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Clinical significance estimation of level SOD enzyme, the Sex hormone in Najaf Province Patients, IRAQ. A Comparative Study

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ABSTRACT
A case-control research was conducted to evaluate the contribution of oxidative stress on the emergence of female infertility. In a healthy body, reactive oxygen species (ROS) and antioxidants coexist peacefully. When an overabundance of ROS dominates the equilibrium, oxidative stress (OS) results. A woman is affected by OS during her whole reproductive life and even after (i.e. menopause). Prooxidants (free radical species) and the body's ability to scavenge them are at odds, which leads to OS (antioxidants). Since ROS play a critical signaling role in both pathogenic events affecting the female reproductive system and normal functions, they are a double-edged sword. ROS has an effect on a variety of physiological processes, including egg maturation, fertilization, hormone sex, and pregnancy. The present study also observed that the concentration of SOD (pg/ml) in (60) patients with infertility was 61.80 ± 0.91 pg/ml is decrease significantly at P value < 0.05 than (30) of control group were 33.59 ± 1.08 pg/ml.

Keywords: Infertilitywomen, Oxidative stress,SOD enzyme, Sex hormone.

INTRODUCTION

The condition known as infertility impairs or restricts a person's ability to become pregnant and give birth. Among heterosexual couples (a man and a woman), this is frequently found after a year of trying to get pregnant (but maybe diagnosed sooner depending on other factors). Among heterosexual couples, one-third of infertility reasons are associated with male difficulties, one-third with female issues, and one-third with a combination of unknown variables. When the female partner is found to be the cause of infertility, the condition is referred to as female infertility, sometimes known as "female factor" infertility (Zauner and Girardi.,2020).Infertility affects all couples who are of reproductive age and is a serious issue. It varies from other illnesses since it is thought to be a particular reproductive health problem. Despite the considerable effects it has on couples, their families, and society as a whole, infertility is not a life-threatening condition(Simionescu *et al* .,2021).It is seen as a problem for world health. Around the world, 60–80 million infertile couples struggle with infertility issues. In industrialized nations, the prevalence of infertility ranges from 3.5% to 16.7%, whereas in underdeveloped nations, it ranges from 6.9% to 9.3%, with an estimated median frequency of (9) worldwide (Al-Mahmood andAl-Ajeely 2020).An antioxidant may be defined (Gutteridge,1994) as "Any chemical that, when present at low concentrations relative to those of the oxidizable substrate, significantly retards or inhibits the oxidation of the oxidizable substrate." For convenience of application, antioxidants are typically divided into two categories: primary or chain-breaking antioxidants, and secondary or preventative antioxidants. Secondary or preventative antioxidants are substances that impede oxidation.The use of naturally occurring antioxidants has been encouraged due to concerns about the safety of synthetic antioxidants, as natural alternatives (like plant bisphenols) have antioxidant activity that is comparable to or even greater than that of

synthetic antioxidants (Beutner *et al* .,2001).Reduced sperm quantity, motility, and fusion due to oxidative stress are all factors in male and female subfertility (Alahmar, 2019).In female infertility situations, prostaglandin F2-alpha promotes the production of the SO anion by luteal cells and phagocytic leukocytes in the corpus luteum. ROS are produced when ovarian blood supply is reduced, which causes tissue damage. Mn-SOD concentrations increase in the corpus luteum during regression in order to scavenge ROS produced in the mitochondria by inflammatory reactions and cytokines. There is a considerable decrease in Mn-SOD in the regressed cell as a result of the full disruption of the corpus luteum. Currently, cell death is imminent (Shkolnik *et al* ., 2011).The synthesis of progesterone is closely tied to the Cu, Zn-SOD enzyme, and Mn-SOD shields luteal cells against inflammation brought on by OS (Behrman *et al* ., 2001).

PATIENTS AND METHOD

Ethical approval

Approval for this study was obtained from the University of Kufa Academic and Ethical Committee. Informed consent from all the patients was obtained. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Total women and hormones levels measurement:

One hundred twenty women age range 20-50 years old (90 infertility and 30 control fertile) were admitted at AL-Sadder Medical City, Al-Najaf Province during the period from January to June 2022, Five ml of serum was placed in a gel tube, which was stored at (-20) ºC, and used to measure the levels of the catalase enzyme and sex hormones in the blood. Sex hormones levels have been measured by using the Minivides technology (Marcy-rEoile-France) and catalase enzyme using a spectrophotometer.

