The role of some of the level Antioxidant enzymes and Obesity in development infertility women's infertility in Najaf Province Patients, IRAQ

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Abstract. In case-control research, the impact of Obesity and oxidative stress on the emergence of infertility in women was examined. From October to February 2022, I examined 150 clinical samples of women, all female and aged (at childbearing age). Two groups of patients were formed: the first group contained 60 patients with obesity-related infertility in women and 60 patients with non-obesity-related infertility in women. In contrast, the second group contained 30 control subjects who were fertile. Saline blood From each patient, samples were taken. This study adhered to the same ethical standards as the accepted patients who visited the Infertility Center at AL-Sader Medical City in the province of AL-Najaf. Using a gel tube, 3 ml of venous blood was placed to separate the serum and calculate the catalase (CAT), Level of the enzyme Superoxide Dismutase (SOD), and Glutathione peroxidase (GPx) Infertility in Women patients' serum concentrations of Catalase (CAT), SOD and GPx was found to be significantly lower ($P \leq 0.05$) than those of control women. The findings showed a positive correlation with significant differences between catalase andSOD AND GPX, sex hormone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin ana Teststerone respectively.

1 Introduction

The medical term for infertility is "infertility." It is defined as the failure to conceive after 12 or more months of regular, unprotected sexual intercourse. However, if there are medical reasons or a history of potential fertility issues, an inquiry may be begun earlier [1].The prevalence of female infertility can vary depending on a woman's age. According to estimates, about 7-15% of reproductive-aged couples experience infertility, however, this percentage can go up to as much as 28% in women older than 35 years. Additionally, it is reported that 84% of couples will become pregnant after one year of having regular, unprotected intercourse, and 92% will do so after two years. It's important to note that these are just estimates, and actual fertility rates can vary widely due to a variety of factors [2].The prevalence and causes of infertility can vary, it is estimated that 40-50% of infertility cases

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are related to female factors. These can include issues such as hormonal imbalances, structural problems with the reproductive system, or problems with ovulation. Another 20-30% of infertility cases are caused by a combination of both female and male factors, such as problems with sperm count, motility, or shape. The remaining cases of infertility are caused by male factors, or the cause is unknown [3]. Oxidative stress (OS) is an imbalance between the production of reactive oxygen species (ROS) and the body's ability to detoxify them. When there is an excess of ROS, it can cause damage to cells, including oocytes (eggs) and sperm. In women, OS can cause damage to the ovaries and the ovarian follicles, which can lead to infertility. The oocytes within the ovarian follicles can be directly harmed by OS, leading to poor oocyte quality and an increased risk of miscarriage. Furthermore, OS can also lead to an environment in the peritoneal cavity that is detrimental to oocytes and spermatozoa, which can impede fertilization.According to [4]. Reactive oxygen species (ROS)-antioxidant imbalance is also linked to luteal regression and inadequate luteal hormonal support for the continuation of pregnancy.

Obesity and malnutrition may impact infertility and other lifestyle choices like smoking, drinking, and recreational drugs [5]. Endocrine-disrupting substances (EDS) and pesticides in the environment and at work. Oxidative stress is brought on by several factors [6]. Antioxidant status and sex hormones interact intricately in female infertility. Ovaries, fallopian tubes, and the uterus can get damaged as a result of oxidative stress, which develops when antioxidants and reactive oxygen species (ROS) are in an unbalanced state. and oxidative stress can have a deleterious impact on sex hormones including LH and FSH, Prolactin, and Testosterone synthesis and function, which are essential for healthy reproduction [7]. Numerous harmful occurrences are brought on by fat. Includes insulin resistance, diabetes, liver failure, rheumatologic issues, cardiovascular issues, sleep issues, asthma, oncological issues, and reproduction, As depicted in the following picture (one) [8].

