American Journal of Bioscience and Clinical Integrity
https://biojournals.us/index.php/AJBCI
ISSN: 2997-7347

Evaluation of Inhibin B and Lipid Profile Levels in Secondary Infertile Women

Nuha Ali Hadi Ali_Samarrai
Department of Chemistry, College of Education, University of Samarra, Samarra - Salah Eldin, Iraq, noha62@uosamarra.edu.iq

Rana Raad Zanzal
Department of Chemistry, College of Education, University of Samarra, Samarra - Salah Eldin, Iraq, rana.r.zanzal@ uosamarra.edu.iq

Mays Subhi Wasmi
Department of Chemistry, College of Education, University of Samarra, Samarra - Salah Eldin, Iraq, mayssubhi9@ uosamarra.edu.iq

Received: 2025, 12, Jun
Accepted: 2025, 13, Jul
Published: 2025, 14, Aug

Abstract: Ninety blood samples were collected from infertile and healthy women, aged 19 to 41, between October 15, 2022, and January 15, 2023, for the present study. Thirty samples of healthy women served as the control group, whereas sixty samples of infertile women made up the first group (G1). Lipids (cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein) and inhibin B hormone levels were assessed from the samples taken for this investigation. The findings of the present investigation. Chemistry lab tests: This study's findings suggest that. There were no statistically significant changes between G1 and G2 in the reduction of inhibin B levels in infertile women (P0.05) when comparing to the control group. Also There was no statistically significant difference between G1 and G2 in terms of blood cholesterol levels when compared to the healthy controls (P0.05). and At the level of probability (P0.05), there was a statistically significant rise in triglycerides in the blood serum of both G1 and G2 compared to the healthy group. also Both

G1 and G2 had lower levels of high-density lipoprotein in their blood serum than the healthy controls, at a probability level (P0.05), with no discernible difference between the two groups. There was no statistically significant difference between G1 and G2 with respect to the elevated levels of low-density lipoprotein and very low-density lipoprotein in their blood serum when compared to the healthy control group (P0.05).

Keywords: infertility, inhibin B, lipid Profile

Introduction

According to estimates, between 8 and 10 percent of all couples worldwide have infertility, which is defined as the inability to conceive a child within a year of trying while engaging in sexual activity without protection. According to the WHO, one in four women in low-income regions experience infertility. In Iraq, the average number of children a woman has is about 4.5. (1) As a major health morbidity that affects the A large number of the population in the world and encounters many couples in developed and developing countries alike, infertility is a condition with multiple genital manifestations, and it affects more than half of the world's women. More than 1.5 million American women, or 6% of the married population between the ages of 15 and 44, were infertile (4), according to a study conducted between 2006 and 2010. Infertility rates have been falling in both Africa (5.1–4.7%) and Asia (2.4–2.2%) during the last several years (5). Therefore, infertility stems from a wide range of factors, and the precise reason is often unknown. Pregnancy loss might have a single cause in one or both partners, or it can be the result of a cluster of issues.

Polypeptide hormone Inhibin-B has an approximate molecular weight of 14000 Daltons and contains 199 individual amino acids. There are two halves to this hormone: BB and BA. Human men release this hormone, which is also present in humans. Both males and females produce this hormone, but in women, the granular cells of the ovary secrete it during the follicular phase, and the inhibin-B chain is shorter than the inhibin-A chain because inhibin-B is composed of two subunits (Lambart et al., 1997). From the menstrual cycle, this hormone induces variations in inhibin-B levels during menstruation by stimulating the release of the pituitary gland hormone FSH (7). Sertoli cells in men release this hormone (8). Since inhibin-B is produced in response to an increase in FSH percentage, its presence prevents further FSH production and causes an increase in estrogen levels (9). Since a drop in FSH levels leads to fewer ovulations and, ultimately, infertility, inhibin has been linked to sterility. In addition, inhibin-B is viewed as an indicator of primary ovarian failure, and its concentration drops in women as they approach menopause (10).

Fats are molecules that are insoluble in water and are primarily categorized as fatty acids, triglycerides, phospholipids, or cholesterol. Fats are widely distributed in cellular organelles and act as building blocks or basic materials for building all membranes. Cholesterol is a fatty acid that serves as a precursor to other molecules in the body, including bile salts, steroid hormones, and vitamin D. It is also necessary for the proper functioning of nerve cells, making it an essential component of nerve tissue (12).

Preparation of study samples

Samples collection

90 blood samples were collected from infertile and healthy women, whose ages ranged between (19-41) years, for the period from 10/15/2022 - 1/15/2023. The samples were divided into the control group (the healthy ones), which included 30 samples of healthy women, and the first group (G1), which included 60 samples of infertile women.

Preparation of serum

The samples for the current study were collected by taking 5 ml of blood and placed in test tubes and left for (10) minutes to coagulate, after which the serum was separated from it using a centrifuge at a speed of 3000/rpm for a period of 10 minutes, and then the separated serum was kept under freezing until Use it in serological tests.

Estimation of inhibin B

Inhibin B concentration was estimated by following the steps provided with the prepared assay kit according to the manufacturer's instructions for the ELISA technique .

