Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 111 - 116
Received 24 October 2020; Accepted 15 December 2020.

Effect of Leptin on the Infertile Women

Zena A.M. Al-Jawadi
University of Mosul,College of Science, Department of Chemistry, Mosul, Iraq.
E-mail: zena_aljawadi@uomosul.edu.iq

Abstract
Blood tests have been obtained from the laboratory that deals with infertility. Many of the community participants obtained an exam of their physical condition. When these participants were first grouped into regulation and infertile classes, they were then classified into slim or average weight, overweight and obese classes. Leptin has been calculated in plasma using a Leptin Elisa package, as well as Body mass index has been measured in kilogrammes per square metre (kg/m2) in all subjects.
In people suffering infertility, a clear association (0.210) was identified between body mass index and a predictor of increased leptin secretion (serum leptin), suggesting a similar relationship between body mass index and increased birth defect. This study showed that if the leptin levels are down the individual is more prone to have infertility issues. When contrasted to a balanced control sample, a woman that has been in an inactive, overweight population, correlates to have slightly higher leptin levels, indicating a strong correlation between BMI and serum leptin levels. Recruits that have this abnormality have elevated blood amounts and are called clinically obese events. Leptin is also a key element in the balancing of several people's hormone states. It is quite obvious that for today, it is fattening that overweight is the key perpetrator to infertility. Control of leptin is the test for its development.
Keywords: Infertility, Leptin, Obesity, BMI, Female hormones, Lipids.

Introduction

Currently, infertility is one of the most prevalent health issues in certain cultures. Of all the various health problems, infertility may now be one of the serious health problems in the future, since individuals unaware of being pregnant will not be willing to employ reproductive methods together in order to have children. There are many ways and causes why couples which find themselves infertile, while unexplained infertility is the only cause of infertility in 25% of couples who are presenting for supported fertility services. There are several factors involved in the growth of an ultrasound that allow it to be higher than it should be. These may include sperm count, patient's age, past ultrasound anomalies, pregnancy hormone levels, and ultrasound sonographers' "equipment". Throughout a female's life, she passes through various stages, each one of which is her "Puberty." It is crucial as one goes through various measures in the road toward a healthy lifestyle, one must have good guidance and advice to direct them along the way. Leptin is the key component of the metabolic control of growth, pregnancy, and maternal nutrition. Adolescence is a chronic, recurrent bodily system that transforms the body of an infant into an adult. since the absence of this hormone during early or severe adolescence leads in delay in fertility among adolescents. In addition to preserving energy homeostasis through the management of appetite and energy expenditure, many other hormones essential for reproduction and control of the endocrine system are often controlled [3, 4]. Leptin may be an adipogenesis hormone which is also considered the body's master hormone, and is generated mainly by adipocytes and granulosa, stroma

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 111 - 116
Received 24 October 2020; Accepted 15 December 2020.

cells, and cumulus cells of ovarian follicles [5, 6], respectively. The mutation of the gene of the leptin and its regulation domains has been linked with the production of diabetes mellitus, metabolic disorders, and chemical imbalances and induce massive overweight contributing to infertility. Researchers conclude that circulatory leptin amounts are markers of the menstrual cycle. The existing research (as it stands) does not properly discuss the disparity that might occur between hormones during the menstrual cycle. Leptin, in addition to changing the production of gonadotrophin-releasing hormone and gonadotrophin, also influences gonadotropin-releasing hormone and gonadotrophin. Not only does it play an important part in the development and preservation of the ovaries and fallopian tubes, but it is often involved in the forming of a foetus during birth. This research aimed to investigate the impact of leptin on women's infertility by analyzing the hormonal and biochemical parameters.

Materials and Methods

This research was performed following the criteria stipulated in the Helsinki Declaration and approved by our institution (210/R.A.D, 6/4/2017). The Hospitals in Duhok / Iraq performed a cross-sectional study from 6 June 2019 to 20 March 2020.

Group of Infertile Patients: One hundred and three infertile women were enrolled in this sample. Half of them were diagnosed by a specialist, while the other half could be diagnosed without a specialist. The ages ranged from 18 to 43, both of which were diagnosed by a specialist. A patient's BMI was approximately 20 to 58.6 kilogrammes per metre squared, the breadth of the waist was greater than 0.8 metres, and clinical evidence was gathered through a current questionnaire There are disorders such as asthma, high blood pressure, and thyroid disorder.

Control Group (Reference Group): This study was attended by seventy young fertile women (control group), ages ranging from 17-43 years with a BMI of 18-24.9 kg/m2, and a WHR of below 0.8.