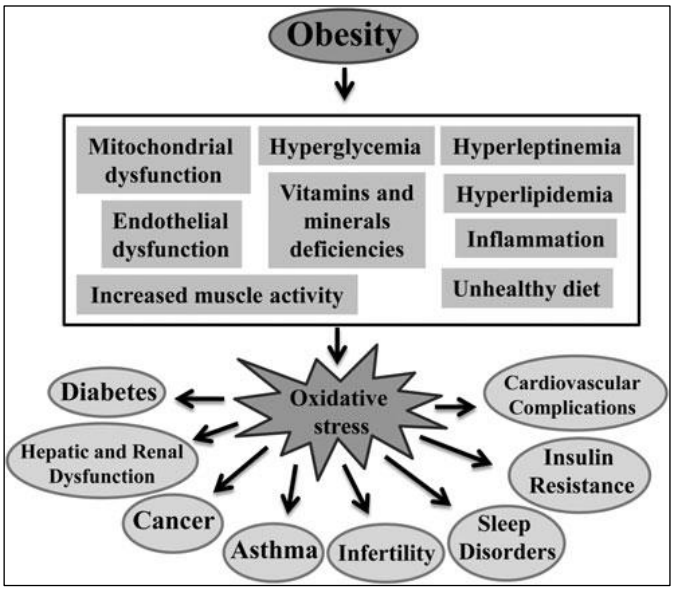

Fig. 1. Conditions generating oxidative stress in the pathogenesis of Obesity and the role of oxidative stress in developing obesity-associated health risks [8].

Finally, 15% of couples experience unexplained infertility. Unexplained or idiopathic infertility is the diagnosis if the findings of a typical infertility examination are normal [9].

2 Methods

2.1 Patients and method

Patients and Method: It was decided to conduct a case-control hospital-based study between May and September 2022. The participants in the study were split into two groups: the first group had patients with Obesity and infertility in women (60) ,the infertility women patients without Obesity (60), the second group had healthy women (30), and The study aimed to evaluate the levels of activity of three enzymes CAT, SOD, and GPX in the blood using a spectrophotometer. Sex hormone levels have been measured using the Minivides technology (Marcy-rEoile-France) [7]. Ethical considerations were taken into account, and the study was approved by the Medical Ethics Committee of the Ministry of Health in Iraq.

2.2 2.2 Semen samples and processing:

After three days of no sexual activity, semen samples were obtained via masturbation and placed in sterile containers. The samples were examined for semen quality (volume, motility, concentration, and morphology) within an hour of ejaculation following the [10], guidelines [11].

2.3 Inclusion and Exclusion Criteri

Patients with breast cancer, arthritis, chronic bronchitis, chronic renal disease, glomerulonephritis, asthma, rheumatism, diabetic illness, and retinal diseases have been excluded from the study

2.4 Statistical analysis

The results of the one-way ANOVA using Scheffe's approach are shown as mean, standard deviation) S.df). The statistical threshold for comparing sick to healthy individuals was ($P \leq 0.05$) [12].

3 Results

Table 1. Distribution of infertility in women patients, Obesity infertility in women patients, and Control According to age.

Range of age	Patient infertility women	Patient infertility women obesity	Control
Count 18 - 28	51.47%	23.88%	58.62%
Count 29 - 39	39.71%	65.67%	31.03%
Count > 40	8.82%	10.45%	10.34%

3.1 Determination of serum level catalase activity:

According to figure 2, the findings of the current study revealed a significant decrease ($P \leq 0.05$) in the level of catalase in infertility women patients (17.00 ± 0.2415) and a significant increase ($P \leq 0.05$) in the level of catalase in infertility women who are obese patients (11.15 ± 0.3118) compared with the control group (27.99 ± 0.8654), as well as a significant increase ($P \leq 0.05$) in the level of catalase.

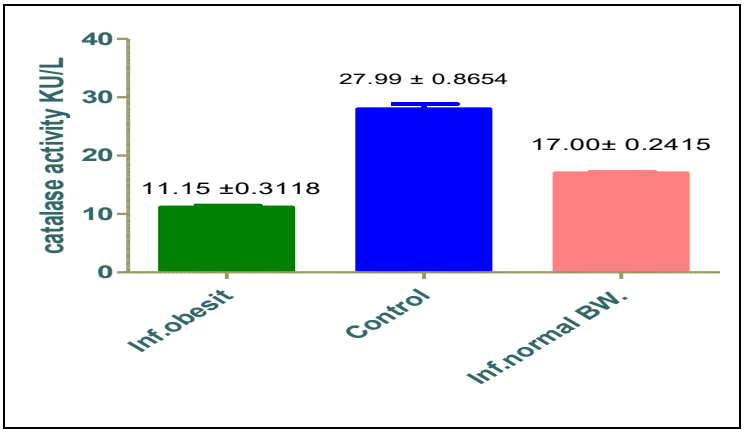

Fig. 2. Determination of serum level catalase activity in Obesity and infertility in women patients and healthy controls group

3.2 Determination of serum level SOD activity:

According to figure 3, the findings of the present study revealed a significant decrease ($P \leq 0.05$) in the level of SOD in infertility women patients (42.83 ± 0.7080), and a significant increase ($P \leq 0.05$) in the level of catalase in infertility women who were obese (3080 ± 0.7268) compared to the control group (61.68± 0.9345) as well as a significant increase ($P \leq 0.05$) in the level of SOD.