Estimation of lipid concentration:

The lipid concentration was estimated according to the kit prepared by the Tunisian company Biomigrb, as the cholesterol level was estimated according to the researcher's method [13], while the triglycerides were estimated according to the method [14], high-density lipoprotein according to the method [15], and low-density lipoprotein according to the researcher's method [16]. and very low-density lipoprotein, according to the researcher [16].

Statistical analysis

T.Test, a statistical program test, was used to compare sick groups with a healthy control group in SPSS - Statistical Package for the Social Sciences at the p 0.05 probability level.

Result and Dissection

Table (1) shows the serum levels of inhibin B and lipids (cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein) of infertile women, together with their means and standard deviations.

Table 1 shows sample means and SDs.

Groups / Parameters	Mean ± SD		
	C (19-41)	G1 (19-29)	G2 (30-41)
Inhibin B	97.584±4.543a	39.797±5.348b	21.005±5.597c
T.C	156.080±22.326b	252.533±101.270a	275.748±110.671a
T.G	72.20±9.581c	169.02±68.248a	136.01±55.355b
HDL	64.060±10.210a	43.741±14.496b	43.405±9.899b
LDL	86.588±22.925b	211.105±89.070a	196.105±105.434a
VLDL	16.360±3.451b	35.996±13.496a	32.424±13.025a

- **Different letters mean there are significant differences at ≤ 0.05 level.**
- **Similar letters mean no significant differences at > 0.05 level.**

Level of Serum Inhibin-B

Infertile women's B hormone levels ranged from a mean of (39.797) (5.348) pg/ml in the G1 group to a mean of (21.005 (5.597) pg/ml in the G2 group and a mean of (97.584 (4.543) pg/ml overall, as shown in Table (1). As can be seen in Figure (1), the levels of inhibin in the blood of both Groups G1 and G2 were found to be lower than those of healthy participants, with the level of inhibin in Group G2 being lower than that of Group G1.

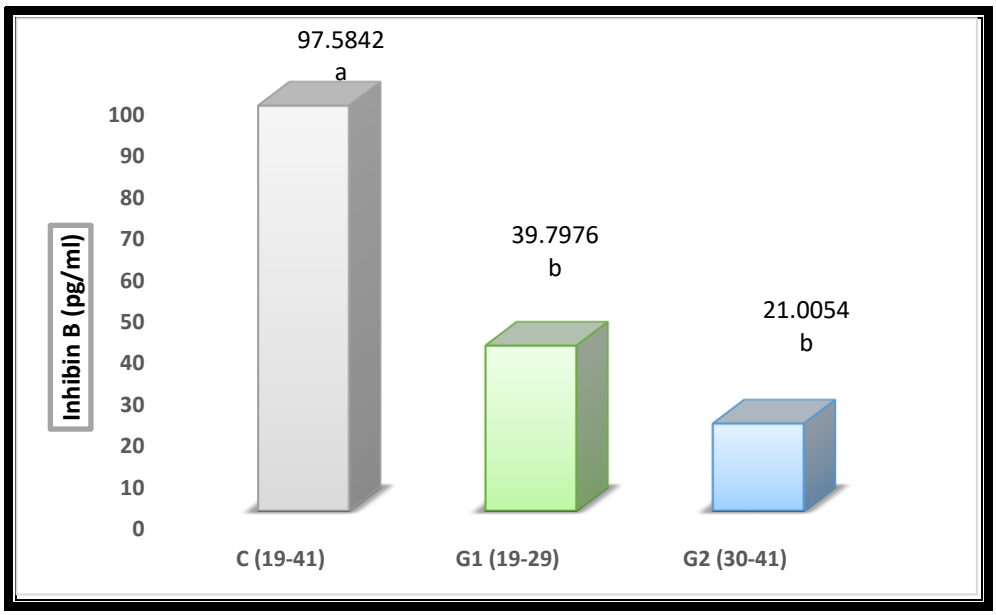

Figure 1: inhibin B hormone in the samples under study according to age

This research matches Radhi (17), Aeeel (18), Corson (19), and Dokras (20). Infertile women had lower inhibin-B levels. It also contradicts Ibrahim (21), who found a surge in infertility in women with polycystic ovary syndrome.

There is a clear difference between infertile women, which may explain why inhibin-B levels are lower in their serum. Since inhibin-B plays a key role in the egg maturation process, a low concentration of inhibin-B may be an indicator of infertility or poor fertility. To be used as an indicator of ovarian age or impending infertility due to menopause. It is important to remember that inhibin B levels decline with age and disappear altogether once a woman reaches menopause (22). Since inhibin B concentrations are lowest in premenopausal women, this supports Giovanni's (23) conclusion that this hormone's activity is related to that of follicle-stimulating hormone (FSH). Changes in the concentration of inhibin in women with primary infertility and those with secondary infertility suggest that inhibin B may be the primary cause of their infertility because of the inverse relationship between these two hormones, in which an increase in the concentration of one acts as a suppressor for the other. Because of this negative feedback mechanism, as soon as the pituitary gland begins to secrete follicle-stimulating hormone (FSH) to the ovary, this signal is received by special receptors on the surface of the oocytes, and the oocytes respond by secreting inhibin, which has an effective effect on the ovary's functioning, especially during the menstrual cycle. Ovaries have receptors for both inhibin and activin (24).

