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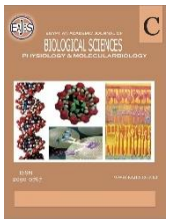

Biochemical Study of the Influence of FSH, LH, and PRL Hormones in Infertile Female

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ABSTRACT

Objective several females fail to conceive after several attempts. This is an indication of a defect in fertility, based on several of studies. The ability of hormones as an indicator in the assessment of infertility has received a lot of attention. **Methods,** the study included 76 female who suffered from reproductive problems and who were previously diagnosed with infertility, and 50 healthy as a control group, age range of 22-40 years and each group of females subclassification according to BMI. Samples were collected from women attending the infertility center in Al-Sadr Medical City in Al-Najaf. **Results ,** the current study aimed to study the most important hormones associated with infertility in women and link the relationship between them. Study of hormone levels LH, FSH and PRL correlation, the distinction between normal-weight and obese individuals, that obesity had an effect on LH, PRL and FSH levels, there was a significant difference in the means of all groups, with the obese patient and control group**. Conclusion,** the levels of prolactin and LH were better in the serum of unproductive women compared to healthy women.

INTRODUCTION

Infertility is a word that signifies, a grade of reduced fertility in couples unsuccessfully trying to conceive (Gnoth, *et al.*, 2005). Infertility is presently defined as a year of unintentional non-conception with unprotected sexual activity throughout the fertile part of the menstrual cycle (clinical definition) (Samiullah, M.*et al.*, 2021). Infertility is a complicated condition that causes serious physical, psychological, and monetary issues. Infertility in either men or females or a combination of the two Primary and secondary infertility are the two forms (Patel, A., *et al.*, 2016). Its reported rates range from 0.6% to 3.4% for primary infertility and 8.7% to 32.6% for single infertility, respectively (Borumandnia, N., *et al.*, 2022). Although there are several therapies available, it can be challenging to identify the cause of female infertility (Mansour, H. A. E. H. (2023).

Infertility can be caused by a variety of medical disorders (Ojo, O. A, *et al.*, 2023). In actuality, different medical issues account for the majority of occurrences of infertility. These conditions can harm the fallopian tubes, obstruct ovulation, or result in hormonal issues (Eisenberg, M. L., *et al.*, 2023).). The link between sexual activity and infertility is complicated. Sexual dysfunction can lead to a missed opportunity for conception as well as a delay in conception.

The best likelihood of conception is accomplished by having several sex sessions throughout the fertile time (Claes, A., & Stout, T. A. E. 2022).

Problems with sexuality might be the cause of infertility. Consequently, an assessment of the sexual conduct of the couple should be part of the infertility investigation (Saxena, S., *et al.*, 2016).

The hormonal conditions hyperthyroidism, hypothyroidism, and hyperprolactinemia all impact ovulation (Alazawa, Z. F. R., and Barrouq, D. M. S. 2022). Hormonal abnormalities, such as those involving prolactin, luteinizing hormone (LH), and follicle-stimulating hormone (FSH), can have an impact on infertility (Murray, C. M., & Orr, C. J. 2020). These hormones are essential for controlling ovulation, the menstrual cycle, and general reproductive function (Berga, S. L. 2020). The main function of the hormone prolactin in breastfeeding mothers is to increase milk production (Haerifar, N., Vaezi, G., Samani, Z. G., and Lak, S. S. 2020). Hyperprolactinemia, or elevated prolactin levels in non-lactating, non-pregnant women, might interfere with ovulation and the regular menstrual cycle (Haerifar, N., *et al.*, 2020). Prolactin levels that are too high can inhibit the production of GnRH, which in turn influences the release of LH and FSH (Nath, C. K., *et al.*, 2019). Infertility can result from this disturbance, which can cause irregular or nonexistent ovulation. Ovulation, the process by which a developed egg is released from the ovary, is brought on by LH (Alazawa, Z. F. R., and Barrouq, D. M. S. 2022). Unusual or anovulatory cycles may be caused by an aberrant LH surge or by inappropriate timing of the LH surge, which might further the problem of infertility (Broekmans, F. J. 2019). Ailments including polycystic ovarian syndrome (PCOS) can cause ovulation to be interrupted and LH levels to rise. The formation and development of ovarian follicles, which house eggs, depend on FSH. A decreased ovarian reserve, which results in the ovaries not responding as effectively to FSH stimulation and perhaps causing problems with ovulation and conception, might be indicated by elevated FSH levels (18-20). Additionally, disorders including premature ovarian insufficiency (POI) have been linked to high FSH levels (Mohajan, D., and Mohajan, H. K. 2023).