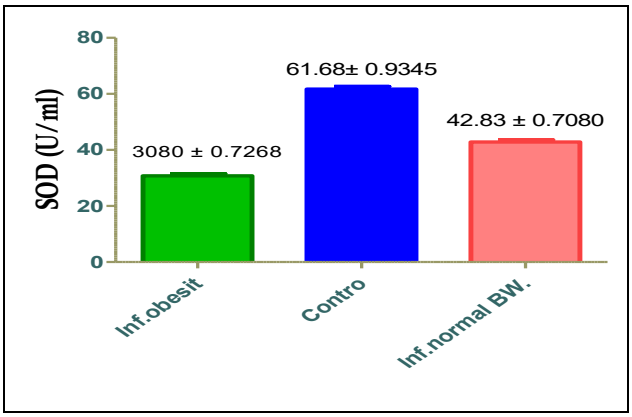

Fig. 3. Determination of serum level SOD activity in Obesity and infertility in women in patients and healthy controls group

3.3 Determination of serum level Glutathione peroxidase (GPx) e activity

According to figure 4, the findings of the current study revealed a significant decrease ($P \leq 0.05$) in the level of GPX in infertility women patients (22.04 ±0.784) and a significant increase ($P \leq 0.05$) in the level of GPX in infertility women who are obese patients (26.61±0.931) compared with the control group (33.39 ± 1.136), as well as a significant increase ($P \leq 0.05$) in the level of GPX.

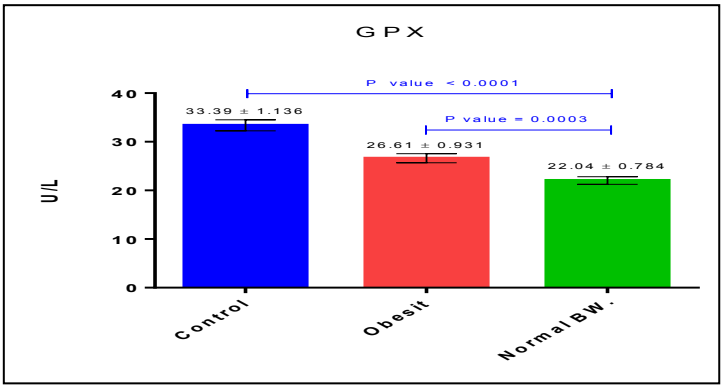

Fig. 4. Determination of serum level (GPx) activity in Obesity and infertility in women in patients and healthy controls group.

3.4 Evaluation of LH hormone level in Obesity and infertility in women patients and controls group

The present study also observed that the concentration of LH significant increase ($P \leq 0.05$) in the level in infertility women patients (8.721 ±0.290) and infertility women who are obese patients (9.077±0.213) compared with the control group (3.961± 0.288), as shown in figure 5.

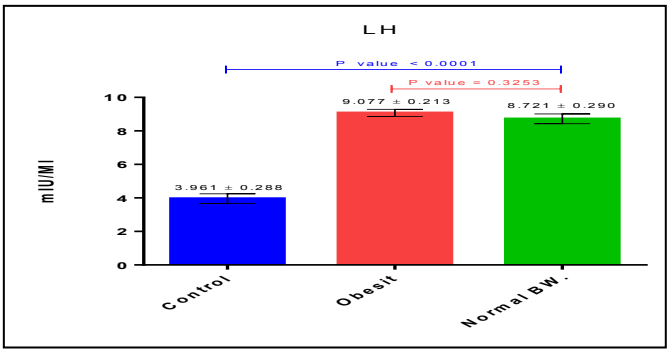

Fig. 5. LH levels Obesity and infertility in women in patients and healthy controls group.

3.5 Evaluation of FSH hormone level in Obesity and infertility in women in patients and healthy controls group

The present study also observed that the concentration of FSH significant increase ($P \leq 0.05$) in the level in infertility women patients (6.783 ±0.2015) and infertility women who are obese patients (6.299±0.1451) compared with the control group (5.003± 0.2547), as shown in figure 6.