These receptors trigger appropriate quantities of inhibin secretion by granulosa cells through nerve impulses. Inhibin may be a useful indication for detecting ovulation failure, detecting uterine malignancies in women, and tracking the progress of IVF (25).

There is evidence that variations in inhibin concentration are the primary cause of infertility in women with secondary infertility.

However, the present study's age-related findings were consistent with those of (26), who found that inhibin B levels dropped in the serum of infertile women beyond the age of 40.

In addition, 95% of people had measurable levels of reduced inhibin B, with levels remaining roughly constant between women 20 and 35 years of age but dropping dramatically in adult women beyond the age of 40 (27).

Impaired ovulation, reduced conception rates, and an increased risk of miscarriage were all linked to low levels of inhibin (28). The levels of inhibin, androgens, and insulin were found in another study to be predictive of the recruitment of ovarian follicles by chondrotropin treatment

(29), which led to the stimulation of the gonads for fertilization.

Level of Serum cholesterol

Table (1) shows that the mean ± standard deviation of the cholesterol level for infertile women was (252.533 ± 101.270) for the G1 group, (275.748 ± 110.671) mg / dL for the G2 group, compared to (156.080 ± 22.326) for the healthy group. The results showed a significant increase in the blood serum of the two groups. G1, G2 compared to the control group as in Figure (2).

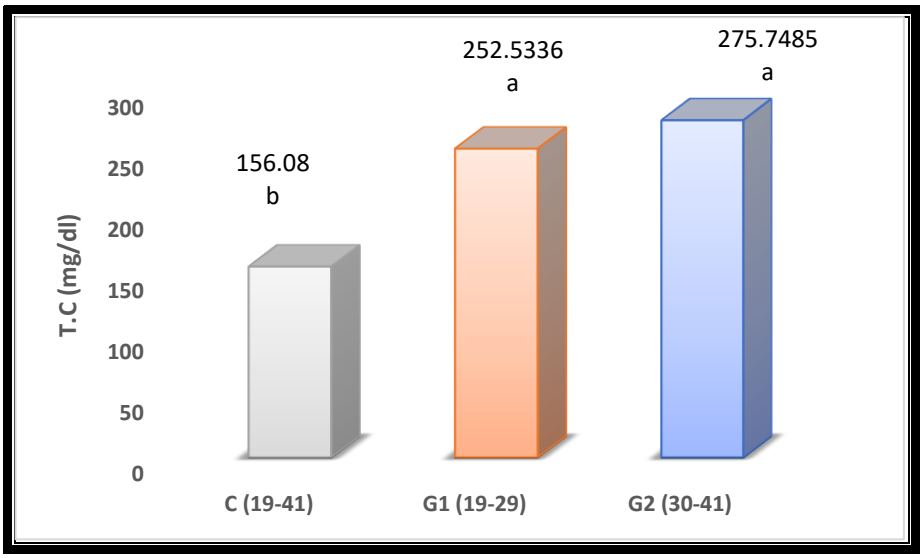

Figure 2: Cholesterol level in the blood serum of the samples under study according to age

In his research, Al-Tikriti (30) observed no significant variations in cholesterol levels in primary infertile women using metformin and clomid. He observed that secondary infertile women's serum cholesterol reduced. Al-Tikriti's research disagrees with the present study. ASEEL (18), Salwa (31) and Abdul Razzaq (32) agreed with the current study's conclusions, however the latter study did not.

The process of follicular maturation, ovulation, and Latinization are all supported by cholesterol, which is crucial for the generation of the substrate required for steroid synthesis (33). Also, the high concentrations of cholesterol confirm the presence of accumulated fats in the serum of patients, and these fats cause obesity in them, which would cause infertility for women. In addition to this, the high concentrations of cholesterol cause women who have primary infertility to have high blood pressure or cardiovascular disease (34).

Also, the considerable rise in the concentration of cholesterol in infertile women might be the consequence of a drop in the steroid hormones (estrogen, progesterone), which could have been followed by a lack of use of cholesterol in the manufacturing process. This would have led to an increase in cholesterol levels. Additionally, it has been shown that polycystic ovary syndrome (35), which is the cause of infertility in females, is associated with a high cholesterol level in these women.

Because of an excess of insulin and androgen, adipocytes go through the process of lipolysis triggered by catecholamine, which results in an increased release of fatty acids (36). This may be the root cause of high blood cholesterol.

Or, an increase in cholesterol levels in the blood may be caused by a number of different factors, such as the decomposition of low-density lipoprotein-cholesterol LDL-C or the inefficiency of the receptors of the protein part of LDL-C in the tissues, as well as the activity of the enzyme acyl cholesterol transferase responsible for the absorption of cholesterol in the intestine, an increase in the amount of cholesterol consumed, or an increase in the amount of cholesterol that is Additionally, it promotes the consumption of diets that are rich in saturated fats (37), which is

a factor that leads to an increase in the amount of cholesterol that is naturally produced by the body. It is possible that the high amounts of cholesterol seen in the blood serum are the result of the body consuming fats from other sources for the goal of using them as a source of energy (38). As a consequence, there is an accumulation of cholesterol in the blood vessels.

