Original Research

CLINICO-BIOCHEMICAL PROFILE OF THYROID AND PROLACTIN HORMONE LEVELS AMONG INFERTILE WOMEN IN TERTIARY CARE HOSPITAL

Sreevani Matta[1], T.Sankara Narayana[2], Bezwada Srinivasa Rao[3], S.Srivani[4]

[1]Department of Biochemistry, Govt. Siddhartha Medical College, Vijayawada, A.P.
[2]Department of Biochemistry, Rangaraya Medical College, Kakinada, A.P.
[3]Department of General Medicine, Govt. Siddhartha Medical College, Vijayawada, A.P.
[4]Department of Biochemistry, Govt. Siddhartha Medical College, Vijayawada, A.P.

ABSTRACT

Background: Thyroid dysfunction is prevalent in the female population and is known to affect reproductive function and even pregnancy. Hyperprolactinemia is also one of the common problems which are encountered in reproductive disorder. Objective of the study was to determine the prevalence of thyroid profile abnormalities with or without elevated levels prolactin hormone in infertile women. **Materials and Methods:** The present descriptive study was conducted after taking Ethical committee approval. A written consent form was obtained after explaining the procedure and the study protocol to each subject. The cases consisted 100 female subjects who were suffering from primary infertility and had been referred the Department of Biochemistry. The inclusion criteria for the selection of cases were diagnosis of primary infertility, aged between 20-40 years. **Results:** Mean T3, T4 and TSH levels were 1.31, 8.32 and 3.05 respectively with mean prolactin levels being 22.74. 13% of the infertile women had hypothyroidism and 3% had hyperthyroidism. There were a statistically significant high prolactin levels and TSH levels in hyperprolactinemic infertile women compared to normoprolactinaemic infertile women. **Conclusion:** Hyperprolactinemia with thyroid disorders could play a significant factor in infertility and therefore during the workup of infertile women, T3, T4, TSH and prolactin levels should be estimated.

Keywords: infertility; thyroid profile; prolactin levels; clinic-biochemical profile

INTRODUCTION

Infertility is defined as a failure to achieve a pregnancy after regular unprotected sexual intercourse for 12 months or more and it is classified into two types; primary infertility and secondary infertility. Primary infertility denotes those patients who have never conceived and secondary infertility indicates previous pregnancy but failure to conceive subsequently [1,2].

Infertility is a challenging and widespread issue that affects millions of couples globally. Global estimates mention that every year 60–80 million couples have issues of infertility of which more than one thirds are from India. Considering the current population statistics of India, this extrapolates to a humongous number.[3]

The causes of infertility can be due to female factors, male factors, combined factors, or unexplained. Under female factors, the important causes of infertility include hormonal conditions such as thyroid problems, diabetes, hyperprolactinemia, and polycystic ovary syndrome.[4] Among these factors, endocrine hormones have an important role in female fertility. The regulation of ovulation is intricately governed by hormones such as follicle-stimulating hormone, luteinizing hormone, prolactin, and thyroid hormones, all orchestrated by the hypothalamic-pituitary-ovarian axis.

Thyroid hormones [triiodothyronine T3 and tetraiodothyronine T4] are responsible for the normal growth, sexual development, and reproductive physiology. Thyroid dysfunction is prevalent in the female population and is known to affect reproductive function and even pregnancy. Despite the normal concentrations of TSH and free thyroxin [FT4], few patients exhibit clinical hypothyroidism.[5,6] Identification of these thyroid hormone imbalances is crucial and treatment with appropriate medications such as thyroxin might help in menstrual abnormalities and thereby in restoration of fertility. [7]

Prolactin hormone secreted by the anterior pituitary responsible for the milk production during the lactation period and its imbalance especially hyperprolactinemia is commonly encountered in reproductive disorder causing infertility by interfering with ovulation. Despite having raised serum prolactin levels, infertile women may still have normal menses.[8]

The existing literature shows that many infertile women with hypothyroidism have high prolactin levels indicating the association between hypothyroidism and hyperprolactinemia. Thyroid supplementation may restore prolactin levels thereby normalizing ovulatory function. [9]

eISSN: 2583-7761

Correspondence: Dr.Sreevani Matta, Professor, Department of Biochemistry, Govt. Siddhartha Medical College, Vijayawada, Andhra Pradesh., Phone: +919441420428, email: mattasreevani@yahoo.com

Appropriate management of thyroid dysfunction improve health status, normalization of menstrual periods and help in achieving normal fertility.[10] In countries such as India where thyroid dysfunction is prevalent; screening infertile women for thyroid abnormalities is crucial. Therefore, women planning for pregnancy and infertile women should be assessed for thyroid hormones and serum PRL.

