elevated, while no alteration was noted for testosterone.

KEY WORDS: Correlation, Luteinizing hormone, Follicle stimulating hormone, Testosterone, Prolactin Level, Depression Level, Polycystic Ovary Syndrome Patients, Hirsutism.

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1.INTRODUCTION:

PCOS is one of the most common problems in women of reproductive age. In polycystic ovarian syndrome, the associated abnormalities include: hyperandrogenism, polycystic ovaries, oligomenorrhea, gynaecological and endocrine symptoms including anovulation, insulin resistance, as well as metabolic syndrome. Research suggested numerous possible causes in addition to many correlations with factors that lead to different disorders such as genetic diseases (Fauser et al 2011, Legro 2002, Diamanti-Kandarakis 2006), hormonal disturbances (Gory et al 2006, Brothers et al 2010), obesity (Qiao et al 2010), reproductive processes (Frearson et al 2013), low GI diet, vitamin D deficiency (Veltman et al 2012) and depression (Rasgon 2003). PCOS usually causes infertility associated with anovulation, in which a mid-luteal phase progesterone test may be used to diagnose luteal phase defects.

It has been shown that a high occurrence of depression was found among women with PCOS. Therefore, a high association between depression and PCOS markers (Kuczmierzyck and Hardeman 1948), along with stress has shown to weaken the immune system and increase the adrenohypophyseal cortisol (stress hormone) secretions (Bishop et al 2009). Furthermore, research indicated women with PCOS were shown to have increased risks for anxiety, depression...
and poor body image; with increased time taken to diagnose PCOS found associated with a poor psychological functioning (Tan 2009). All these factors can highly impair these women's quality of life and well-being.

PCOS represents a major risk factor for psychological and emotional problems, but infertility does not appear to constitute a primary determinant of psychological problems (Raja-Khan et al 2011). Multiple metabolic and cardiovascular risk factors are also associated with PCOS, including insulin resistance, type II diabetes mellitus, hypertension, dyslipidaemia, inflammation and subclinical cardiovascular disease (Lynch et al 2014).

A recent study showed that women with the higher stress levels are significantly more unlikely to get pregnant within the first 12 months of trying (Riedel et al 2002). Hence, the aim of this study is to evaluate and examine the relationship between different hormone levels and depression levels in our community. This is in addition to examining the variation in LH and FSH, testosterone and prolactin factors of follicular phase corresponding to each depression facet.

1.1 Materials and Method

Throughout this study’s steps (psychological assessment & ultrasound test), PCOS patients were informed about the aim of the study and their consent was taken. In addition, this work was commenced after the approval of the ethics committee at the college of pharmacy, Hawler Medical University in Iraq, and conducted from the 05/01/2014 to the 16/07/2014. Convenience method of sampling was used to collect the study subjects in different places within the city centre of Erbil, Iraq; with the total initial sample of 50 women (reduced to 45 later on), with verbal consent gained from all initial subjects. Psychological assessment was performed using the Beck’s Depression Inventory (BDI). This item can be self-scored by adding up the score for each of the 21 questions, with each question including 5 choices. Later 6 different categories were obtained, each of specific scale.

Data were collected through direct face to face interviews. Depression levels were categorized into six groups: normal (1-10), mild mood disturbance (11-16), borderline clinical depression (17-20), moderate depression (21-30), severe depression (31-40) and extreme depression (scores over 40).

The diagnosis of PCOS for each subject in each category was made on clinical basis with ultrasound examination by a qualified physician. PCOS changes were then identified. A detailed history was also taken from each patient regarding: age, disease duration, symptoms & signs (including primary & secondary infertility), irregular cycles (oligomenorrhea – no cycles >35 days; or amenorrhea – no menstrual cycle > 6 months), metrorrhagia, menorrhagia, hirsutism and history of repeated spontaneous abortion.

Routine blood sampling was performed by withdrawing 5 ml of venous blood from each subject in the follicular phase of the menstrual cycle, transferred into test tubes and centrifuged at 3000 rpm for 10 minutes. Serum has separated from RBC and other precipitant using a micro-pipette and poured into a new test tube before testing the hormonal assay for LH, FSH, testosterone and prolactin using the COBAS method.

1.2 Statistical Analysis

The statistical analysis was performed using the statistical package for social sciences (SPSS 18) at Hawler Medical University, Iraq. Microsoft Excel package was used to present the analyzed results. Data are expressed as mean ± standard error (mean ± S.E.). One-way analysis of variance (ANOVA) followed by Duncan’s Post Hoc test was applied for multiple comparisons. Pearson’s Correlations coefficient (r) was used to assess the strength of correlation between two numerical variables. A p value of <0.05 was considered as statistically significant.

