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A comparative study on the Thyroid status in fertile and infertile females.

KEYWORDS: Thyroid hormones, euthyroid, infertility

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ABSTRACT Thyroid hormones are essential for normal growth and development. Thyroid disorders are associated with a variety of changes in reproductive functions including delayed onset of puberty, menstrual disorders, anovulatory cycles, infertility and reproductive wastage when pregnancy is achieved.

A case control study was conducted in Department of Physiology, Tezpur Medical college, over a period of 6 months. 69 female patients of 20-35 years, diagnosed as primary infertility, were included as cases and were compared with another 69 healthy euthyroid fertile women. Thyroid status was estimated by Radioimmunoassay method.

On comparision of thyroid status between fertile & infertile women it was found to be statistically significant.

Summary:

Thyroid disorders may lead to infertility. Hence, thyroid screening should be included in the infertility workup and treated accordingly.

Introduction:

Infertility is the inability of a couple to conceive after one year of regular unprotected intercourse. Its prevalence is estimated to be 10-15% in any community.(1) It is therefore a common condition with important medical, economic and psychological implications. Thyroid hormones are essential for normal growth, sexual development and reproductive function. Both hypothyroidism and hyperthyroidism are associated with a variety of changes in reproductive functions including delayed onset of puberty, menstrual disorders, anovulatory cycles, infertility and reproductive wastage when pregnancy is achieved (2, 3, 4). Thus thyroid dysfunctions may have a great impact on fertility in females.(5) Undiagnosed and untreated thyroid disease can be a cause for infertility as well as sub-fertility. The prevalence, screening and treatment of sub-clinical thyroid disorders in infertility patients have been discussed in many studies, but no consensus has been obtained. (6) Evaluation of thyroid status in the infertile couple is not only important because it is significant and most common but also its treatment is very simple and often has reversible or preventable effects on infertility (7, 8). Data on relationship between subclinical thyroid dysfunction and infertility remain scarce as these subgroups of infertile patients passes unrecognized. Due to the lack of population-based infertility data of women with subclinical thyroid dysfunctions in our state, we planned to evaluate the thyroid status in infertile women.

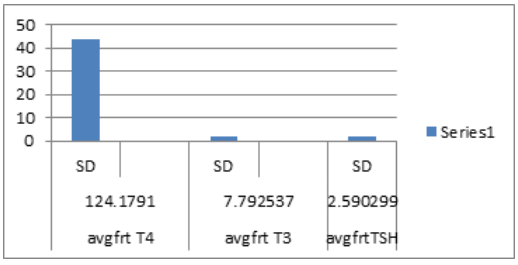
Materials and methods :

A case control study was conducted in Department of Physiology, Tezpur medical college, Assam over a period of six months. 69 female patients between the age group of 20-35 years, who were being diagnosed as primary infertility, were included as cases in the study. Inclusion criteria were history of at least one year infertility. They were compared with another 69 age matched healthy euthyroid fertile women. Those women who were already on treatment for thyroid disorders were excluded from the study. The study was conducted after taking informed, written consent of the participants. After taking all the aseptic precautions, about 2 ml of venous blood was drawn. Thyroid status was estimated by measuring serum T3, T4 and TSH by well calibrated Radioimmunoassay method. (9)

Statistical Analysis : All the data was analysed using Microsoft excel and SPSS. Data were expressed in the form of Percentage, Mean±SD. Pearson's correlation coefficient and p value were calculated. p value of <0.01 was taken as statistically significant.

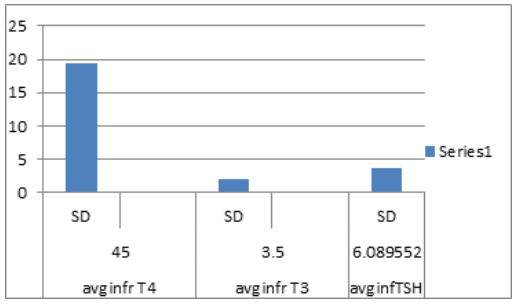
Results and observations :

