



## Study Fertility Levels on Women Infected by Type 2 Diabetes Mellitus

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Article History	Abstract
Received: 26 June 2023 Revised: 15 Sept 2023 Accepted: 21 Sept 2023	<p><b>Aim:</b> This study attempts to measure the total amounts of LH, FSH, prolactin, testosterone, and fasting Blood Glucose (F.B.G) in diabetic Women. The specimen is divided into two classes; the first class consisted of forty women who have diabetes type 2 with polycystic ovary syndrome (PCOS). The second class is twenty (control) <b>Material and method:</b> The results in this work showed a successive increase (LH, Prolactin, Testosterone, and fasting Blood Glucose (F.B.G)) at (<math>P &lt; 0.005</math>) in women who have diabetes type 2 with polycystic ovary syndrome when compared to the control class, while the outcomes indicated a decrease in the level of (FSH Hormone) at (<math>P &lt; 0.005</math>) when compared healthy group. <b>Statistics and Result:</b> Diabetes Mellitus Type 2 affects the levels of the LH Hormone (<math>8.1 \pm 3.9</math>), Prolactin (<math>11.3 \pm 5.1</math>), Testosterone Hormone (<math>230 \pm 118.2</math>), fasting Blood Glucose (<math>222.1 \pm 12.10</math>), and the level of (FSH Hormone <math>5.6 \pm 1.3</math>) in women. Hence, high blood sugar in women leads to infertility for them. Infertility affects a significant portion of women with type 2 diabetes and polycystic ovaries, which is why this issue has to be studied. One of the most crucial answers to this issue is to follow the advice given by the doctor and try to treat lowering blood sugar and reach the normal limit because high sugar affects the ovaries and thus causes infertility.</p>
CC License CC-BY-NC-SA 4.0	<b>Keywords:</b> Women infected, Diabetes type 2, Mellitus

### 1. Introduction

Failing to achieve pregnancy after more than a one year of attempting to conceive is commonly known as Infertility (Lim et al., 2013; Louis et al., 2012). The major challenge for worldwide general health is the Diabetes mellitus (DM), it involves a heterogeneous etiology of infections described by raised the glucose of blood (Dakovic et al., 2014; Richard IG Holt, 2012; Tuleab, 2021; Zipitis&Akobeng, 2008). The conditions that cause problems in releasing of an ovum (egg) are the most common causes of infertility in females (Elbers et al., 2011; Hull et al., 1986). Polycystic ovary syndrome is the most common endocrinopathy in women of reproductive age, affecting from 5 to 10 percent of all the population, and it is the leading cause of infertility in females (Diamanti-Kandarakis et al., 2006; Kosova & Urbanek, 2013; Legro & Strauss, 2002; Musmar et al., 2013). Approximately 5% to 10% of women in reproductive age have symptoms produced by PCOS (Boomsma et al., 2008; Goldenberg & Glueck, 2008).

### 2. Materials And Methods

#### Laboratory Measurements

A study was held in Clinics in the time period from (January 2021) to (April 2021) in Kirkuk City, Iraq. The study includes forty women who have type\_2 diabetes in the age range of (25-35) years. In addition to the selection of the random group, a sample of twenty healthy women of ages (25-35) years was included as a control group.

The process of collecting blood tests was by taking 10 mL from the vein of the patient then the samples were placed in dispensable test tubes to make Hormone tests and (F.B.G). Some Biochemical Parameters have been used in this work such as:

### The glucose Measurements

The Glucose has been estimated in the serum by following the steps with (Kit) as in (Trinder, 1969).

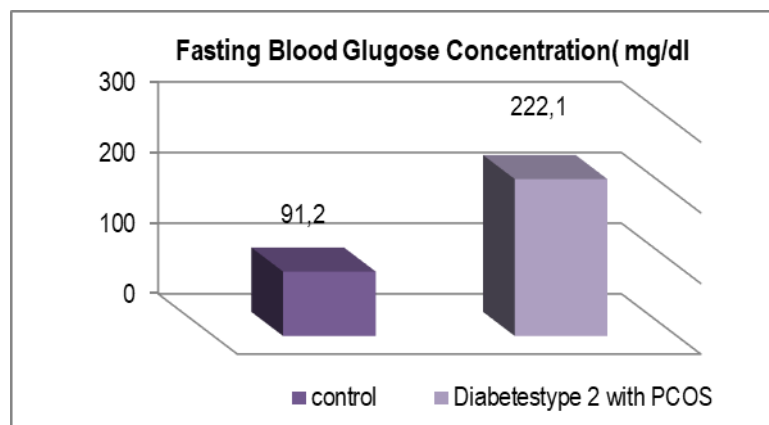
### The Hormones Measurements

LH, FSH, Testosterone, of Prolactin Concentration. The way is used according to Biomerieux Kit FSH, LH, Testos, and PRL (Lenton et al., 1982; Vitt et al., 1998; Tietz, 1991; Wheeler, 2013).