Cholesterol is an essential component in the breakdown of water-soluble vitamins, including vitamins A, D, E, and K. Patients who take medications that include vitamins see an increase in their cholesterol levels since this is a necessary step in the metabolism of the vitamins that are being taken into the body. An imbalance in the functioning of hormones and lipids in the body would be caused by high cholesterol concentrations according to age groups rather than according to infertility, whether primary or secondary infertility (39).

Level of Serum Triglyceride

According to Table (1), the mean triglyceride level for infertile women was (169.02 68.248) mg / dl for the G1 group, (136.01 55.355) mg / dl for the G2 group, and (72.20 9.581) mg / dl for the healthy group. The healthy group had a triglyceride level that was much lower than the other two groups. As can be seen in Figure (3), the findings demonstrated that there was an increase in the amount of triglycerides present in the blood of the two groups G1 and G2, when compared to the levels seen in healthy people.

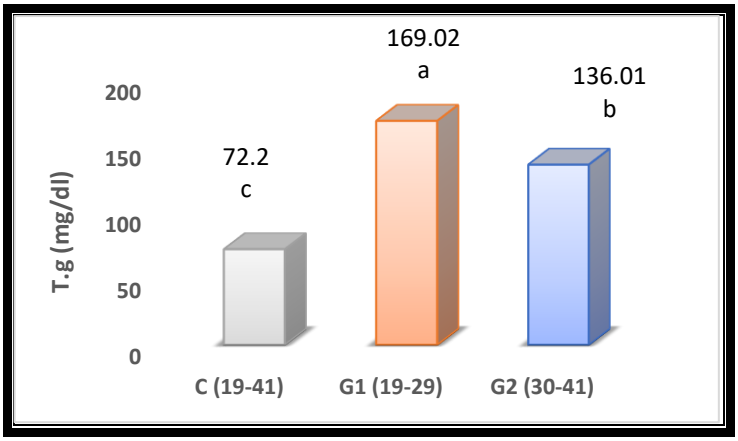

Figure 3: The level of triglycerides in the blood serum of the samples under study, according to age

The findings of the present investigation are in line with those obtained from earlier research conducted by Mulder (40), as well as those obtained from Hollmann (41) and Abdullah (42).

It was shown that around 35% of infertile women had high concentrations of triglycerides (43), which leads us to believe that infertile women may suffer from cardiovascular disease or polycystic ovarian syndrome. This is due to the fact that women who have polycystic ovaries have high concentrations of triglycerides, which is also true of women who have polycystic ovarian syndrome. These are also associated with insulin resistance and thus with obesity, both of which can be the cause of infertility events (44). Some studies have indicated that infertile females with polycystic syndrome have high concentrations of triglycerides as a result of the nature of the food intake, particularly fatty ones. This is due to the fact that polycystic syndrome is associated with obesity.

There is also the possibility that the high level of triglycerides in the blood is the result of a decrease in the activity of the enzyme Lipoprotein lipase -LPL (45), which is responsible for the breakdown of triglycerides. This would suggest that the enzyme is unable to break down the triglycerides into their constituent parts. Alternately, it may be due of an increase in the intake of significant amounts of foods that are rich in fat, which in turn promotes an increase in the creation of chylomicrons inside the gut. Alternatively, it may be because of a combination of these two factors. The breakdown of these chylomicrons results in the release of fatty acids. As a

consequence of this, the liver cells take in large amounts of fatty acids, which leads to a rise in the concentration of TG (46).

Level of serum high-density lipoprotein

According to Table (1), the mean HDL level for sterile women was (43.741 14.496) mg/dL for the G1 group, while the mean HDL level for sterile women in the G2 group was (43.405 9.899) mg/dL. This is in contrast to the healthy group, which had a mean HDL level of (64.060 10.210) mg/dL. As can be seen in Figure (4), the findings demonstrated a lower concentration of high-density lipoprotein (HDL) in the blood serum of participants belonging to groups G1 and G2 as compared to healthy volunteers.

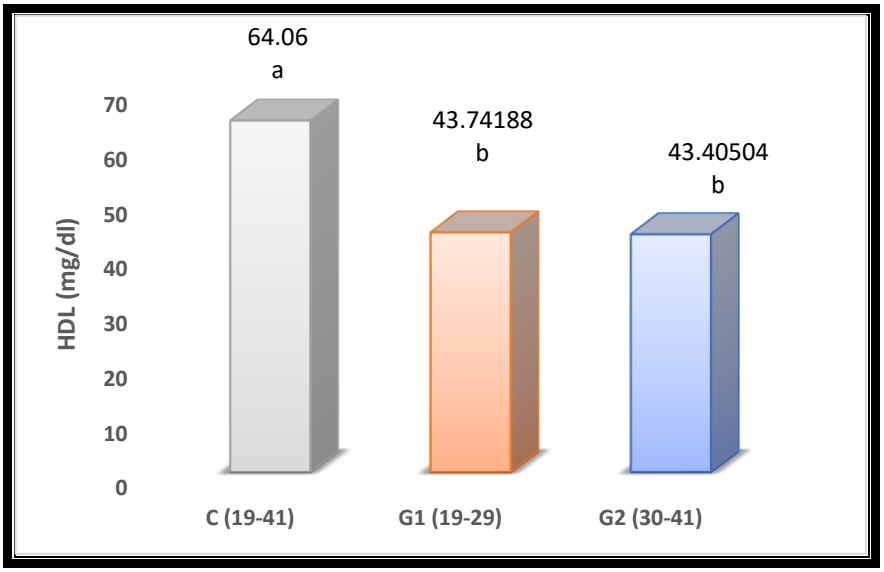

Figure (4): High-density lipoprotein level in the blood serum of the samples under study according to age

The findings of the present investigation are in agreement with the findings of (Belan) (47), who found in his study a low level of high-density lipoprotein. The findings of the current study may be found here.