By comprehensively examining the interplay between these hormonal factors and infertility, we hope to shed light on effective diagnostic and therapeutic strategies for this significant healthcare challenge. Objective of the study was to determine the prevalence of thyroid profile abnormalities with or without elevated levels prolactin hormone in infertile women.

MATERIALS AND METHODS

The present descriptive study was conducted after taking Ethical committee approval. A written consent form was obtained after explaining the procedure and the study protocol to each subject. The cases consisted 100 female subjects who were suffering from primary infertility and had been referred the Department of Biochemistry of Siddhartha Medical College for hormonal evaluations. The cases were selected over a period of six months. The inclusion criteria for the selection of cases were diagnosis of primary infertility, aged between 20-40 years.

Exclusion criteria included infertility with male factor, female infertility with tubal etiology or congenital issues of urogenital tract or any organic lesion. Any known histories of thyroid abnormalities or any previous thyroid surgery or women on thyroid medication were excluded.

A proper medical history was taken from infertile women followed up by physical examination and relevant investigations especially hormonal assessment [TSH, FT4, FT3, prolactin, FSH and LH] and ultrasonography. A prior informed consent was taken and each subject was explained and well informed about the procedure of testing.

Fasting Venous blood [5ml] was collected in the morning from infertile women by venipuncture for serum biochemical analysis which was separated; all samples were pooled and stored at -4°C until test run. All hormones [Thyroid and Prolactin] tests were estimated using Electro chemiluminescence immunoassay method and the protocol was followed as instructions given by the manufacturer.

As per the serum TSH profile the cases, were divided into three groups:

I-Euthyroidism was present when the value of TSH was within the normal range.

II-Hyperthyroidism was diagnosed if serum TSH was <0.5mIU/L.

III-Hypothyroidism was diagnosed if serum TSH was >4.7mIU/L.

Statistical analysis:

Data was captured in MS-Excel and statistical analysis done by SPSS software. Demographic data was reported in their frequencies and comparisons and the significance was calculated by using student t-test. For correlation of different variable and their association we used Pearson's correlation test. A p-value <0.05 was considered statistically significant.

RESULTS

Data was captured Mean age of the study women was 29.99±3.7 years. Mean T3, T4 and TSH levels were 1.31, 8.32 and 3.05 respectively with mean prolactin levels being 22.74.

Table 1: Distribution according to T3,T4,TSH and Prolactin levels

Hormone levels	Mean	Standard deviation
T3 [ng/ml]	1.31	0.244
T4[ug/dl]	8.32	2.02
TSH [uIU/ml]	3.05	1.67
Prolactin levels [ng/ml]	22.74	22.08

Table 2: Thyroid status among study population

With regards to thyroid status, 13% of the infertile women had hypothyroidism and 3% had hyperthyroidism.

Thyroid status	Frequency	Percentage
Hyperthyroidism [<0.5 mIU/L]	03	3%
Hypothyroidism [>4.7 mIU/L]	13	13%
Euthyroidism [0.5-4.7 mIU/L]	84	84%

Table 3: Comparison of physical and biochemical parameters in hyper and normoprolactinaemic infertile women

Parameter	Hyperprolactinaemic infertile women (n-23)	Normoprolactinaemic infertile women (n=77)	P value	95% CI
Age (years)	28.56±3.75	28.16±5.38	0.7	-1.98 to 2.78
Prolaction levels (ng/ml)	44.61±38.50	14.57±6.35	0.00001*	21.14 to 39.13
T3 (ug/ml)	1.28±0.16	1.32±0.26	0.4	-0.15 to 0.07
T4 (ug/dl)	8.68±1.77	8.21±2.09	0.3	-0.48 to 1.42
TSH (uIU/ml)	3.75±2.0	2.84±1.52	0.02*	0.13 to 1.68

***Statistically Significant**

On comparison of physical and biochemical parameters, there was a statistically significant high prolactin level in hyperprolactinemic infertile women with mean prolactin levels being 44.61 compared to 14.57 in normoprolactinaemic infertile women.