For the two classes of blood tests were carried out after 12 hours of overnight fasting, during the early follicular period (cycle day 2 or 3) for oestrogen (E2), Follicle-Stimulating-Hormone (FSH), Luteinizing-Hormone (LH), Prolactin, Cholesterol, Triglyceride (TG), and progesterone, luteal prolactin (cycle day 21), in the test centrifuge tube for serum separation within one hour of blood collection, the serum was stored in a deep freezer at a temperature of -20oC for further analysis. Samples from cans were checked for analytical variations in 100 batches of cans. Before the analysis was conducted, the samples had been enabled to exceed room temperature. This procedure runs a test with an instrument named the "mini VIDS" which is a tool that allows calculation of an enzyme made by the body. The lipid profile also contained Total Cholesterol (TC), Triglyceride (TG), High-Density Lipoprotein (HDL) study, and was tested using commercial kits (Biolabo Kits) were measured through Ultraviolet & Noticeable Spectromethod. Low-Density Lipoprotein (LDL) and Very Low-Density lipoprotein (VLDL) were calculated indirectly, using the Friedewald formula. Calculations have been produced using BMI and WHR calculations, with weight = (Kg)/ (Meters) , and waist/ hip measure (in centimetres) = (Waist)/ (Hip) (Hip).

Ethical approval: In accordance with related legislative actions, internal procedures, and principles of the Helsinki Declaration, the study took place.

Informed Consent: All participants' rights were protected and oral informed approval has been obtained according to the Helsinki Declaration.

Statistical analysis: Analysis of the data was conducted using SPSS tools. T-test, Duncan test was used to compare the parameters between total control number and patients, based on the occupancy at $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.001$, respectively, and the Pearson correlation coefficient test.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 111 - 116
Received 24 October 2020; Accepted 15 December 2020.

Result discussions

This table showed that the amount of hormonal and biochemical parameters is substantially lower among infertile mothers.

Table 1: A comparison between the level of hormonal, and biochemical parameters of infertile women and the control group

Hormonal and biochemical parameters	Infertile group Mean ± SD	Control group Mean ± SD	P- value
Estrogen (E2) (pg/mL)	42.1 ± 30.9	56.53 ± 26.4	0.01**
Progesterone (ng/mL)	1.94 ± 0.83	3.96 ± 2.4	0.01**
FSH (mlU/mL)	5.15 ± 5.12	6.84 ± 1.69	0.019*
LH (mlU/mL)	3.19 ± 1.0	3.84 ± 1.5	N
Prolactin (ng/mL)	30.7 ± 11.5	15.68 ± 7.1	0.02*
Leptin (ng/ml)	39.210 ± 1.19	35.401 ± 0.911	0.05*
Total Cholesterol (mg/dL)	186.3 ± 34.1	151.93 ±33.5	0.001***
Triglyceride(TG) (mg/dL)	152.5 ± 83.7	110.1 ± 55.4	0.001***
VLDL (mg/dL)	34.5 ± 12.6	21.87 ± 9.9	0.008**
HDL (mg/dL)	41.44 ± 8.7	62.1 ± 26.80	0.0016**
LDL (mg/dL)	110.3 ± 22.9	84.55 ± 24.8	0.007**

*Significant differences at P≤0.05, **Significant differences at P≤0.01,
*** Significant differences at P≤0.001, N=No significant differences

The results in Table 1 showed that the concentration of estrogen, FSH, and LH was decreased significantly. While it is observed higher significantly the concentration of leptin and prolactin infertile women compared with the control group. The major cause for infertility appears to be the lack of long ovulation, the relation between leptin and ovarian, with high levels of leptin, has been shown to inhibit the development of estradiol and progesterone and also to stop the onset of active follicles. The ovary often develops leptin and promotes the synthesis of estradiol. Leptin has stimulating effects at low concentrations, gonads have been shown to have leptin receptor, that indicate that leptin has a direct impact on women and has inhibitory effects on gonadotropins at high levels [9, 10]. The concentrations of cholesterol, TG, VLDL, and LDL have increased considerably in Table1 also. Infertile women have seen a significant reduction in HDL concentration, indicating the likelihood of a correlation between impaired lipoprotein metabolism and female infertility [11].

The results in Table 2 showed the comparison of the level of hormonal and biochemical parameters in infertile women with different BMI.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 111 - 116
Received 24 October 2020; Accepted 15 December 2020.

Table 2: A experimental research compared the hormone levels and biochemical parameters of infertile people with varying body mass index.