1.3 Results

The results from Table 1 showed that the LH level (normal 2.3-12.9 MIU/ml) increased gradually within the first four categories (normal, mild, borderline and moderate depression groups). Their scales were 14.11 ± 1.95, 14.91 ± 1.16, 16.00 ± 1.90 and 16.19 ± 1.16 respectively, and slightly lowered in the 5th category (severe depression) 15.68 ± 1.49. These results displayed some consistency despite the non-significance
between each group and the normal amount. No extreme depression subjects was encountered, hence it is not accounted in all further tests.

Concerning FSH, results showed lower amounts in comparison to the normal range. These decreased levels were evident throughout all 5 analyzed depression groups, especially significant in the 5th severe depression group (6.41 ± 0.59) compared to the normal range (3.5-12.9 MIU/ml). Approximately all the amounts of both LH & FSH were determined at a ratio of 2:1 (LH:FSH). Similar to the LH levels, prolactin was found markedly elevated within the 5th depression group (31.01 ± 2.01 compared to normal 4.8-23.3 ng/ml). No significant variation was observed in the testosterone levels between the 5 depression groups.

As shown by Table 2 (correlation of all obtained scales), no significant associations were found between all groups throughout different parameters in PCOS patients, with the exception of a significant relationship between LH and testosterone.

### Table 1 Hormonal levels across 5 depression groups.

| Variables       | Normal (n = 6) | Mild (n = 11) | Borderline (n = 4) | Moderate (n = 17) | Severe (n = 7) |
|-----------------|----------------|---------------|--------------------|-------------------|---------------|
| LH (2.3-12.9 MIU/ml) | 14.11 ± 1.95\textsuperscript{a} | 14.91 ± 1.16\textsuperscript{a} | 16.00 ± 1.90\textsuperscript{a} | 16.19 ± 1.16\textsuperscript{a} | 15.68 ± 1.49\textsuperscript{a} |
| FSH (3.5-12.5 MIU/ml) | 9.59 ± 0.75\textsuperscript{a} | 7.54 ± 0.4\textsuperscript{ab} | 8.51 ± 2.11\textsuperscript{ab} | 8.3 ± 0.61\textsuperscript{ab} | 6.41 ± 0.59\textsuperscript{b} |
| Prolactin (4.8-23.3 Ng/ml) | 24.10 ± 1.27\textsuperscript{ab} | 18.05 ± 1.25\textsuperscript{ab} | 17.55 ± 5.26\textsuperscript{a} | 25.18 ± 3.95\textsuperscript{ab} | 31.01 ± 2.01\textsuperscript{b} |
| Testosterone (0.6-0.8 Ng/ml) | 0.49 ± 0.08\textsuperscript{a} | 0.41 ± 0.05\textsuperscript{a} | 0.36 ± 0.11\textsuperscript{a} | 0.50 ± 0.09\textsuperscript{a} | 0.47 ± 0.07\textsuperscript{a} |

\textsuperscript{a} - no significant difference; \textsuperscript{ab} - statistical difference at p ≤ 0.05.
Table 2 Correlation between different pairs of variables.

| Scale vs LH       | Person Correlation (r-values) | p-values |
|-------------------|-------------------------------|----------|
| Scale vs FSH      | -0.160                        | 0.325    |
| Scale vs Prolactin| 0.242                         | 0.133    |
| Scale vs Testosterone | -0.033                   | 0.838    |
| LH vs FSH         | 0.282                         | 0.078    |
| LH vs Prolactin   | 0.052                         | 0.746    |
| LH vs Testosterone| 0.370                        | 0.019    |
| FSH vs Prolactin  | -0.28                         | 0.76     |
| FSH vs Testosterone| 0.212                     | 0.183    |
| Prolactin vs Testosterone | -0.085      | 0.604    |

1.4 Discussion

PCOS has numerous symptoms which occur in varying combinations, thus creating a diverse clinical picture, unique to each woman affected. However, despite the diversity, depression is a prominent feature in most PCOS patients. Various hormones, along with the coping of a difficult diagnosis are the culprits of this salient feature. Depression can be an especially troublesome aspect of PCOS, as the consequent anergia can make it less likely for PCOS sufferers to seek help, potentially creating problematic daily emotional & physical challenges.

This research was initiated with 50 PCOS patients, but some of the data were far from the expected values, and therefore, were neglected to be 45 patients later on. Other data that showed to be reasonable to some extent has been considered as it it refers to the same direction of the expected test.

The present study did not consist of patients with extreme level of depression. This is may be due to lack of frankness by some women, or the shame and embarrassment in answering some questions specially those are related to their sexual life. These facts may explain the variation in some readings (results).