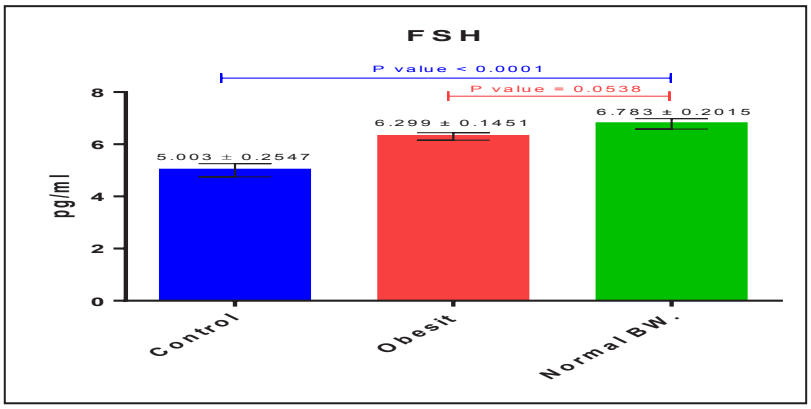

Fig. 6. FSH levels Obesity and infertility in women in patients and healthy controls group.

3.6 Evaluation of Prolactine hormone level in Obesity and infertility in women in patients and healthy controls group

The present study also observed the findings of a significant increase ($p \leq 0.05$) in the level of prolactin hormone in infertility women patients (42.67 ± 2.935), and a significant increase ($p \leq 0.05$) in the level of prolactin in infertility women who were obese (30.62 ± 1.140) compared to the control group (13.26 ± 0.790) as well as a significant decrease ($P \leq 0.05$) in the level of prolactin hormone.

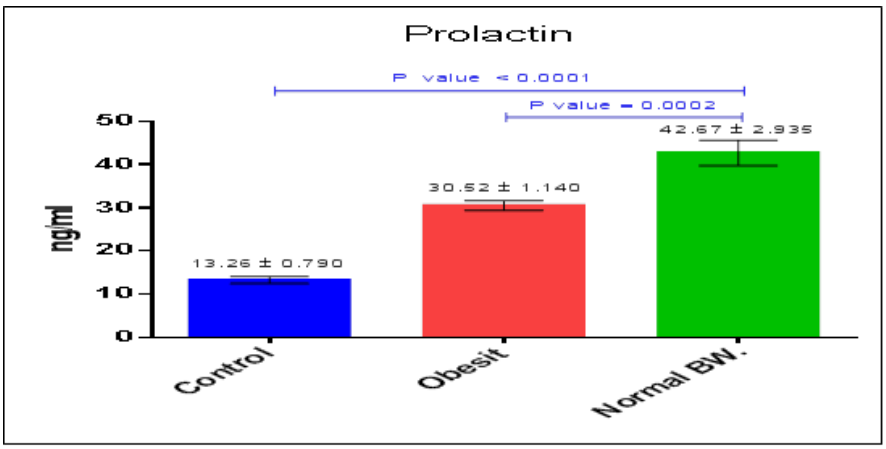

Fig. 7. Prolactin levels Obesity and infertility in women in patients and healthy controls group.

Evaluation of Testosterone hormone level in Obesity and infertility in women in patients and healthy controls group .

3.7 Evaluation of Testosterone hormone level in Obesity and infertility in women in patients and healthy controls group

The present study also observed the findings of a significant decrease ($p \leq 0.05$) in the level of Testosterone hormone in infertility women patients (0.2170 ± 0.020), and a significant decrease ($p \leq 0.05$) in the level of Testosterone hormone in infertility women who were obese (0.2004 ± 0.021) compared to the control group (0.4905 ± 0.027) as well as a significant increase ($P \leq 0.05$) in the level of Testosterone hormone.