MATERIALS AND METHODS

Patients who contacted the Infertility and Fertility Treatment Center, Al-Sadr City Educational Center Najaf city from Nov 25, 2022, and Mar 12, 2023, were the subjects of the research. 64 patients, aged between (22 and 40) years, were included in the research and classification into two groups. Group as a control 46 women in health. Then, two groups were separated into two subgroups, normal weight and obese, based on BMI. Weight (kg), height (m^2), and body mass index (BMI) measurements. Infertile patients were selected based on their previous diagnoses of infertility after several failed attempts to conceive naturally. 5 mL of venous blood was taken from each subject. Using enzyme-linked immune sorbet assay (ELISA) techniques, the levels of serum luteinizing hormone (LH), Prolactin (PRL), and Follicle Stimulating Hormone (FSH) were determined (Bioassay Equipment Laboratory-China). Data analysis was carried out with (IBM SPSS Statistics Version 26. Results were presented as mean (with standard deviation) ST. D), Stas.

RESULTS AND DISCUSSION

In the current study, T-test analysis was applied to the data obtained from patients and healthy people. The data was divided into groups based on the mass table for obese patients and patients with normal weight. The control group was also classified into obese healthy people and those with normal weight. In this investigation, 64 infertile patients and 46 controls were of reproductive age, as indicated in Table 1. BMI is an anthropometric measure for assessing obesity when it is between normal weight (18.5-24.9) and obese (more than 30), according to the WHO standard (Saadia, Z.

2020). The demographic information for the study groups is described in Table 1, and the findings were reported as means, with a conventional splitting of age and BMI between the patient and control groups.

The age mean±SD of obese infertility patients was (30.1±1.40), normal-weight was (28.6±1.33), and the mean±SD for obese infertility was (28.9±1.70), obese control was (28.9±1.70), with P-value between all subdivided groups more than 0.05 that is no significant difference. The BMI of the obese infertility patients (34.04±0.45) with p-value, obese controls (33.14±0.55), , normal-weight of infertile patients (22.2±0.21), and control (23.2±0.31),

Table1. Data about the Demography Status of the Studies Group

Variable	Group	Study groups	Means ±S.D	P- value
Age/Y	control	Normal weight /21	29.3±2.23	0.87
		Obese/25	28.9±1.70	0.73
	Patients	Normal weight /28	28.6±1.33	0.82
		Obese/36	30.1±1.40	0.52
BMI kg/m^2	control	Normal weight /30	23.2±0.31	0.74
		Obese/20	33.14±0.55	<0.001
		Normal weight /24	22.2±0.21	<0.01
	Patients	Obese/36	34.04±0.45	0.93

Considered statistically significant when P-value < 0.05 whereas, BMI body mass index

Matching was performed in this examination between patient and control groups to prevent changes in parameter findings that may have emerged as a result of the huge age variance, which is shown in Table 1 , that 64 infertile patients and 46 control healthy group in this study were of reproductive age.

The study found that there was no discernible difference between normal-weight and obese individuals, that obesity had an effect on LH levels, and that infertility patients produced more LH than control. As can be shown in Table 2, there is a substantial difference between the mean FSH levels of LH,FSH,PRLand LH.

Table2: Correlations Levels of LH, FSH, and PRL with weight in Patients Group and Control Group.