Statistical analysis

Inclusion Criteria: Infertile women, patients with primary infertility, and secondary infertility**.**

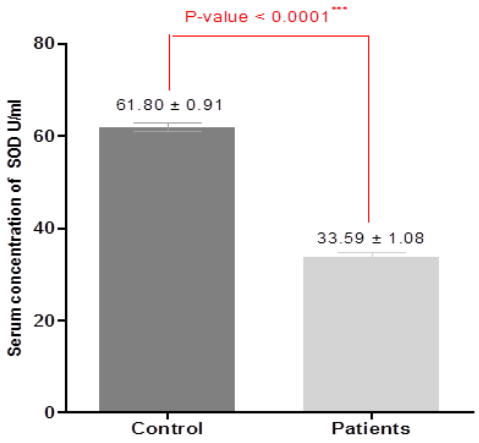
Inclusion and Exclusion Criteria: The following medical conditions have been excluded Patients with Breast Cancer, polycystic ovary syndrome (PCOS), thyroid problems premature ovarian failure, Arthritis, Chronic bronchitis, Chronic kidney disease, Glomerulonephritis, Asthma, rheumatism, diabetes disease, and retinal diseases.

Statistical analysis: The one-way ANOVA Scheffe's method was employed represented as mean ±standard deviation) S.df). A $p < 0.05$ was considered statistically significant to compare patients and healthy people.

RESULTS AND DISCUSSION

Evaluation of SOD in infertilitypatients

The present study also observed that the concentration of SOD (pg/ml) in (60) patients with infertility was 61.80 ± 0.91 pg/ml is decrease significantly atP value < 0.05 than (30) of control group were 33.59 ± 1.08 pg/ml as shown in figure 1 .



Figure(1): SOD concentration (pg/ml) patients with infertility women and Control group.

Evaluation of LH in infertilewomen:
The present study also observed that the concentration of LH in 60 infertile women was (8.694 ± 0.2880)pg/ml is increase significantly atP-value< 0.05 than 30 control group (3.911 ± 0.2935) pg/ml as shown in figure 2.

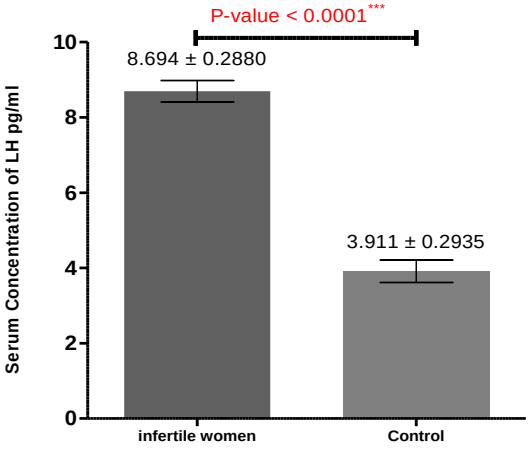


Figure 2: LH levels in infertile women and control group

Evaluation of FSH in infertile women:
Non-significant difference has been shown in figure 3 in FSH level between infertile women(6.793±0.20) pg/ml and control group (6.353±0.38) pg/ml.

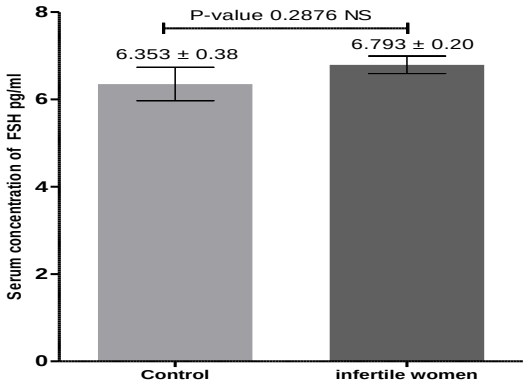


Figure 3: FSH levels in infertile women and control group

Evaluation of prolactin in infertile women:

The present study also observed that the concentration of prolactin in 60 infertile womenwas (42.62 ± 2.935)pg/ml is increase significantly atP-value< 0.05 than control group (13.26 ± 0.7908) pg/ml as shown in figure 4.

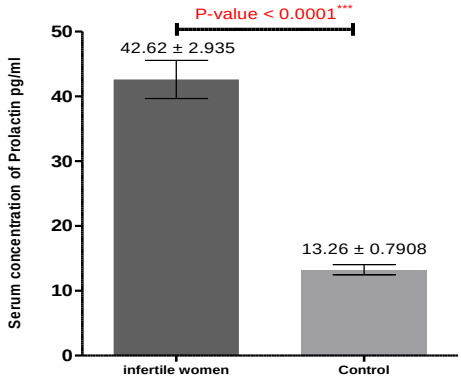


Figure 4: Prolactin levels in infertile women and control group

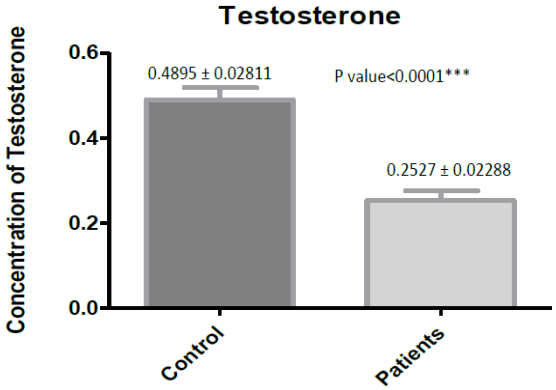


Figure 5: Testosteronelevels in infertile women and control group

DISCUSSION

The statistical analysis for the current study showed a substantial difference in (SOD)decrease significantly at P value < 0.05 serum levels between the patient infertility women and the control group; hence, there is a direct correlation between SOD enzyme serum levels in infertility women and in the control group, present results found that decreased SOD activity may participate in infertility because previous research (Al-Qaysi and Al-Asedde,2016).