Among the thyroid hormones, TSH levels were also significantly higher [3.75] in hyperprolactinemic infertile women compared to normoprolactinaemic infertile women [2.84]. There was no significant difference in T3 and T4 hormone levels in between the two groups.

Table 4: Correlation between Prolactin and TSH levels

Parameter	Mean+SD	Correlation of Coefficient (r value)	P value
TSH (uIU/ml)	3.05±1.67	0.23	0.00001
Prolactin levels (ng/ml)	22.74±22.08	0.23	0.00001

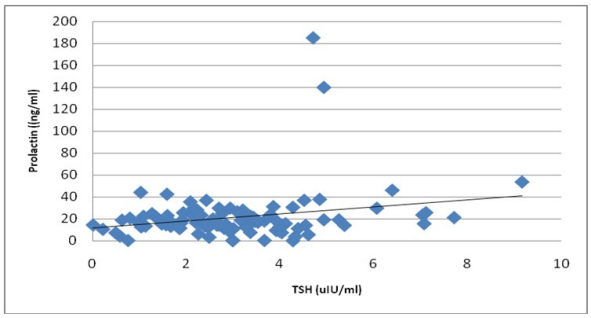

Figure 1: Correlation between Prolactin and TSH levels on Pearson's correlation between Prolactin levels and TSH levels, a slightly positive correlation was observed with 'r' value being 0.23.

DISCUSSION

ith changes in the lifestyle, increasing stress and other factors, infertility is one the rise with nearly 1 in 6 people globally affected by it. The present hospital based descriptive study was done to assess the infertility issue with regards to thyroid profile abnormalities with or without elevated levels prolactin hormone among infertile women.

Present study found that mean T3, T4 and TSH levels were 1.31, 8.32 and 3.05 respectively with mean prolactin levels being 22.74. 13% of the infertile women had hypothyroidism and 3% had hyperthyroidism. Among the thyroid hormones, TSH levels were also significantly higher [3.75] in hyperprolactinaemic infertile women compared]. There was no significant difference in T3 and T4 hormone levels in between the two groups. There was a statistically significant high prolactin level in hyperprolactinemic infertile women with mean prolactin levels being 44.61.

Similar findings observed in a study by Saxena S et al [2016] where mean TSH and prolactin levels were higher in infertile women compared to normal fertile; though there was such comparison done in our study [11].

A systematic review and meta-analysis by Ramadras DD et al [2024] observed that serum prolactin and TSH in infertile women correlated with a significant impact on women's infertility which can be reversed with diagnosis and prompt treatment. [12]

Pearson's correlation between Prolactin levels and TSH levels, a slightly positive correlation was observed with 'r' value being 0.23 compared to Saxena S et al [2016] [11] which showed significant positive correlation in both primary and secondary infertility cases.

Another study by Bassey IE [2015] from Southern Nigeria observed a significantly higher mean serum prolactin and TSH were observed among the infertile groups compared to the fertile controls [$p<0.05$]. The mean serum T3 and T4 were significantly lower in the hyperprolactinemic infertile women compared to the fertile controls [$p<0.05$]. The mean TSH and T3 of normoprolactinemic infertile women and controls were comparable [$p>0.05$]. However, the mean T4 was significantly lower in normoprolactinemic infertile women compared to the fertile controls [$p<0.05$]. In all the groups, TSH correlated inversely with T3 and T4, while T3 correlated positively with T4. It was only in the control group that prolactin correlated positively and significantly with TSH.[13] Similar results with regards to correlation was observed in Sinha Sulekha et al [2020]. [14] In contrast, study by Sharma and Prasad showed a negative correlation between serum prolactin and TSH levels in infertile women. [15]

Limitations: Comparison was done within the infertile women and no control group or comparison with fertile women and since the study findings were from a single tertiary care hospital, findings may not be generalizable.