Parameters	Study. Group	Group	Mean±S.D	P-value
LH(mIU/ml)	Normal weight	Patients Control	8.41±1.15 4.35±0.42	0.01
	Obese	Patients Control	9.84±1.24 3.71±0.34	0.000
FSH(mIU/ml)	Normal weight	Patients Control	4.49±0.43 7.42±0.54	0.001
	Obese	Patients Control	3.43±0.36 7.03±0.36	0.000
PRL(mIU/ml)	Normal weight	Patients Control	19.48±2.36 5.83 ± 0.66	0.000
	Obese	Patients Control	26.414 ± 3.405 9.289±2.43	0.000
LH/FSH	Normal weight	Patients Control	2.01±0.2 0.63±0.11	0.001
	Obese	Patients Control	1.82±0.4 0.91±0.12	0.000

The obese patient groups and the healthy control group, respectively (P-value 0.01). The outcome supports that characters with infertility had lower serum FSH concentrations than people in the control group. The outcome was that individuals with infertility had higher serum PRL concentrations than women in the control group. According to Table 2, there was a significant difference (P-value 0.000) in the means of all groups, with the obese patient and control group means being (1.82±0.4), (0.91±0.12) respectively. and the normal weight groups control and patient had corresponding means (2.01±0.2), (0.63±0.11).

Table:3 Correlation between PRL with LH, FSH and LH: FSH ratio**.**

Variables	r	p
LH	0.176	0.000
FSH	-0.153	0.025
PRL	-0.784	0.002

The results of various earlier investigations, which revealed that there is a highly significant difference in LH between the patient and control groups, corroborated the findings of this study (Lunenfeld, B., (2019). Additionally, the findings are consistent with paper that discovered substantial changes in LH, FSH, and the LH/FSH ratio between obese and non-obese (normal weight) females (McCartney, C. R., *et al.*, 2022). Increased gonadotropin secretion that favors the production of LH over FSH may be the cause of the rise in LH levels in individuals with infertility due to the GnRH pulse generator's lower sensitivity to feedback regulation by ovarian steroids. The outcome supports the fact that infertility patients' blood FSH concentrations are less than those of the control group (Koysombat, K., Abbara, A., and Dhillo, W. S. 2023), (Khmil, M., Khmil, S., and Marushchak, M. 2020). In fact, the FSH results from the current research agreed with those from earlier ones (Khmil, M., Khmil, S., and Marushchak, M. 2020).). It shown that women with infertility had lower FSH levels (Antonio, L., Priskorn, L., Olesen, I. A., Petersen, J. H., Vanderschueren, D., and Jørgensen, N. (2020). revealed in their study that the level of FSH did not change considerably and that it was slightly elevated in PCOS women. further study that disagrees (McCartney, C. R., Campbell, R. E., Marshall, J. C., and Moenter, S. M. 2022). The outcomes of this study's findings are interpreted as indicating a malfunction in pulsing GnRH secretion, which results in decreased FSH concentration and increased LH, which results in high androgen and decreased estrogen. As shown in Table 3, the results for the LH/FSH ratio revealed a highly significant elevation in the patient group when compared to the control. This finding supports the theory that PCOS women have faster hypothalamic GnRH pulses, which increases the LH/FSH ratio (Ding, H., *et al.*, 2021).

However, the correlation coefficients between FSH and LH/FSH in patients with normal weight are negative as Table 3**,** with (P-value 0.041, r = -0.19) and the correlation coefficients in patients with obesity are positive between LH and FSH (P-value 0.005, r = 0.64) and there is no significant correlation between FSH and LH/FSH. High levels of LH in obese women cause the generation of androgens in ovarian theca cells. only in patients who are fat were LH and FSH levels favorably associated. The LH/FSH ratio has been linked to PCOS-related morbidities for example obesity, insulin resistance, and dyslipidemia.
According to a previous study on infertile women, they noticed a decrease in both LH and FSH (Liu, Y., Li, Y., *et al.*, 2023). This contradicts our results, and the reason is attributed to the fact that among the infertile women, there was a percentage of women with polycystic ovary syndrome. Likewise, its relationship with PRL is positive with LH and negative with FSH, as in Table 3. In previous investigations consistent with our research, they found that

hyperprolactinemic women with primary and secondary infertility had a considerable drop in blood LH during the follicular, ovulatory, and luteal phases. Females who had been diagnosed with primary infertility had significantly reduced blood FSH levels during the ovulatory phase. In hyperprolactinemic women who had been diagnosed with secondary infertility, a similar substantial decline in serum FSH during the luteal phase was seen.

