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Serum Prolactin, Thyroid Stimulating Hormone and Thyroid Hormones (FT3, FT4) Concentrations in Female Patients with Infertility: An Institutional Study

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Abstract: ***Background: The prevalence of infertility is estimated between 12-14 %. Hormonal disorders of female reproductive system are comprised of a number of problems resulting from aberrant dysfunction of hypothalamic- pituitary-ovarian axis. Materials and Methods: The study was conducted on 50 women (age group 21–40 years) in Biochemistry Department of RIMS, Ranchi between March 2017- March 2018.Hormonal profile were done by enhanced chemiluminescent microparticle immunoassay method on ABOTT ARCHITECT i1000SR IMMUNOASSAY analyzer.50 fertile woman with similar age were enrolled as the controls. Results: There was a positive correlation between serum TSH and prolactin levels in the infertile subjects. Hyperprolactinemia was depicted in 57% of the infertile women while it was 7% in the control group. The infertile women with hypothyroidism had significantly higher prolactin levels when compared to the controls. Conclusion: Hyperprolactinemia with thyroid dysfunction may be a major contributory hormonal factor in female infertility patients and estimation of prolactin, FT3,FT4, and TSH should be included in the workup for patients with female infertility.***

Keywords: Prolactin, thyroid profile, infertility

1. Introduction

According to the World Health Organization (WHO), infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse [1]. Infertility is a global health issue, partly due to its complexity in etiology as well as difficulty in preventing, diagnosing and treating it, varies across regions of the world affecting approximately 8-12% couples worldwide[2]. The WHO estimates that 60-80 million couples worldwide currently suffer from infertility[3]. Infertility represents a common condition nowadays, with important medical, economic and psychological implications. Hormonal disorders of female reproductive system are comprised of a number of problems resulting from aberrant dysfunction of hypothalamic-pituitary-ovarian axis. These relatively common disorders often lead to infertility. Thyroid dysfunction which is quite prevalent in the population affects many organs including male and female gonads, interferes with human reproductive physiology, which reduces the likelihood of pregnancy and adversely affects pregnancy outcome, thus becoming relevant in the algorithm of reproductive dysfunction.[4,5]. Hyperprolactinaemia and Hypothyroidism are found to be closely inter-related. Measurement of Prolactin and thyroid hormones especially thyroid stimulating hormone (TSH) has been considered an important component of Infertility work up in women.[6] Hyperprolactinemia which results from a longstanding primary hypothyroidism may result in ovulatory dysfunctions ranging from inadequate corpus luteal progesterone secretion to oligomennorhoea or ammenorhoea.[7] Amenorrhoea occurs in hypothyroidism due to hyperprolactinaemia, which results from a defect in the positive feedback of oestrogen on LH, and because of the suppression of LH and FSH.[8] Hypothyroidism is associated with increased production of TRH, which stimulates pituitary to secrete TSH and Prolactin. Hyperprolactinemia adversely affects the fertility potential by impairing pulsatile secretion of GnRH and hence interfering with ovulation.[4,9]

Even in the absence of hyperprolactinemia, hypothyroidism itself may contribute to infertility since thyroid hormones may be necessary for the maximum production of both estradiol and progesterone.[10] There has been paucity of data regarding the association between Thyroid disorders and serum Prolactin levels in infertility. So, the aim of this study was to evaluate the status of Thyroid hormones as well as Prolactin levels in infertile females and to correlate their impact on them.

2. Materials & Methods

Type of case-control study was conducted on 50 women (age group 19–40 years) in Biochemistry Department of RIMS, Ranchi between March 2017- March 2018.Hormonal profile were done by enhanced chemiluminescent microparticle immunoassay method on ABOTT ARCHITECT i1000SR IMMUNOASSAY analyzer.50 fertile woman with similar age were enrolled as the controls.

Inclusion criteria

1) Infertile women age between 19 to 40 years.
2) Normal fertile women age between 19 to 40 years.

Exclusion Criteria

1) Male factor infertility.
2) Amongst the female factors were tubal factor, any congenital anomaly of the urogenital tract, or any obvious organic lesion.

3) Any history of thyroid disease or previous thyroid surgery.
4) Patient using any means of contraceptives

3 ml blood was drawn and transferred to clean test tubes. Blood was centrifuged at 3000 rpm for 10-15 min. Serum was separated and stored at -20 degree Thyroid disorders was classified as euthyroidism, TSH within the normal range, subclinical hypothyroidism, TSH > 4.7mIU/L but normal thyroid hormones, primary hypothyroidism, TSH > 4.7mIU/L and primary hyperthyroidism, TSH < 0.5mIU/L. Likewise hyperprolactenemia, prolactin level more than 23.2ng/ml and normoprolactenemia 1.0 to 23.2ng/ml.