Although the values of the LH in normal, mild, border line, moderate and sever levels (14.11, 14.91, 16.00, 16.19 and 15.68), respectively, were not statistically significant comparison with the normal variable (2.3-12.9) MIu/ml, these results roughly showed that as the depression levels became higher, LH tends to slightly elevate.

On the contrary, the extracted values of the FSH were declined in all depression levels (9.59, 7.54, 8.51, 8.3, and 6.41) respectively, until it reached to a significant difference between the severe depression level (6.41 ± 0.59) and the normal value (3.5 – 12. 5) MIU/ml. These results clearly showed that as the depression levels became higher, the FSH level is evidently decreased.

In all the depression levels, LH/FSH ratios were higher than normal and these results confirm those being found (Adail 2008). However, these ratios were compensated to the ratio 2:1, in which it is familiar in PCOS patients. Therefore, it may be possible to say that severe depression showed a tendency to elevate LH hormone and simultaneously decreases the FSH level. This opposes saying that depression has no effect on the release of both of them as the indication could be picked up by a quick look to other lower levels.

The result revealed an apparent raise in the level of production of prolactin in severe depression. This is usually one of the standard signs noticed in PCOS patients. Therefore, it might be very important to acknowledge that the
longer a patient has PCOS diagnosis, the more likely the increase in risks of depression.

In contrast to what has been found (Adail 2008), the current result did not show a significant elevation in testosterone level and hirsutism at any depression level. It remains unclear which factors play a role in the development of depression due to PCOS in women rather than hirsutism as suggested (Kerchner et al 2009). The present result did not indicate an association between depression and hirsutism, confirming the results obtained (Adail 2008).

5. Conclusion: It seems that LH level is clearly increased and FSH level decreased significantly in comparison with their normal ranges. Prolactin tests were markedly elevated, while no alteration was noted for testosterone.

Conflict of Interest: The authors declare that they have no conflict of interest.

1.5 References:

Bishop SC, Bash S, Futterweit W. (2009). Polycystic ovary syndrome, depression, and affective disorders. 15 (5):475-82.

Brothers, K. J. (2010). Rescue of Obesity-Induced Infertility in Female Mice due to a Pituitary-Specific Knockout of the Insulin Receptor (IR). Cell Metabolism. 12 (3): 295–305.

Lynch C.D., Sundaram R., Maisog J.M., and Buck Louis G.M. (2014). "Preconception stress increases the risk of infertility: results from a couple-based prospective cohort study - the LIFE study." Hum. Reprod. deu 032v1-deu032.

Deeks A. A., Gibson-Helm M. E., Paul E. and Teede H. J. (2011). Is having polycystic syndrome predictor of poor psychological function including anxiety and depression? Human Reproduction. 26 (6):1399 – 1407.

Diamanti-Kandarakis E; Kandarakis H, Legro RS. (August 2006). "Infertility in polycystic ovary syndrome: focus on low-dose gonadotropin treatment". Endocrine. 30 (1): 27–33.

Kerchner A, Lester W, Stuart SP, Dokras A. (2009). Risk of depression and other mental health disorders in women with polycystic ovary syndrome: a longitudinal study. Fertile Steril. 207 – 212.

Kuczmierzyczk, AR, Hardeman, PJ. (2011). Anxiety and depression in polycystic ovary syndrome: a systematic review and meta-analysis". Hum. Reprod., 93 (6): 1948–56.

Legro RS ; Strauss JF. (September 2002). Molecular progress in infertility: polycystic ovary syndrome .Fertility and Sterility. 78 (30) : 569–576.

Qiao, J.; Feng, H. L. (2010). "Extra- and intra-ovarian factors in polycystic ovary syndrome: impact on oocyte maturation and embryo developmental competence". Human Reproduction Update. 17 (1): 17.

Raja-Khan N., Stener-Victorin E., Wu X., and Richard S. L. (2011). The physiological basis of complementary and alternative medicines for polycystic ovary syndrome. J.Physiol endocrinol Metab. (301): E1-E10.

Rasgon NL. (2003). Depression in women with polycystic ovary syndrome: clinical and biochemical correlates. J Affect Disord. 74(3):299-304.

Riedel Wim J, Tineke-Klaassen and Jeroen A.J. Schmitt. (2002). Tryptophan, mood and cognitive function. “Brain, behavior and Immunity. 16(5):81-589.

Tan S. (2009). Psychological implication of infertility in women with polycystic ovary syndrome. Human Reproduction. 23(9) : 2064–2071.

Veltman-Verhulst SM, Boivin J, Eijkemans MJ, Fauser B.J. (2012). Emotional distress is a common risk in women with polycystic ovary syndrome: a systematic review and meta-analysis of 28 studies. Hum. Reprod. Update. 18 (6): 638–51.