It is likely that the low quantities of HDL-C in the serum of infertile women are caused by the absence of oxidation of lipoproteins, and that HDL-C may have a potential role in producing infertility (48). This would explain the drop in the amount of HDL that is seen in the serum of infertile women. Additionally, a rise in triglyceride levels and a reduction in HDL levels are caused when there is a lack of conversion of fatty acids to esters and when there are high amounts of fatty acids (49). Also, the decrease in high-density lipoprotein contributes to obesity, insulin resistance, and hyperandrogenism in infertile women, as a result of polycystic ovary syndrome. This is because polycystic ovary syndrome has independent and interactive effects on blood lipid disorders (50). Additionally, it was discovered that metformin treatment leads to a decrease in the level of high-density lipoprotein (51).

Level of Serum Low-density lipoprotein

According to Table (1), the mean LDL level of infertile women had a value of (211.105 89.070) mg/dL for the G1 group and (196.105 105.434) mg/dL for the G2 group, in comparison to the value of (86.588 22.925) mg/dL. This difference was statistically significant. The findings revealed that there was a considerable rise in the amount of LDL-C in the blood serum of groups G1 and G2 in comparison to healthy people, as can be shown in Figure (5). This was the case for the control group.

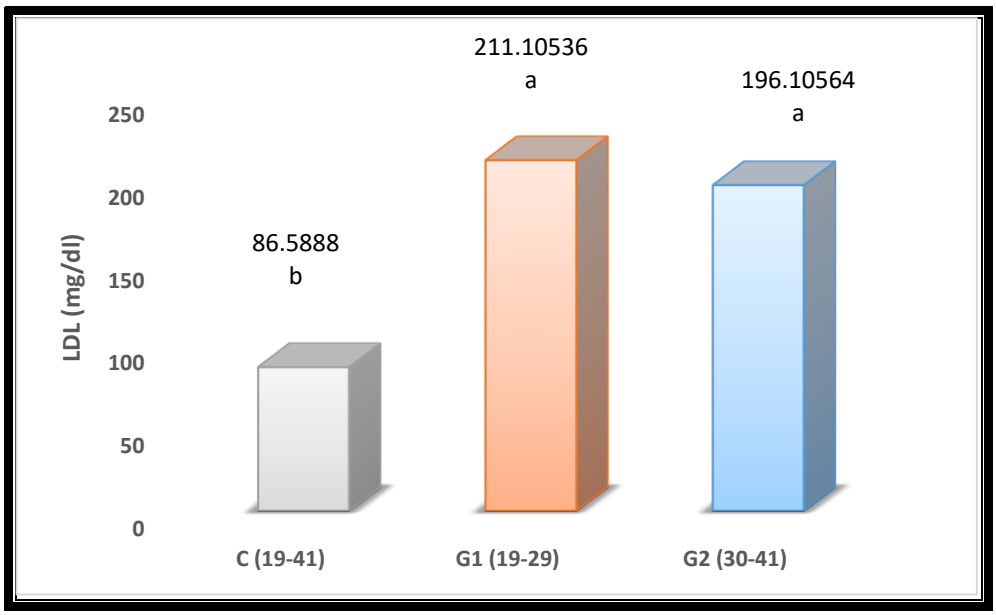

Figure 5: Low-density lipoprotein level in the blood serum of the samples under study by age

The findings of the present investigation are in line with those discovered by (Aseel) (18) and those discovered by Salwa (45), respectively. It is known that the role of this lipoprotein is to transport cholesterol and triglycerides from the liver to the tissues of the body. The reason for the increase in the level of LDL in the serum of sterile women is because the high levels of LDL-C may come from the increased intake of fatty food, which causes obesity. This is because it is known that the high levels of LDL-C may come from the increased intake of fatty food. The oxidative stress that is brought on by active oxygen species, the concentrations of which are increased following oxidative damage (52), plays a part in the modifications that have taken place. In a similar manner, an increase in the amount of cholesterol in food that is delivered to the liver leads to the activation of the building of receptors. On the other hand, an increase in the concentration of saturated fatty acids hinders the process of filtering LDL-C particles, which in turn leads to a decrease in the effectiveness of its receptors and an increase in its concentration in the blood. This leads to instances of atherosclerosis and, as a consequence, the many different heart illnesses that are related with infertility (53). It is also possible that certain women using hormonal medicines, which boost progesterone concentrations in the blood and, as a consequence, greater levels of LDL-C, are to blame for high levels of LDL-C in their bodies (54). This is one of the theories that has been put up to explain this phenomenon.

During the menstrual cycle of a woman, especially on the 15th day of the cycle, the concentrations of low-density lipoproteins begin to increase as a consequence of the production of human chorionic gonadotropin (HCG) (55). This occurs as a result of the fact that the concentrations of low-density lipoproteins begin to rise.