The consent was taken from each subject and the ethical approval for the study was provided by review board of RIMS, Ranchi, Jharkhand.

The data from study were analysed using SPSS Windows version 22. The data was expressed as mean and SD values.

Independent *t*-test, One way Analysis of Variance (ANOVA) were used. Association between TSH and PRL was analysed with Pearson's correlation coefficient. A *P* value < 0.05 was considered statistically significant.

3. Results

Table 1: Number of study subjects

Group	Subjects	Number
I	Cases(infertile woman)	50
II	Controls(fertile woman)	50

Table 2: The mean age distribution of subjects

Variables	Group I(cases)	Group II(controls)
Age	26.345±2.28	26±2.08

Table 3: General characteristics of patients

Characteristics	Cases N (%)	Controls
Euthyroidism	27(54%)	40(80%)
Subclinical hypothyroidism	11(22%)	6(12%)
Primary hypothyroidism	5(10%)	2(4%)
Primary hyperthyroidism	7(14%)	2(4%)
Normoprolectinemia	21(42%)	50(100%)
Hyperprolectinemia	29(58%)	0(0%)

Table 4: Thyroid hormones, TSH and PRL levels in patients and controls

Parameters	Patients Mean (SD)	Controls	P Value
F T3 (pg/ml)	2.57(0.60)	2.48(0.47)	0.140
F T4 (ng/dl)	1.34(0.39)	1.28(0.25)	0.263
TSH (m IU/L)	2.19(1.23)	2.06(1.08)	0.198
PRL (ng/ml)	25.28(34.18)	17.55(23.88)	0.004

Table 5: Comparison of serum PRL in cases and controls between different thyroid disorders PRL levels Mean(SD)

	cases	control	P Value
Subclinical hypothyroidism	18.23(11.47)	5.38(4.02)	0.002
Primary hypothyroidism	36.01(10.71)	10.11(1.48)	0.033
Primary hyperthyroidism	22.73(19.30)	2.35(0.31)	0.026

Table 6: Comparison of thyroid profile in cases with high and normal prolactin level Mean (SD)

	Normal PRL	High PRL	P value
f T3(pg/ml)	2.91(1.78)	2.81(1.07)	0.193
f T4(ng/dl)	1.69(1.31)	1.33(0.49)	0.207
TSH (mIU/L)	2.59(1.83)	5.29(5.07)	0.038

4. Discussion

This study was conducted to measure the level of thyroid hormones and prolactin in patients suffering from primary infertility and to compare the results with that obtained from the subjects with proven fertility. In the present study, serum prolactin in cases was found to be significantly higher than in control group. Hyperprolactinemia was seen in 58% of the amenorrhoeic cases. Similar finding was also observed in the study of Emopae.et al[11], Pratibha et.al[12] and Kumum et al (13,10). This altered prolactin levels may contribute to the failure of conception and pregnancy as Prolactin is supposed to be important for the maintenance of secretory activity of the corpus luteum.[14] Amenorrhea occurs in thyroid disorder due to hyperprolactinaemia as a result of LH and FSH suppression [15,11]. TRH in addition to increasing TSH causes to raise prolactin level . Prolactin hinders FSH and GnRH thus impairs ovulation. Thus, hyperprolactinaemia results to irregular menstrual cycles and infertility (16, 13).

Majority of the infertile cases as well as controls were euthyroid in our study. This is supported by study of Binita Goswami et al. (17). Higher serum prolactin levels were seen in the euthyroidism and subclinical hypothyroidism cases as compared to their respective control groups. Similarly, mean serum prolactin in cases of primary hypothyroidism and hyperthyroidism was found to be significantly higher. (*P* = 0.033) .Subclinical hypothyroidism associated with hyperprolactinaemia was significantly higher in our cases than in controls. This is similar to study by Sujata Shreshtha et al[18].Although some studies reported that hyperprolactinemia is rare disorder in subclinical hypothyroidism [19]. Positive correlation was found between serum TSH levels and high prolactin level unlike fT3 and fT4 levels in cases. This finding is also consistent with the findings of other studies (20, 21). During the regulation of TSH secretion the negative feedback on the hypo-thalamo pituitary axis results in increased secretion of TRH that stimulates thyrotrophs and lactotrophs thereby increasing the levels of both TSH and prolactin (22). This study shown an association between amenorrhea and hyperprolactainemia (*P* = 0.04). Hypothyroidism is associated with increased production of TRH, which stimulates pituitary to secrete TSH and PRL. Hyperprolactinemia adversely affects fertility potential by impairing GnRH pulsatility and thereby ovarian function. Therefore in every infertile female should be investigated for TSH and PRL levels regardless of their menstrual rhythm at the time of initial consultation.