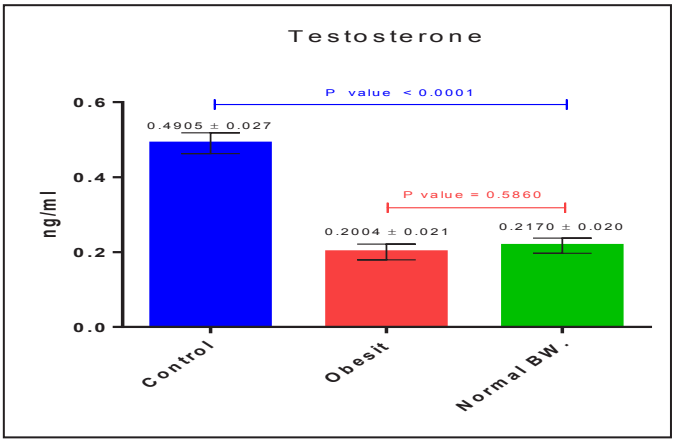

Fig. 8. Testosterone levels Obesity and infertility in women in patients and healthy controls group.

4 Discussion

The goal of the current study was to compare the more extensive age range for infertility patients among women between the ages of (18 – 28) in the control group, which read 58.62 percent, and determine the prevalence of Obesity among infertility patients among those between the ages of (29 -39). According to studies by [13], mild oxidative stress gradually arises as people age. According to the [14] study, aging is the gradual tissue and organ function decline over time. The oxidative stress theory of aging, also known as the free radical theory of aging, is based on the structural damage-based theory that age-related functional losses result from an accumulation of oxidative damage to macromolecules (lipids, DNA, and proteins) caused by reactive oxygen and nitrogen species (RONS). Additionally, [15] noted in their study that getting older was linked to the interaction between age and gender in the sexual life domain. Men's sexual life exhibited a consistent reduction with age, but women's sexual life scores declined in all age groups after age 18–24.9. Women scored significantly lower (more impaired) than men on all IWQOL-Lite domains. As a result, growing older has both positive and harmful effects on how weight affects a person's quality of life when they are overweight or obese. The current investigation aimed to assess serum CAT, SOD, and GPx enzyme levels in patients as an efficient infertility screening, diagnostic, and prognosis for infertile women and investigate the relationship between CAT, SOD, and GPx and a some sex hormons.

Infertility in women was shown in the current study to gradually decline in significant ($P \leq 0.05$) CAT, SOD, and GPx enzyme serum levels compared to infertility in women due to Obesity and healthy controls. The new study supports the findings of [16], who found that female Obesity and underweight harm fertility by altering hormone rhythms and the menstrual cycle. The findings of the present investigation were in agreement with those of

[17]. They discovered lower serum levels of catalase activity in infertile women than in the control group. The findings of Malaysian study by [18], indicate that antioxidant enzymes guard against oxidative damage. The current results indicate that the obese body group had higher CAT activity than the average weight group. According to various papers, the elevated CAT activity in the obese body group is indicative of the existence of oxidative stress. CAT is a tetrameric protein that is primarily present in peroxisomes. It facilitates the breakdown of hydrogen peroxide into water and hydrogen. This is in line with the outcomes we already have.

The study's authors [19], should be aware that It has been demonstrated that losing weight helps with fertility and menstrual cycle regularity and increases the likelihood of spontaneous ovulation and conception in anovulatory overweight and obese women. He mentioned to that in his studies [20], it was significant that weight loss of between 5 and 10 percent of body weight may unquestionably improve fertility rates, while other studies demonstrate that 5 percent of weight loss results in a significant improvement of endocrine parameters, such as a decrease in free testosterone, LH, and insulin levels, with an increase in ovulation frequency .Epidemiology, biochemistry, and clinical studies have determined that oxidative stress markers have a role in infertility in women [21]. The analysis's findings are intended to evaluate how antioxidants and oxidative stress interact in infertile women. Overall, we discovered lower levels of catalase (CAT) in patients with infertility than in healthy controls, which is consistent with the current investigation. The gynecologic environment's oxidative stress is probably a modulator of conception.

There are threshold levels of oxidative stress that are necessary for encouraging conception. These ROS are produced by metabolically active cells. According to research, maintaining a healthy body weight, eating a diversified diet, taking multivitamins regularly, and avoiding alcohol and caffeine all help fertility [22]. The new study supports the findings of [23], who describe how Obesity affects granulosa cells, cumulus cells, and oocytes in obese females' ovaries. In addition to the production of oxidative stress and endoplasmic reticulum stress responses, which are closely linked with systemic inflammation, Obesity is associated with lipid accumulation in non-adipose tissue cells. These exact mechanisms are reportedly activated in the ovary in response to Obesity, according to the analysis of the cells and fluid from obese women's ovaries. Studies back this up and help us better understand the mechanisms through which diet-induced Obesity affects the endoplasmic reticulum and mitochondria in obese female. Observe the changes in SOD expression level, concentration, and activity reported by [24], at Wroclaw Medical University in Poland. SOD activity was found in developing follicles, membranes of granulosa cells of Graafian follicles, postovulatory follicles, as well as in follicular fluid and the ovaries in the case of disorder of women's genital functions, indicating that this enzyme is involved in the ovulation process and the development of oocytes.