Level of Serum very low density lipoprotein

Table 1 shows that the mean and standard deviation of the very low-density lipoprotein level in sterile women was (35.996 13.496) mg/dL for the G1 group, (32.424 13.025) mg/dL for the G2 group, and (16.360 3.451) mg/dL for the control group. These values compare to the control group's level of (16.360 3.451) mg/dL. As can be seen in Figure (6), the findings demonstrated that both Group G1 and Group G2 had elevated levels of VLDL in their blood serums, in comparison to the healthy patients.

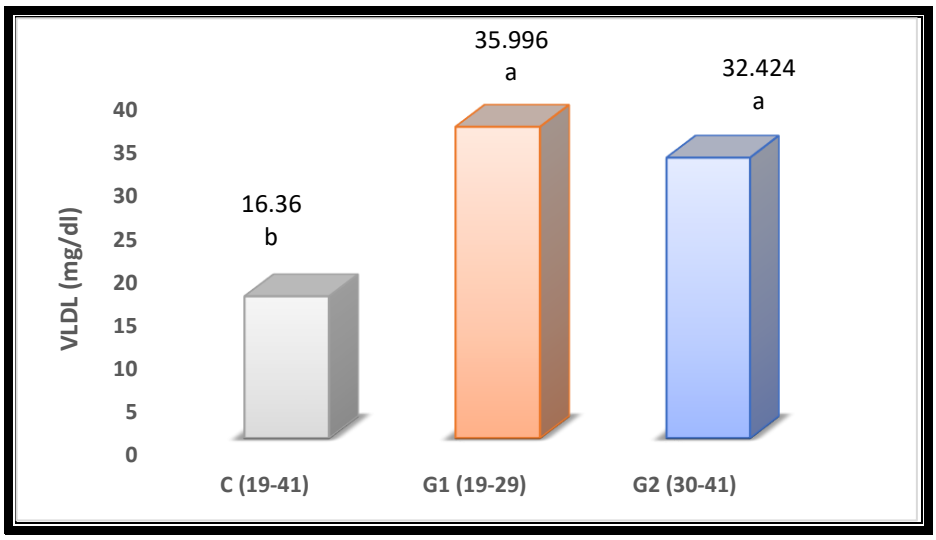

Figure 6: The level of very low-density lipoprotein in the blood serum of the samples under study, according to age

The findings of the present investigation are in line with those discovered by (Aseel) (18) and those discovered by Salwa (45), respectively. The concentration of very low-density lipoprotein, which plays a key role in the development of cardiovascular illnesses, is raised in infertile females who have polycystic ovarian syndrome (41).

In general, there are a variety of medicines, such as cyclosporin, diuretics, oral contraceptives, and some hormones such as androgens, glucocorticoids, and progesterone (56), that have the potential to influence serum lipids and lipoprotein concentrations. An increase in fatty acids in the liver may be to blame for the rise in the concentration of VLDL in the group of patients. This rise in fatty acids stimulates the production of very low-density protein, which finally results in hyperlipidemia (57).

References

1. Saeed,R,H.,Al-Mohaidi,A.M.,& Ismail ,N.K 2021 Assocation Between Some Risk Factors With Hormnal State in a Sample Of Infertile Iraqi Women. 2021.
2. Ayat A. Abbas, Ismail A. Abdul-Hassan. The Immunological Role of Anti-Sperm Interleukin-6 Antibody in Primary Male Infertility. Iraqi Journal of Biotechnology, 2022; 21(2: 9-12.
3. Ayat A. Abbas, Ismail A. Abdul-Hassan. The Immunological Role of Anti-Sperm Interleukin-6 Antibody in Primary Male Infertility. Iraqi Journal of Biotechnology, 2022; 21(2: 9-12.
4. Lindsay TJ, Vitrikas K. Evaluation and treatment of infertility. Am Fam Physician. 2015;91(5):308-314.
5. Eldib A, Tashani OA. Infertility in the Middle East and North Africa Region: A systematic review with meta-Analysis of prevalence surveys. Libyan J Med Sci. 2018;2(2):37.
6. Bala R, Singh V, Rajender S, Singh K. Environment, lifestyle, and female infertility. Reprod Sci. 2021;28(3):617-638.
7. Burger , H.G. ; Fuller , P.J. ; Chus , M.P. et al . The inhibin and ovarian cancer . J. Molecular Cell Endocrinolo.2001; (180):145-148.
8. Bernard, D. J. Chapman , S. C. and Woodruff, T.K. Mechanisms of Inhibin signal transduction , J. of Pub. Med.2001; (56):417-50.