The data of this study were collected and statistically analyzed using the Statistical Package for the Social Sciences (SPSS10) with (mean  $\pm$  SD) and the significant differences at level (0.05).

### 3. Results and Discussion

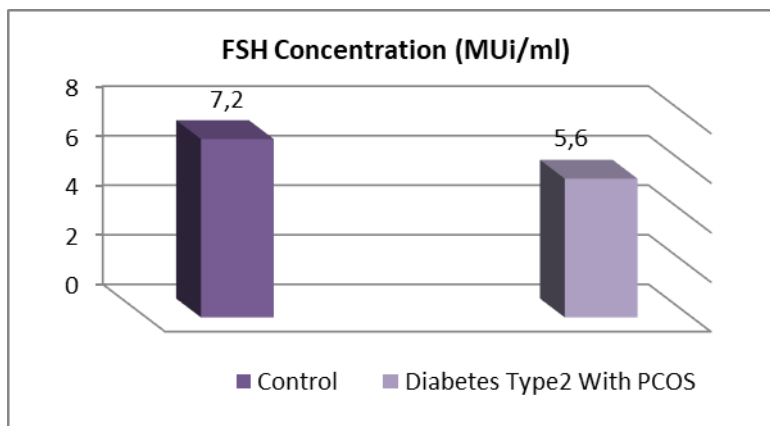
Our study showed in Figure 1 a rising in the blood glucose at ( $P < 0.005$ ) in patients with diabetes type 2 with polycystic ovary syndrome with (control). These results agree with the study of (Elbers et al., 2011) its significant increase in blood glucose concentration in comparison with the control group. DM is a metabolic disorders group characterized by hyperglycemia, the elevation in FBG level may be caused by the defection in insulin secretion, insulin action, or both (Association, 2013). The results of this work concur with the study of (Hussein & Al-Qaisi, 2012; Vital et al., 2006).



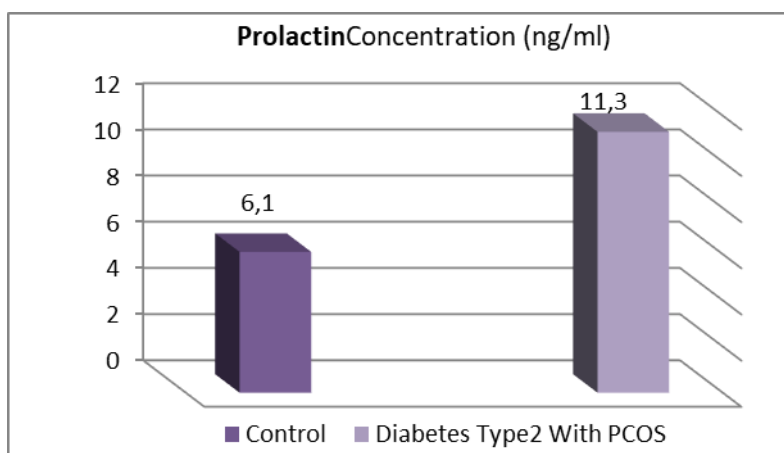
**Fig. 1.** Illustrated Fasting Blood Glucose In women who have diabetes type 2 with polycystic ovary syndrome and compare with control.

Figure 2 shows low levels of FSH while Figures (3,4 and 5) show a significant increase in PRL, LH, and testosterone in Diabetes mellitus type 2 in comparison with the control group. (Hofny et al., 2010) has a study that shows lowered significantly FSH while high significantly LH, and testosterone in women. In PCOS, it is caused by a defect in the endocrine glands and thus leads to changes in the secretions of the gonads. When there is an imbalance of the gonadotropin-releasing hormone, it will escort rise levels of ovulation hormone, and therefore it will work to reduce the secretion of FSH. The rise in the secretion of LH increases the secretion of insulin which leads to an increase in the production of androgen from theca cells with a decrease in the levels of the aromatase enzyme. The increase in insulin levels in the blood suppresses production the of protein (SHBG), which increases the percentage of free testosterone (Conway et al., 2014; Franks & Berga, 2012; Yildiz et al., 2008).