The current study supports the researcher's findings. GSH, SOD, CAT, TAC, Se, Zn, and Mg levels were considerably lower in the primary and secondary kinds of unexplained infertility compared to controls, according to [25]. An additional function for oxidative stress pathways in the pathogenesis of unexplained infertility may be suggested by the considerable difference in oxidant/antioxidant state between unexplained infertile and fertile women. Female infertility is one of Obesity's underappreciated side effects. Young ladies are frequently obese [26]. GPX (glutathione peroxidase) is an antioxidant enzyme that helps protect cells from oxidative stress. Oxidative stress occurs when there is an imbalance between free radicals and antioxidants in the body, leading to damage to cells, including reproductive cells [27]. Women with infertility have lower levels of GPX in their follicular fluid (the fluid that surrounds developing eggs in the ovaries), and that supplementation with antioxidants including GPX may improve fertility outcomes in some cases. However, other studies have found no association between GPX levels and female infertility [28]. Obesity

has been linked to an increase in oxidative stress, which can lead to damage to cells, including reproductive cells. GPX is an antioxidant enzyme that helps protect cells from oxidative stress. Studies have found that levels of GPX may be decreased in obese individuals, which may contribute to increased oxidative stress and associated health problems, including infertility [8]. Obesity is associated with infertility and oxidative stress. One of the main mechanisms linking obesity and infertility is the alteration of the hormonal balance in the body. Obesity is characterized by chronic low-grade inflammation, which can cause an increase in the production of inflammatory markers and pro-inflammatory cytokines. These changes can disrupt the normal hormonal milieu in the body and cause problems with ovulation and the menstrual cycle [29].

In women, obesity has been linked to reduced fertility, as it can disrupt hormonal balance and impair ovulation. Some studies have found that supplementation with antioxidants, including GPX, may improve fertility outcomes in obese women by reducing oxidative stress [30]. Obesity can have a significant impact on the levels of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), which play important roles in the menstrual cycle and fertility [31]. LH is a hormone that plays a key role in ovulation, it is responsible for the ovary to release an egg. In women who are obese, high levels of estrogen can lead to increased LH levels, which can cause the ovaries to release eggs more frequently. This can cause disruptions in the menstrual cycle and make it more difficult for women to become pregnant [19]. FSH, on the other hand, is a hormone that stimulates the growth and development of the follicles in the ovaries, which contain the eggs. Elevated levels of estrogen caused by obesity can suppress FSH, which may prevent ovulation. Furthermore, chronic high Insulin levels caused by obesity can lead to Hyperinsulinemia which can cause suppression of FSH and LH levels in the blood leading to decreased ovulation and fertility) [32].

Overall, obesity can have a negative impact on LH and FSH levels, which can contribute to fertility-related issues and make it more difficult for infertile women to become pregnant. It is important for women who are struggling with infertility to work with their healthcare provider to address any underlying health issues, such as obesity, that may be contributing to their infertility [33].

The relationship between obesity and changes in the levels of prolactin and testosterone in infertile women. obesity is associated with hormonal imbalances in the body, which can lead to a range of reproductive health issues, including infertility. One of the hormones that may be affected by obesity is prolactin, a hormone that is produced by the pituitary gland and plays a role in breast development and milk production. In obese women, high levels of prolactin interfere with ovulation and fertility [34]. 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 [35].

The results of the current study agreed with the results of the researcher [36]. 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. Testosterone plays an essential role in reproductive health. Women need only small quantities of testosterone – too much or too little can interfere with fertility. A testosterone helps to promote the development of follicles - structures that hold and release eggs during ovulation. Testosterone is also closely linked to normal libido and sex drive, indirectly affecting fertility [37].

5 Conclusion

Antioxidant enzymes and obesity play a significant impact in the development of infertility in women. Obesity can lead to hormonal abnormalities and oxidative stress, which has a

detrimental effect on fertility. Antioxidant enzymes help neutralize reactive oxygen species and reduce oxidative stress.

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