The study conducted by Bizon *et al* (2022) at Wroclaw Medical University in Poland found that alterations in the expression level, concentration, and activity of superoxide dismutase (SOD) were associated with disorders of women's genital functions. Specifically, SOD activity was identified in developing follicles, membranes of granulosa cells of Graafian follicles, postovulatory follicles, as well as in follicular fluid and ovaries.

Matos *et al*. (2009) conducted research at the University of Porto, Portugal, which found that superoxide dismutase (SOD) is associated with oocyte quality. As an antioxidant enzyme, SOD helps protect cells from oxidative stress, which can damage the genetic material and other components of the cell. The study suggests that SOD may be an important factor in maintaining the quality of oocytes, which are essential for successful fertilization and embryo development. This further emphasizes the importance of SOD in women's reproductive health.

Pei *et al* ., (2022) found that the changes observed in women's reproductive cells were due to increased oxidative stress. Specifically, the study found that oxidative stress mediates lipid peroxidation, which results in the production of malondialdehyde (MDA). Additionally, the study identified that levels of antioxidant enzymes such as superoxide dismutase (SOD), glutathione peroxidase (GSH), and catalase were low in women with oxidative stress, while MDA concentration was high in their peritoneal fluid. This suggests that oxidative stress can cause significant damage to reproductive cell structures, which may negatively impact fertility. These findings underscore the importance of maintaining healthy levels of antioxidant enzymes to protect reproductive cells from oxidative damage.

Kolesnikova *et al* ., (2012) conducted a study on infertility women patients from Russian populations and found that reduced total antioxidant activity and lower levels of superoxide dismutase (SOD) were observed in these patients. Additionally, the study revealed decreased concentrations of reduced glutathione in infertility women patients. These findings are consistent with the study by Pei et al. (2022) that suggested that oxidative stress can lead to reduced levels of antioxidant enzymes such as SOD and damage to reproductive cell structures.

The study by Cahill and Wardle in 2002 found that LH levels were higher in infertile women compared to fertile women. Specifically, the LH levels in infertile women were found to be 9.32 ± 6.69 mIU/mL, while the levels in fertile women were 3.70 ± 3.39 mIU/mL. It is interesting to note that the study did not find any associated symptoms of raised LH, such as an irregular menstrual cycle, in infertile women. However, the elevated levels of LH in infertile women may suggest an underlying hormonal imbalance that could be contributing to their infertility.

It is interesting to note that the current study found a relationship between oxidative stress and infertility, as well as the potential role of hormones, specifically luteinizing hormone (LH), in regulating oxidative stress in infertile women. These findings are consistent with the thesis by Palani in 2017, which also suggested a link between oxidative stress and female infertility, and explored the potential involvement of hormones in this relationship. Together, these studies suggest that oxidative stress and hormonal imbalances are important factors contributing to female infertility.

The results of the current study agreed with the results of the researcher Alam *et al* ., (2019) at the University of Karachi, Pakistan that found the study Role of Hormones in the Regulation of Antioxidants in Female Infertility Serum, FSH level was not significantly different (p>0.05) found in FSH (IU/mL) infertility women patients(8.2 ± 1.1) compear with women Control group(8.89 ± 0.34).

Notice to the researcher Palani,(2017) University of Garmian. that in the study there were no differences in FSH levels between infertile and fertile women (4.81±3.30 and 2.90 ± 1.41 mIU/mL)

respectively. Although there is no emersion of the associated symptoms (e.g. irregular menstrual cycle), with a significant decrease in SOD levels in infertile women compared with fertile women. these results are in agreement with the results of the current studies.

Prolactin hormone shows a significant increase in the infertile women's group in comparison with their control group. Prolactin is one of several hormones that are produced by the pituitary gland (Wdowiak *et al* 2020).

The present study observed an increase significantly at P value < 0.05 testosterone with oxidative stress, biomarkers showed a negative relationship between Testosterone hormone and SOD in infertility women patients compear with the control group. In these cases, this process involves the generation of ROS and depletion of antioxidant- SOD in the state of oxidative stress-free, This is consistent with the thesis of the researcher (Agarwal and Allamaneni, 2004).

The results of the current study agreed with the results of the researcher De Luca *et al* ., (2021), Study has there low antioxidant levels and low testosterone levels. also have found that persons with low testosterone levels have lower levels of antioxidants, such as SOD, and CAT compared to men with normal testosterone levels.

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