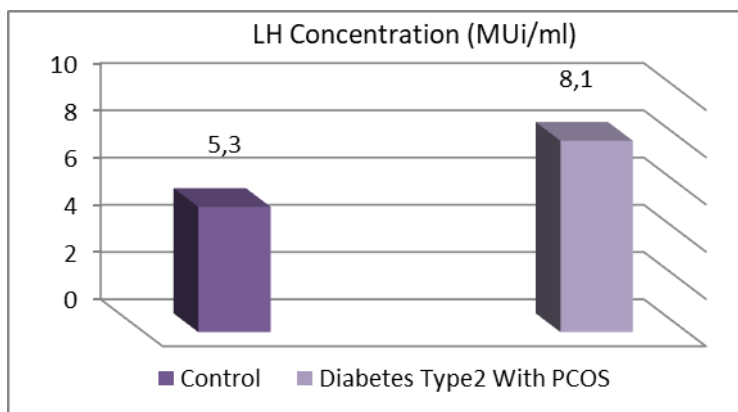
Studies have shown that an increase in prolactin in the blood is 5%-30% (PCOS) (Sheehan, 2004). In our current study, a high percentage of prolactin hormone appeared in women with PCOS compared to the control group (Al-Bayatti, 2006) Roy et al. found in their study that serum insulin and prolactin are elevated in PCOS women with diabetic type\_2 study by (K. Roy George & N. A. Malini, 2014), revealed in Nigeria on 175 ladies had high levels of prolactin level type 2 (da Silva Feuser et al., 2014).



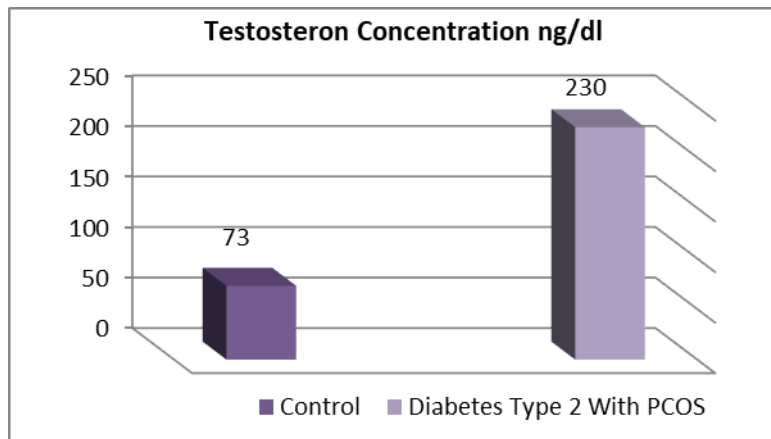
**Fig. 2.** Illustrated FSH in women who have diabetes type 2 with polycystic ovary syndrome And compare with control.



**Fig. 3.** Illustrated Prolactin hormone in women who have diabetes type 2 with polycystic ovary syndrome and compare with control.



**Fig. 4.** Luteinizing Hormone(LH)) in women who have diabetes type 2 with polycystic ovary syndrome and compare with control.



**Fig. 5.** Illustrated Testosterone Hormone in women who have diabetes type 2 with polycystic ovary syndrome and compare with control.