9. Yamoto , M. ; Minami , S. ; Nakano , R. Immun histro chemical localization of inhibin lactivin subunit in human ovarian follicles during the menstrual cycle , J. Clin. Endo. And Metab.1991; (77):859-862.
10. MuttuKrishna, S.T. and Ledger, W. Inhibin and Activin in Human Reproductive physiology. Imperial college press.2001.
11. Matsushita, Y., Nakagawa, H., & Koike, K. Lipid metabolism in oncology: why it matters, how to research, and how to treat. Cancers,2021; 13(3): 474 .
12. 12-Al-Rai, Ahmed Omar. Effect of aqueous extract of hibiscus flowers on hyperlipidemia in rabbits and its relation to blood pressure. Master Thesis. College of Science. October University. Syrian Arab Republic 2016.
13. Allain , C.C.; Poon, L.S.; Chan, C.S.; Richmond , W. and Fu , P.C. Enzymatic determination of total serum cholesterol. Clin. Chem. 1974;20(4):470-5.
14. Fossati, P. and Prencipe, L. Serum triglycerides determined colorimetrically with an enzyme that produces hydrogen peroxide. Clin. Chem. 1982;28(10):2077-80.
15. Gotto , A. M. Lipoprotein metabolism and the etiology of hyperlipidemia. Hosp. Pract. 1988; 23(1): 4- 13.
16. Shettles, L. B.; Dische, Z.; & Osnos, M. Neutral mucopolysaccharide of the human cervical mucus. Journal of Biological Chemistry. (1951);192(2): 589-593.
17. Radhi .I. J. Investigation of some biochemical markers and some elements in infertile women, Degree of Master. Unversity of Kerbala. College of Science. 2018.
18. ASEEL M. H. ABDULWAHED, SAHIB J. ABDULRAHMAN, MUNEF S. A. AL-JANABI. DETERMINATION CONCENTRATIONS OF INHIBIN-B HORMONE AND SOME OTHER HORMONES AND LIPIDS PROFILE IN INFERTILE WOMEN IN SAMARRA. Journal of university of Anbar for Pure science, 2014; 8(1) : 8-16.
19. S.L. Corson, J. Gutmann, F.R. Batzer, H. Wallace, N. Klein, M.R. Inhibin-B as a test of ovarian reserve for infertile women. Human Reproduction, 1999; 14, (11) : 2818–2821.
20. Anuja Dokras, M.D, Antonia Habana, M.D. Juan Giraldo, M.D ,Ervin Jones, M.D. Secretion of inhibin B during ovarian stimulation is decreased in infertile women with endometriosis. ENDOMETRIOSIS| VOLUME 74, ISSUE 1 (https://www.fertstert.org/issue/S0015-0282(00)X0046-5), P35-40, JULY 2000.
21. Ibrahim, Jimin Abdullah, Naji Nizar Ahmed. The role of inhibin B in infertility in some women with polycystic ovary syndrome in Kirkuk city. Kirkuk Journal of Science. Size 11, number 2. 2016: 391-409.
22. Halder A, Fauzdar A, Ghosh M, Kumar A. Serum inhibin B: Adirect and precise marker of ovarian function.. J.clin.diagno.2007. Res.; 3:131-137
23. Pergola G.D ; Maldera S ; Tartagni M; *et al* . Inhibitory Effect of Obesity on Gonadotropin, Estradiol, and Inhibin B Levels in Fertile Women.2006.
24. Peng, C. and Mukai, S.T. Inhibin Activin and their reseptors in female , reproduction development of biology .York Univ. , J. Pub. Med.2000. 78(3):216-79.
25. Lambart , G. M. ; Bukume , Z. O. and Arici , A. Assessment of Ovarian reseve , J. Clini. Endo.1997. Vol.(3):231-7.
26. Huang , K , Zhang ,H , Ding T. Can Inhibin B Reflect Ovarian Reserve of Healthy Reproductive Age Women Effectively? Front Endocrinol (Lausanne). 2021; 12: 626534.

27. Broekmans FJ, Soules MR, Fauser BC. Ovarian aging: mechanisms and clinical consequences. *Endocr Rev* .2009;30(5):465–93.

28. Armitage, P.; Berry, G.; and Matthews, J.N.S. (2002).Statistical Methods in Medical Research.4th ed., Blackwell Publishing, Oxford

29. Sohrabvand, F., Ansari, S.H., and Bagheri, M., Efficacy of combined metformin–letrozole in comparison with metformin– clomiphene citrate in clomiphene-resistant infertile women with the polycystic ovarian disease. Human Reproduction, 2006; 21(6):1432-1435.

30. Al- Tikriti A. A .M. The role of Osteocalcin and Preptin hormones in overweight infertile women in Salah Al-din Governorate . Degree of Master . University of Tikrit . College of sciences. 2021.

31. Salwa H. N. Al- Rubae'I. STUDIES ON HORMONAL CHANGES, HOMOCYSTEINE AND LIPIDS PROFILE IN IRAQI WOMEN WITH INFERTILITY. Journal of Techniques, 2012; 25(2) : 107-116.

32. Abdel-Razzaq, Lina Qais Yassin. (2010). A study of a number of blood and biochemical parameters and some hormones among infertile women in Salah Al-Din Governorate. Master Thesis, College of Science. Tikrit University.

33. Pffeuffer , M. and Pittman, R. "Differences in the underling mecganism of cholesterol – and casein induced hyper cholesterolemia in rabbit and rat" . Atherosclerosis . 1989;76:89-91 .

34. Saija, M.D. Maritta, M.D. Leo, M.D. M, auno vanhala, M.D and Seppo Saari-koski, M. D. Relationship of the metabolic Syndrome and obesity to polycystic ovary Syndrome Acontrolled population based study . Am. J. obstet. GyneGol;2001. 184 : 289-96.

35. Al-Douri, Saria Naji Mohsen. A hormonal, biochemical and physiological study on a number of women with polycystic ovary syndrome in the city of Tikrit and its environs. Master Thesis. College of Science. Tikrit University. 2007.