CONCLUSION

Infertility is emerging as public health issue with many predisposing factors underlying it. Present study found

that 13% of the infertile women had hypothyroidism and 3% had hyperthyroidism. There was a statistically significant high prolactin level in hyperprolactinaemic infertile women and TSH levels were also significantly higher. A slightly positive correlation was observed. Hyperprolactinemia with thyroid disorders could play a significant factor in infertility and therefore during the workup of infertile women. Routine thyroid and prolactin screening is recommended in all infertile women.

Conflicts of Interest: There are no conflicts of interest

REFERENCES

1. Arun Koyyada, Prabhakar Orsu Role of hypothyroidism and associated pathways in pregnancy and infertility: Clinical insights 2020 Apr 10;32[4]:312-317. doi: 10.4103/tcmj.tcmj_255_19. e Collection 2020 Oct-Dec.
2. Dalal A. D C Dutta's Textbook of Gynaecology and Textbook of Obstetrics. J Obstet Gynae col India. 2016 Aug;66[4]:303–4.
3. Saoji AV. Primary infertility problems among female have been a source of concern in India lately Innov J Med Health Sci. 2014;4:332–40
4. Forti G, Krausz C. Clinical review 100: Evaluation and treatment of the infertile couple J Clin Endocrinol Metab. 1998;83:4177–88
5. Mbah AU, Ejim EC, Onodugo OD, Ezugwu FO, EzeMI, Nkwo PO, et al. Two logistic models for the prediction of hypothyroidism in pregnancy. BMCRes Notes. 2011;4[205]:1-10.
6. Goswami B, Patel S, Chatterjee M, Koner BC, Saxena A. Correlation of prolactin and thyroid hormone concentration with menstrual patterns in infertile women. J Reprod Infertil. 2009;10[3]:207.
7. Hivre MD, Bhale DV, Mahat RK, Bujurge AA. Study of serum TSH and prolactin levels in patients of female infertility. Inter J Recent Trends Sci Technol. 2013;9[1]:144-5.
8. Micinsk P, Wielgus E, Wojcieszyn M, Pawlicki K. Abnormal ovarian reserve test reflects thyroid dysfunction. Pol J Gyn Invest. 2006;9[1]:30–4.
9. Armada-Dias L, Carvalho JJ, Breitenbach MM, Franci CR, Moura EG. Is the infertility in hypothy-roidism mainly due to ovarian or pituitary functional changes? Braz J Med Biol Res. 2001;34[9]:1209–15.
10. Wakim AN, Polizotto SL, Burholt DR. Influence of thyroxine on human granulosa cell steroidogenesis in vitro. J Assist Reprod Genet. 1995;12[4]:274–7.
11. Saxena S, Gupta R, Agarwal L, Srivastava PC, Mallick AK. Correlation of serum thyroid stimulating hormone and prolactin in female infertility—a case control study. Indian J Obstet Gynecol Res. 2016;3[4]:388–392.
12. Ramadras DD, Che Soh Yusof NAA, Yaacob NM, Wan Norlina WA, Hanisah AH. Correlation of Serum Prolactin and Thyroid Stimulating Hormone Concentration in Infertile Women: A Systematic Review and Meta-Analysis. Malays J Med Sci. 2024 Feb;31[1]:14-32.
13. Bassey IE, Udoh AE, Essien OE, Isong IK, Gali RM, Archibong EE. Thyroid hormones and prolactin levels in infertile women in southern Nigeria. J Clin Diagn Res. 2015 Mar;9[3]:OC13-5.
14. Sinha Sulekha, Hegde A, A Manjrekar P, Rukmini MS. Correlation of Thyroid-Stimulating Hormone and Prolactin levels in non-pregnant female. Asian J Pharm Clin Res. 2020;13[4]:147-8.
15. Sharma P, Prasad S. Female infertility and its correlation with serum prolactin and TSH concentration: an unmatched case control study. J Pharm Biomed Sci. 2013;30:902–907.