5. Conclusion

Hyperprolectinemia even without thyroid disorders may be a major contributory hormonal factor in infertility. In this study the thyroid disfunction, especially hypothyroidism

may be an important hormonal factor in the development of primary infertility. Thyroid disorders and hyperprolectinemia may be an important hormonal factor in the development of female infertility and may have therapeutic applications. Hence assessment of serum levels of prolactin and thyroid function tests are mandatory in the workup of all the women coming for infertility checkup. Further studies would have been needed to validate the impact of thyroid profile and prolactin in infertile females.

References

[1] World Health Organization. *Infertility: a tabulation of available data on prevalence of primary and secondary infertility*. No. WHO/MCH/91.9. Unpublished. Geneva: World Health Organization, 1991.
[2] Sciarra J. Infertility: an international health problem. Int J Gynaecol Obstet 1994; 46 : 155-63.
[3] World Health Organization. Infecundity, infertility, and childlessness in developing countries. DHS Comparative Reports
[4] Poppe K, Velkeniers B: Thyroid and infertility. Verh K Acad Geneeskd Belg, 2002; 64(4):389-99.
[5] Poppe K, Glinoer D, Van S. A, Tournaye H, Devroey P Schiettecatte J et al: Thyroid dysfunction and hypothalamic-pituitary axis with reference to radiological imaging. J Clin Patho 2003; 56:261-7.
[6] Cramer DW, Sluss PM, Powers RD,McShane P, Ginsburgs ES, Hornstein MD et al.Serum Prolactin and TSH in an invitro fertilization population: is there a link between fertilization and thyroid function? J Assist Reprod Genet 2003; 20(6):210-5.
[7] Krassas GE. Thyroid disease and female reproduction. Fertil Steril. 2000; 74(6):1063-70.
[8] Avasthi Kumkum. Hyperprolactinema and its correlation with hypothyroidism in Infertile women. J Obstet Gynecol India.2006; 56: 68-71.
[9] 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):207-12.
[10] Turankar S, Sonone K, Turankar A. Hyperprolactinaemia and its comparison with
[11] hypothyroidism in primary infertile women. *J Clin Diagn Res.* 2013; 7(5):794–796.
[12] Emokpae, M. A., H. B. Osadolor, and A. Omole Ohonsi. "Sub-clinical hypothyroidism in infertile Nigerian women with hyperprolactinaemia." *Nigerian Journal of Physiological Sciences*, Vol. 26, No. 1, 2011.
[13] Prathibha, D., M. Govardhani, and P. T. Krishna. "Prolactin levels in infertility and bromocriptine therapy in hyperprolactinaemia." *Journal of the Indian Medical Association*, Vol. 92, No. 12, 1994, pp. 397-99.
[14] Kumkum A, Jasmine K, Shweta G, Pal Ajeshwar N. Hyperprolactinemia and its correlation with hypothyroidism in infertile women. J Obstet Gynecol India.2006; 56(1): 68-71.
[15] Hendershot GE, Mosher WD, Pratt WF. Infertility and age: An unresolved issue. Fam Plann Perspect 1982; 14:287.
[16] Choudhary SD, Goswami A. Hyperprolactinemia and reproductive disorders-a profile from northeast. *J Assoc Physicians India.* 1995; 43:617–618.
[17] Koutras DA. Disturbances of menstruation in thyroid disease. *Ann N Y Acad Sci.* 1997; 816:280–284.
[18] 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):207-12.
[19] Sujata Shreshtha, Sunita Neupane, Narayan Gautam, Raju Kumar Dubey, Amit Chandra Jha,Nilesh Raj Doshi, Archana Nayan **. Association of Thyroid Profile and Prolactin Level in Patient with Secondary Amenorrhea.** Malays J Med Sci. Sep-Oct 2016; 23(5): 51-56
[20] Gerhard I, Eggert-Kruse W, Merzoug K, Klinga K, Runnebaum B.Thyrotropin-releasing hormone (TRH) and metoclopramide testing in infertile. and its correlation with serum prolactin and TSH concentration- an unmatched case control study. *J Pharm Biomed Sci.* 2013; 30(30):902–907.