36. Gao, L., Li, M., Wang, Y., Zeng, Z., Xie, Y., Liu, G., ... & Yang, X. Overweight and high serum total cholesterol were risk factors for the outcome of IVF/ICSI cycles in PCOS patients and a PCOS-specific predictive model of live birth rate was established. Journal of endocrinological investigation,2020. 43(9), 1221-1228.

37. Edwards, C.; Boucheir, I.; and Chilver, E. "Davidson's Principles and practice of Medicine." Edinburgh, London and New York, 1996; 12: Pp. 764-8.

38. Laurence, D.; Bennett, P.; Brown, M. "Clin. Pharma." 8th ed.Churchill living stone, New York, Edinburgh, 1997; 26; 478-83.

39. Burger , Henry , G. ; Fracp ; et al. Cycle and hormone change during primenopose the kye role of ovarian function , J. pof the North American Menopouse ,2008. (15):603-612.

40. CL Mulder, ZS Lassi, JA Grieger.*et al*. Cardio-metabolic risk factors among young infertile women: a systematic review and meta-analysis. First published: 2020; 12 127, Issue 8 : 930-939.

41. M Hollmann, B Runnebaum & I Gerhard. Impact of waist-hip-ratio and body-mass-index on hormonal and metabolic parameters in young, obese women. International Journal of Obesity.1997; 21:476–483.

42. Abdullah, Amna Ahmed Tais. A physiological and biochemical study of sterile and healthy women in Salah al-Din Governorate. Master's thesis. Faculty of Education. Tikrit University. 2011.

43. Adils , S.D. and Dhia , J. Lipid Profile studying subjects and patient with 1.H.b. Med., Baghdad .1991; 33(3) :337-342.

44. Huxley, R.R. ; Neil, H.A. The relation between dietary cholesterol cholesterol intake and coronary heart disease mortality : ameta – analysis of prospective cohort studies . Euro . J. Clin.2003.Nutr.57:904-908.

45. AlIzadeh, Sanaz, et al. Metabolic parameters in cord blood of neonate of mothers with obese and non-obese PCOS and controls: retrospective cohort study. BMC Pregnancy and Childbirth, 2021, 21.1: 1-6

46. Patavoukas, E.; Åberg-Liesaho, J.; Halvorsen, C. P.; Winbladh, B.; and Wiberg-Itzel, E. Relationship between various maternal conditions and lactic acid dehydrogenase activity in umbilical cord blood at birth. Journal of perinatal medicine. 2018;46(6):605-11.

47. Belan M, Soren Harnois-Leblanc, Blandine Laferrère and Jean-Patrice Baillargeon. Optimizing reproductive health in women with obesity and infertility. CMAJ June 18, 2018 .190 (24) E742-E745.

48. Miettinen HE, Rayburn H, Krieger M. Abnormal lipoprotein metabolism and reversible female infertility in HDL receptor (SR-BI)–deficient mice. The Journal of clinical investigation. 2001 Dec 1;108(11):1717-22.

49. Conwa , G.S. ; Agramal , R. ; Betteridge , D.J. and Jacobs , H.S. Riskfactors for conronary artery disease in lean and obese women with polycyctic ovary yndrom , J, Clin. Endocrinol ,1992; (37):119-125.

50. Keskin ,H.; Timur, O.; Kaya, Y.; *et al* . Increased uric acid levels and clinical relationship in polycystic ovary syndrome Endocrine Abstracts. 2016.

51. Al-Youzbaki, W. B. ;Al-Hussaini, A .J. ; Abdullah ,R .G. Serum Uric Acid Concentration in Patients with Polycystic Ovary Syndrome Treated by Metformin IRAQI JOURNALOF COMMUNITY MEDICINE. 2012; 25(9) 205-209.

52. Agarwal, A.; Gupta. S, Sharma.; RK. Role of oxidative stress in female reproduction. Reproductive biology and endocrinology. 2005;3(1):28.

53. O'Keefe, JH, Cordain L, Harris WH, Moe RM, Vogel R. Optimal low-density lipoprotein is 50 to 70 mg/dl: lower is better and physiologically normal. Journal of the American College of Cardiology. 2004 ; 2;43(11):2142-6.

54. Miller ;Antonio M.; Gotto, J. Low High-Density Lipoprotein Cholesterol as a Risk Factor in Coronary Heart Disease,J. American Heart Association.2009.

55. Bizzi, P Dessole, S. Tonolo, G. Gapotianco, G. Milial, Puddul, Nardol, G. Effect of ovarian stimulating on plasma lipid and polipoprotein contrations in apopulation of infertilite women underogeng.N C.B.I. 2003; 7(3):309-12.

56. Walker, R. Hyperlipidaemia. In: Walker R and Edwards C (ED) . Clinical Pharmacology and Therapeutics, 2nd edition, Churchill Living stone, London.1999: :327-342.

57. Shoaib, O.M.; Mustafa, S.M.; Nourein, I.H. Serum lipid profile of polycystic ovary syndromein Sudanese women. Int. J. Med.Sci.andPublic Health.,2015.4(11), 1605- 13-Smith S, Gillam T. Sexual dysfunction-the forgotten taboo. Mental Health Nursing. 2005;25(1):6.