### References:

- Al-Bayatti, A. (2006). Insulin resistance and upper-body obesity in polycystic ovary syndrome. *Middle East Fertility Society Journal*, *11*, 202–209.
- Association, A. D. (2013). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*, *37*(Supplement\_1), S81–S90. <https://doi.org/10.2337/dc14-S081>
- Boomsma, C. M., Fauser, B. C. J. M., & Macklon, N. S. (2008). Pregnancy complications in women with polycystic ovary syndrome. *Seminars in Reproductive Medicine*, *26*(1), 72–84. <https://doi.org/10.1055/s-2007-992927>
- Conway, G., Dewailly, D., Diamanti-Kandarakis, E., Escobar-Morreale, H. F., Franks, S., Gambineri, A., Kelestimur, F., Macut, D., Micic, D., Pasquali, R., Pfeifer, M., Pignatelli, D., Pugeat, M., Yildiz, B. O., & ESE PCOS Special Interest Group. (2014). The polycystic ovary syndrome: a position statement from the European Society of Endocrinology. *European Journal of Endocrinology*, *171*(4), P1-29. <https://doi.org/10.1530/EJE-14-0253>
- da Silva Feuser, C. S., Barbosa, J. S., da Silva, E. B., & de Medeiros, S. F. (2014). Current insights into gonadotropic pituitary function in the polycystic ovary syndrome. *Asian Pacific Journal of Reproduction*, *3*(1), 64–70. [https://doi.org/10.1016/S2305-0500\(14\)60004-X](https://doi.org/10.1016/S2305-0500(14)60004-X)
- Dakovic, D., Mileusnić, I., Hajdukovic, Z., Cakic, S., & Hadzi-Mihajlovic, M. (2014). Gingivitis and periodontitis in children and adolescents suffering from type 1 diabetes mellitus. *Vojnosanitetski Pregled*, *72*, 50. <https://doi.org/10.2298/VSP131212050D>
- Diamanti-Kandarakis, E., Kandarakis, H., & Legro, R. S. (2006). The role of genes and environment in the etiology of PCOS. *Endocrine*, *30*(1), 19–26. <https://doi.org/10.1385/ENDO:30:1:19>
- Elbers, C. C., Onland-Moret, N. C., Eijkemans, M. J. C., Wijmenga, C., Grobbee, D. E., & van der Schouw, Y. T. (2011). Low fertility and the risk of type 2 diabetes in women. *Human Reproduction*, *26*(12), 3472–3478. <https://doi.org/10.1093/humrep/der332>
- Franks, S., & Berga, S. L. (2012). Does PCOS have developmental origins? *Fertility and Sterility*, *97*(1), 2–6. <https://doi.org/10.1016/j.fertnstert.2011.11.029>
- Goldenberg, N., & Glueck, C. (2008). Medical therapy in women with polycystic ovarian syndrome before and during pregnancy and lactation. *Minerva Ginecologica*, *60*(1), 63–75. <http://europepmc.org/abstract/MED/18277353>
- Hofny, E. R. M., Ali, M. E., Abdel-Hafez, H. Z., Kamal, E. E.-D., Mohamed, E. E., Abd El-Azeem, H. G., & Mostafa, T. (2010). Semen parameters and hormonal profile in obese fertile and infertile males. *Fertility and Sterility*, *94*(2), 581–584. <https://doi.org/10.1016/j.fertnstert.2009.03.085>
- Hull, M. G. R., Glazener, C., Kelly, N. J., Conway, D. I., Foster, P. A., Hinton, R. A., Coulson, C., Lambert, P. A., Watt, E., & Desai, K. (1986). Population Study Of Causes, Treatment, And Outcome Of Infertility. *British Medical Journal (Clinical Research Ed.)*, *291*, 1693–1697. <https://doi.org/10.2307/29521620>
- Hussein, Z., & Al-Qaisi, J. (2012). Effect of Diabetes mellitus Type 2 on Pituitary Gland Hormones (FSH, LH) in Men and Women in Iraq. *Al-Nahrain Journal of Science*, *15*(3). <https://anjs.edu.iq/index.php/anjs/article/view/802>
- K. Roy George, & N. A. Malini. (2014). The prevalence and etiology of polycystic ovarian syndrome (PCOS) as a cause of female infertility in central Travancore. *PREVALENCE*.
- Kosova, G., & Urbanek, M. (2013). Genetics of the polycystic ovary syndrome. *Molecular and Cellular Endocrinology*, *373*(1–2), 29–38. <https://doi.org/10.1016/j.mce.2012.10.009>