BMI / Hormonal &biochemical parameters	(20–24.9) N= 6 Mean ± SD	(25–29.9) N= 14 Mean ± SD	(30–34.9) N= 45 Mean ± SD	(35–39.9) N= 12 Mean ± SD	40≥ N= 3 Mean ± SD	P-value
Estrogen (E2) (pg/mL)	70.7 ± 28.0(a)	66.7 ± 34.6(a)	75.1 ± 29.2(a)	74.8 ± 28.13 (a)	94.02 ± 8.5 (a)	N
Progesterone (ng/mL)	1.71 ± 0.68(a)	1.62 ± 0.62(a)	2.47 ± 1.51(a)	1.35 ± 0.76(a)	1.03± 0.66(a)	N
FSH (mlU/mL)	6.83 ± 2.5(ab)	4.75 ± 3.0(a)	4.17 ± 1.8(a)	9.44 ± 1.2(b)	4.67 ± 1.4(a)	0.02*
LH (mlU/mL)	5.892 ± 2.7(ab)	4.28 ± 3.49(a)	6.24 ± 3.0(ab)	12.011 ± 1.2(b)	8.94 ± 2.2(ab)	0.01**
Prolactin (ng/mL)	12.24 ± 5.3(a)	27.31 ± 5.7(a)	18.95 ± 8.84(a)	15.53 ± 5.5(a)	21.69 ± 9.08 (a)	N
Leptin (ng/ml)	35.20 ± 1.12(ab)	34.31 ± 1.11(a)	36.21 ± 1.09(ab)	38.11 ± 1.10(b)	39.10 ± 1.15(ab)	0.01**
Total cholesterol (mg/dL)	176.2 ± 22.3(a)	179.9 ± 41.3(a)	188.1 ± 29.7(a)	199.9 ± 25.6(a)	207 ± 8.54(a)	N
Triglyceride (TG)(mg/dL)	110.33 ± 87.1 (a)	151 ± 82.4(ab)	163.67 ± 72.2 (ab)	216.58 ± 112.5 (b)	197± 48.1(ab)	0.05*
VLDL (mg/dL)	22.37 ± 17.5(a)	30 ± 16.53(a)	32.97 ± 14.1 (a)	34.32 ± 22.5 (a)	37 ± 9.8(a)	N
HDL (mg/dL)	49.16 ± 14.5(a)	42.17 ± 8.3(a)	40.62 ± 8.4(a)	39.05 ± 6.2(a)	38 ±7(a)	N
LDL (mg/dL)	104.2 ± 16.5(a)	107.0 ± 36.8(a)	117.46 ± 32.5 (a)	119.22± 41.9 (a)	129.6 ± 5.5(a)	N

*Significant differences at P≤0.05, **Significant differences at P≤0.01,
N=No significant differences

Regarding this study, the finding in table (2) shows a rise in the level of oestrogen hormone in women with abnormal ovulation in those with high body mass index (BMI), as the higher the body mass index (BMI) and TG, the higher the level of leptin hormone in the blood [12, 13]. As a consequence, obesity will contribute to declines in the levels of oestrogen hormone, ovulation hormone, or stimulating hormone, which indicates that obesity would reduce the standard of reproductive activity. Leptin hormones were secreted in an attempt to hold energy equilibrium and reproductive capacity in order. Since it plays a major role in controlling appetite, it may be because the leptin hormone prevents the mechanism of steroidogenesis in obese women in granulosa cells, and this deficit may influence the amount of sex hormones (LH & FSH), to establish a difference in the nervous system directives that can lead to the recruitment of inactive ovarian follicles and a limited number enter the maturity stage and, in addition to the effect on follicle development of the egg, it is poor in quality [14, 15]. As a consequence of these findings, this alignment with the study of Shafi and Afzal indicates that overweight with

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 111 - 116
Received 24 October 2020; Accepted 15 December 2020.

hyperleptinemia is generally linked with female infertility. Like slim individuals, obese persons have a higher degree of leptin, and as a consequence deregulates the gonadal hypothalamic-pituitary axis, contributing to reproductive failure, like infertility.

Table 3 illustrates the association between progesterone, anti-Mullerian hormone, luteinizing hormone, and follicle-stimulating hormone and the influence of the BMI and WHR on infertility.

Table 3: The association between hormonal and biochemical parameters in a patient and the influence of leptin.

Hormonal and biochemical parameters	R-value	P-value
Estrogen (E2) (pg/mL)	-0.141	0.021*
Progesterone (ng/mL)	0.001	N
FSH (mlU/mL)	0.187-	0.05*
LH (mlU/mL)	-0.180	0.05*
Prolactin (ng/mLl)	-0.153	N
Total Cholesterol (mg/dL)	0.233	0.01**
Triglyceride (TG) (mg/dL)	0.221	0.025*
VLDL (mg/dL)	0.211	N
HDL (mg/dL)	-0.234	0.007**
LDL (mg/dL)	0.222	0.024*
BMI	0.210	0.01**
WHR	0.108	N

*Significant differences at P≤0.05, **Significant differences at P≤0.01,

N=No significant differences.