Conclusions:

The levels of prolactin and LH were improved in the serum of unproductive female compared to female healthy and were higher in those suffering from obesity compared to women of normal weight.

REFERENCES

Alazawa, Z. F. R., & Barrouq, D. M. S. (2022). A Narrative Review on the Potential Relationship between Fertility and Hypothyroidism . *East African Scholars Journal of Medical Sciences;* Vol-5, Iss-12 (Dec, 2022): 323-329

Antonio, L., Priskorn, L., Olesen, I. East African Scholars J Med Sci; Vol-5, Iss-12 (Dec, 2022): 323-329 A., Petersen, J. H., Vanderschueren, D.,& Jørgensen, N. (2020). High serum FSH is not a risk factor for low bone mineral density in infertile men. *Bone,* 136, 115366.

Bahramrezaie, M., Amidi, F., Aleyasin, A., Saremi, A., Aghahoseini, M., Brenjian, S., ... & Pooladi, A. (2019). Effects of resveratrol on VEGF & HIF1 genes expression in granulosa cells in the angiogenesis pathway and laboratory parameters of polycystic ovary syndrome: a triple-blind randomized clinical trial. *Journal of assisted reproduction and genetics,* 36, 1701-1712.

Berga, S. L. (2020). The Menstrual Cycle and Related Disorders. *Female Reproductive Dysfunction,* 23-37.

Bernstein, L. R., Mackenzie, A. C., Durkin, K., Kraemer, D. C., Chaffin, C. L., & Merchenthaler, I. (2023). Maternal age and gonadotrophin elevation cooperatively decrease viable ovulated oocytes and increase ootoxicity, chromosome-, and spindle-misalignments:‘2-Hit’and ‘FSH-OoToxicity’mechanisms as new reproductive aging hypotheses. *Molecular Human Reproduction,* 29(10), gaad030.

Borumandnia, N., Majd, H. A., Khadembashi, N., & Alaii, H. (2022). Worldwide trend analysis of primary and secondary infertility rates over past decades: A cross-sectional study. *International Journal of Reproductive BioMedicine,* 20(1), 37.

Broekmans, F. J. (2019). Individualization of FSH doses in assisted reproduction: facts and fiction. *Frontiers in endocrinology,* 10, 181.

Claes, A., & Stout, T. A. E. (2022). Success rate in a clinical equine in vitro embryo production program. *Theriogenology,* 187, 215-218.

Cunha, A., & Póvoa, A. M. (2021). Infertility management in women with polycystic ovary syndrome: a review. *Porto biomedical journal,* 6(1): e116.

Ding, H., Zhang, J., Zhang, F., Zhang, S., Chen, X., Liang, W., & Xie, Q. (2021). Resistance to the insulin and elevated level of androgen: a major cause of polycystic ovary syndrome. *Frontiers in endocrinology,* 12, 741764.

Dinh, T., Thompson, M. E., & Gangestad, S. W. (2022). Ovarian hormonesin relation to naturally cycling women's conception risk: Empirical evidence and implications for behavioral endocrinology. *Hormones and Behavior,* 146, 105276.

Eisenberg, M. L., Esteves, S. C., Lamb, D. J., Hotaling, J. M., Giwercman,., Gnoth, C., Godehardt, E., Frank-Herrmann, P., Friol, K., Tigges, J., & Freundl, G. (2005). Definition and prevalence of subfertility and

infertility. *Human reproduction*, 20(5), 1144-1147.