- Legro, R. S., & Strauss, J. F. (2002). Molecular progress in infertility: polycystic ovary syndrome. *Fertility and Sterility*, 78(3), 569–576. [https://doi.org/10.1016/S0015-0282\(02\)03275-2](https://doi.org/10.1016/S0015-0282(02)03275-2)
- Lenton, E. A., Neal, L. M., & Sulaiman, R. (1982). Plasma concentrations of human chorionic gonadotropin from the time of implantation until the second week of pregnancy. *Fertility and Sterility*, 37(6), 773–778. [https://doi.org/10.1016/S0015-0282\(16\)46337-5](https://doi.org/10.1016/S0015-0282(16)46337-5)
- Lim, S. S., Norman, R. J., Davies, M. J., & Moran, L. J. (2013). The effect of obesity on polycystic ovary syndrome: a systematic review and meta-analysis. *Obesity Reviews*, 14(2), 95–109. <https://doi.org/10.1111/j.1467-789X.2012.01053.x>
- Louis, G., Sundaram, R., Schisterman, E., Sweeney, A., Lynch, C., Gore-Langton, R., Chen, Z., Kim, S., Caldwell, K., & Barr, D. (2012). Heavy metals and couple fecundity, the LIFE Study. *Chemosphere*, 87, 1201–1207. <https://doi.org/10.1016/j.chemosphere.2012.01.017>
- Muthiadin, C.U.T., Aziz, I.R., Hatta, M., Nasrum, M., Hartina, Supardan, D., Ashriady, Elisanti, A.D., Prihati, D.R., Dasopang, E.S.
- Immunoreactivity of 36 kDa outer membrane proteins (OMP) salmonella enterica serovar typhi as candidate immunodiagnostic for typhoid fever  
(2018) International Journal of Pharmaceutical Research, 10 (3), pp. 167-171.
- Musmar, S., Afaneh, A., & Mo'alla, H. (2013). Epidemiology of polycystic ovary syndrome: A cross sectional study of university students at An-Najah national university-Palestine. *Reproductive Biology and Endocrinology : RB&E*, 11, 47. <https://doi.org/10.1186/1477-7827-11-47>
- Richard IG Holt. (2012). *Essential Endocrinology and Diabetes* (6th ed.). John Wiley & Sons.
- Sheehan, M. T. (2004). Polycystic ovarian syndrome: diagnosis and management. *Clinical Medicine & Research*, 2(1), 13–27. <https://doi.org/10.3121/cmr.2.1.13>
- Tietz, N. W. (1991). *Clinical guide to laboratory tests* (2nd Edition). Saunders Co.
- Trinder, P. (1969). Determination of Glucose in Blood Using Glucose Oxidase with an Alternative Oxygen Acceptor. *Annals of Clinical Biochemistry: International Journal of Laboratory Medicine*, 6(1), 24–27. <https://doi.org/10.1177/000456326900600108>
- Yau, AshiruAnees, SaiffuddinKamfuti Sani, Aparna Datta, and . 0. POTENTIAL OF CURCUMIN LOADED NANOPARTICLES IN ANTIMICROBIAL PHOTODYNAMIC THERAPY. <https://doi.org/10.31838/ijprt/11.02.07>
- Tuleab, S. (2021). Serum High-Sensitivity C-Reactive Protein and Endogenous Sex Hormones in Diabetic Men. *Journal of Biotechnology Research Center*, 10. <https://doi.org/10.24126/jobrc.2016.10.1.463>
- Vital, P., Larrieta, E., & Hiriart, M. (2006). Sexual dimorphism in insulin sensitivity and susceptibility to develop diabetes in rats. *The Journal of Endocrinology*, 190(2), 425–432. <https://doi.org/10.1677/joe.1.06596>
- Vitt, U. A., Kloosterboer, H. J., Rose, U. M., Mulders, J. W. M., Kiesel, P. S., Bete, S., & Nayudu, P. L. (1998). Isoforms of Human Recombinant Follicle-Stimulating Hormone: Comparison of Effects on Murine Follicle Development In Vitro. *Biology of Reproduction*, 59(4), 854–861. <https://doi.org/10.1095/biolreprod59.4.854>
- Wheeler, M. (2013). *Hormone Assays in Biological Fluids*. <https://doi.org/10.1007/978-1-62703-616-0>
- Ludhiani, Simran, Rajesh Kumar Maheshwari, and . 2022. NOVEL APPLICATION OF MIXED SOLVENCY CONCEPT TO DEVELOP AND FORMULATE LIQUID SYSTEM OF A POORLY WATER SOLUBLE DRUG, FUROSEMIDE AND THEIR EVALUATIONS. *International Journal of Pharmacy Research & Technology*, 12 (1), 28-57. <https://doi.org/10.31838/ijprt/12.01.05>
- Yildiz, B. O., Knochenhauer, E. S., & Azziz, R. (2008). Impact of obesity on the risk for polycystic ovary syndrome. *The Journal of Clinical Endocrinology and Metabolism*, 93(1), 162–168. <https://doi.org/10.1210/jc.2007-1834>
- Zipitis, C. S., & Akobeng, A. (2008). Vitamin D Supplementation in Early Childhood and Risk of Type 1 Diabetes: a Systematic Review and Meta-analysis. *Archives of Disease in Childhood*, 93, 512–517. <https://doi.org/10.1136/adc.2007.128579>