In infertile people, high serum E2 levels and low serum LH levels are correlated with low serum leptin levels. Likewise, high total cholesterol, high low-density lipoprotein cholesterol, and low high-density lipoprotein cholesterol levels all appear to be positively associated with high serum leptin levels in women. Yet, low haemoglobin levels are negatively associated with serum leptin levels in women. Progesterone in the ovary induce a preovulatory increase in leptin along with a preovulatory increase in estradiol that, in turn, induces the ovaries to generate more leptin along with a preovulatory increase in progesterone in the same way that does with males. Throughout the luteal stage of the menstrual cycle, there were no major improvements in the progesterone levels.

Conclusions

This study showed that (1) Leptin is a newly strong risk factor for increasing fertile female infertility, 2) Leptin plays a key role in sustaining endocrine, reproductive, and immune function by inhibition of dietary intake and power usage. If female patients are overweight, their body's hormone can shift, allowing them to ovulate less. Because of this, they can be controlled by a doctor. Therefore, fertility complications induced by this may be handled in the future by taking birth control pills, removing hormones, or by surgery.

Acknowledgements

The author would like to thank Mosul University for its support and to thank the individuals who have agreed to participate in this research.

References

[1] Aljawadi ZAM. (2020) Effect of selenium level of serum and semen in infertile Iraqi Men.*Biochem. Cell. Arch*. 20(2), 3619-3622.

[2] Kumari P., Jaiswar S. P., Shankhwar P., Deo S., Ahmad K., Iqbal B. and Mahdi A.A. (2017) Leptin as a Predictive Marker in Unexplained Infertility in North Indian Population *Journal of clinical and diagnostic research: JCDR* 11(3), QC28–QC31.

[3] Baig M., Azhar A., Rehman R., *et al*. (2019) Relationship of Serum Leptin and Reproductive Hormones in Unexplained Infertile and Fertile Females. *Cureus* 11(12), e6524.

[4] Pérez-Pérez A., Sánchez-Jiménez F., Maymó J., Dueñas JL., Varone C., and Sánchez-Margalet V. (2015) Role of leptin in female reproduction.*ClinChem Lab Med*. 53, 15-28.

[5] Kamyabi Z., and Gholamalizade T. (2015) A comparative study of serum and follicular fluid leptin concentrations among explained infertile, unexplained infertile, and fertile women. *International journal of fertility & sterility* 9(2), 150-156.

[6] Catteau A., Caillon H., Barriere P., Denis MG., Masson D., and Freour T. (2016) Leptin and its potential interest in assisted reproduction cycles. *Human reproduction update* 22(3), 320-341.

[7] Saranya M., and Pathy M.R. (2018) Insights into the putative role of leptin in various traversing stages of women: A narrative review. *Journal of Applied Pharmaceutical Science*, 8(07), 141-148.

[8] Rehman R., Tariq S., Usmani A., Baig M., and Tariq S. (2015) Interplay of leptin with obesity and polycystic ovarian syndrome.*Life Sci J.* 12, 83-89.

[9] Tafvizi F., and Masomi M. (2016) Comparison of Serum Leptin Level in Women with Unexplained Infertility and Fertile Women in Iran *Journal of obstetrics and gynecology of India* 66(Suppl 1), 466–470.

[10] BaigM., Rehman R., Tariq S., and Fatima SS. (2014) Serum leptin levels in polycystic ovary syndrome and its relationship with metabolic and hormonal profile in Pakistani females*Int J Endocrinol* 2014, 132908.

[11] Deyhoul N., Mohamaddoost T., and Hosseini M. (2017) Infertility-related risk factors: a systematic review. *International Journal of Women's Health and Reproduction Sciences* 5(1), 24-29.

[12] L. Li, K-J. Lee, B-C. Choi, and K-H. Baek (2013) The relationship between leptin receptor and polycystic ovary syndrome.*Gene* 527, 71-74.

[13] AL-TaieF.Kh., and AL-Jawadi Z.AM. (2019) The Impact of Obesity on Infertile Women with Polycystic Ovaries in Iraq.*Rafidain journal of science* 28(2E: Chem.), 1-9.

[14] Caprio M., Fabbrini E., Isidori AM., Aversa A., and Fabbri A. (2001) Leptin in reproduction.*Trends EndocrinolMetab* 12, 65-72.

[15] Smith G., Jackson L., and Foster D. (2002) Leptin regulation of reproductive function and fertility.*Theriogenology* 57, 73-86.

[16] Shafi R., and Afzal MN. (2008) Status of leptin levels in a female with infertility. *Saudi Med Journal*29(10), 1419–1422.