Haerifar, N., Vaezi, G., Samani, Z. G., & Lak, S. S. (2020). The effect of vitex agnus castus extract on the blood level of prolactin, sex hormones levels, and the histological effects on the endometrial tissue in hyperprolactinemic women. *Crescent Journal of Medical & Biological Sciences*, 7(4): 545–550. eISSN 2148-9696.

Khmil, M., Khmil, S., & Marushchak, M. (2020). Hormone imbalance in women with infertility caused by polycystic ovary syndrome: is there a connection with body mass index?. *Open Access Macedonian Journal of Medical Sciences*, 8(B), 731-737.

Koysombat, K., Abbara, A., & Dhillo, W. S. (2023). Current pharmacotherapy and future directions for neuroendocrine causes of female infertility. *Expert Opinion on Pharmacotherapy*, 24(1), 37-47.

Liu, Y., Li, Y., Xiao, N., Liu, M., Wang, Y., Luo, H., ... & Wang, S. (2023). Serum Organophosphate Flame retardants and plasticizers in Chinese females of childbearing age: Association with serum reproductive and thyroid hormones. *Chemosphere*, 139237.

Lunenfeld, B., Bilger, W., Longobardi, S., Alam, V., D'Hooghe, T., & Sunkara, S. K. (2019). The development of gonadotropins for clinical use in the treatment of infertility. *Frontiers in endocrinology*, 10, 429.

Mansour, H. A. E. H. (2023). Infertility diagnosis and management.*Beni-Suef University Journal of Basic and Applied Sciences*, 12(1), 81.

McCartney, C. R., Campbell, R. E., Marshall, J. C., & Moenter, S. M. (2022). The role of gonadotropin-releasing hormone neurons in polycystic ovary syndrome. *Journal of neuroendocrinology*, 34(5), e13093.

McCartney, C. R., Campbell, R. E., Marshall, J. C., & Moenter, S. M. (2022). The role of gonadotropin-releasing hormone neurons in polycystic ovary syndrome. *Journal of neuroendocrinology*, *34*(5), e13093.

Mohajan, D., & Mohajan, H. K. (2023). Body Mass Index (BMI) is a Popular Anthropometric Tool to Measure Obesity among Adults. *Journal of Innovations in Medical Research*, 2(4), 25-33.

Murray, C. M., & Orr, C. J. (2020). Hormonal Regulation of the Menstrual Cycle and Ovulation. In Maternal-Fetal and Neonatal Endocrinology (pp. 159-167). Academic Press.

Nath, C. K., Barman, B., Das, A., Rajkhowa, P., Baruah, P., Baruah, M.,& Baruah, A. (2019). Prolactin and thyroid stimulating hormone affecting the pattern of LH/FSH secretion in patients with polycystic ovary syndrome: A hospital-based study from North East India. *Journal of family medicine and primary care*, 8(1), 256.

Ojo, O. A., Nwafor-Ezeh, P. I., Rotimi, D. E., Iyobhebhe, M., Ogunlakin, A. D., & Ojo, A. B. (2023). Apoptosis, inflammation, and oxidative stress in infertility: A mini review. *Toxicology Reports.*, Volume 10, Pages 448-462

Patel, A., Sharma, P. S. V. N., Narayan, P., Binu, V. S., Dinesh, N., & Pai, P. J. (2016). Prevalence and predictors of infertility-specific stress in women diagnosed with primary infertility: A clinic-based study. *Journal of human reproductive sciences*, 9(1), 28.

Samiullah, M., Shah, H. S., & Sheikh, S. I. (2021). Male Perspective of Infertility and Germ line Gene Therapy: An Islamic and Medical Perusal. *Indian Journal of Economics and Business*, 20(2): 38-49.

Saxena, S., Gupta, R., Agarwal, L., Srivastava, P. C., & Mallick, A. K. (2016). Correlation of serum

thyroid stimulating hormone and prolactin in female infertility–a case control study. *Indian Journal of Obstetrics and Gynecology Research*, *3*(4), 388-392.

Stuenkel, C. A., & Gompel, A. (2023). Primary ovarian insufficiency. *New England Journal of Medicine*, 388(2), 154-163.