Figure 1 : Mean±SD of T3, T4 and TSH of fertile women



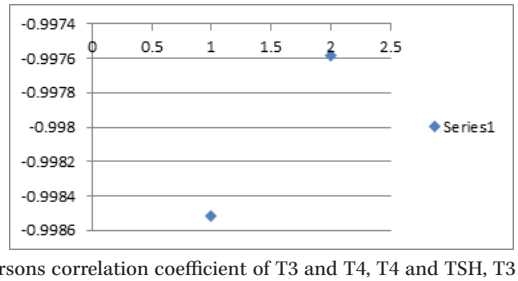
Mean±SD of T4, T3 and TSH in fertile women were 124.18±43.78, 7.79±1.94 and 2.59±1.83.

Figure 2: Mean±SD of T4, T3 and TSH of infertile women



Mean±SD of T4, T3 and TSH in infertile women were 45±19.49, 3.5±1.95 and 6.09±3.58.

Figure 3: Pearsons correlation coefficient of T4 and TSH and T3 and TSH in fertile women



Pearsons correlation coefficient of T3 and T4, T4 and TSH, T3 and TSH among fertile women were 0.9986, -0.9985 and -0.9976 respectively.

Figure 4: Pearsons correlation coefficient of T4 and TSH and T3

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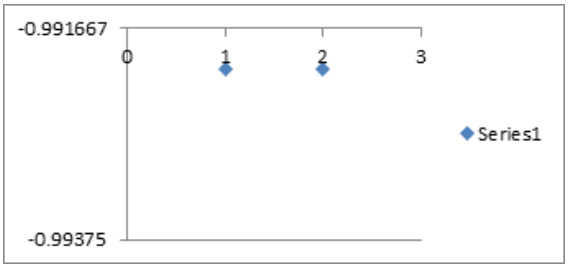
and TSH in infertile women



Pearsons correlation coefficient of T and T4, T4 and TSH, T3 and TSH among infertile women were 1, -0.9921 and -0.9921 respectively.

Discussion:

The present study includes 69 infertile women as cases and 69 age matched healthy fertile women as controls. Most of the patients were in the age group of 24 – 28 years and the average duration of infertility was 5 years or less.

As shown in Table 1, 2, 3 and 4; serum T3, T4 levels were found to be decreased in infertile females compared to fertile controls ($p<0.0001$) and it was statistically highly significant. Serum TSH levels were found to be increased in infertile females as compared to fertile controls and it was also statistically highly significant ($p<0.0001$).

As shown in Table 3 and 4; Pearson's correlation coefficient between T3 and T4 among infertile and fertile females was calculated to be 0.9986 and 1. There was a significant positive correlation between T3 and T4. With increase in T3 level, T4 level was also found to increase in both infertile and fertile females.

Pearson's correlation coefficient between T3 and TSH, and between T4 and TSH, among infertile females were -0.9985 and -0.9976 respectively. There was a significant negative correlation between both T3 and TSH, and T4 and TSH, among infertile females. With increase in the level of both T3 and T4 among infertile female, TSH level was found to decrease significantly.

Pearson's correlation coefficient between T3 and TSH, and T4 and TSH, among fertile females were -0.9921 and -0.9921 respectively. There was a significant negative correlation between both T3 and TSH, and T4 and TSH, among fertile females. With increase in the level of both T3 and T4 among fertile female TSH level was found to decrease significantly.

Female infertility occurs in about 37% of all infertile couples and ovulatory disorders account for more than half of these (10). Thyroid hormone have profound effects on reproduction and pregnancy.

In the present study, there is statistically significant increase in mean serum T3 and T4 and decrease in TSH levels in infertile women when compared to controls.

The impact of hypothyroidism on ovulation and menstrual function is related to numerous interactions of thyroid hormones with the female reproductive system, thus finally leading to infertility. In hypothyroidism, increased TRH production leads to hyper prolactinemia and altered GnRH pulsatile secretion. This leads to a delay in LH response and inadequate corpus luteum leading to abnormal follicular development and ovulation. Thyroid hormones receptors are expressed in human oocytes and granulosa cells. At the cellular level, thyroid hormones synergize with the FSH-mediated LH/hCG receptor to exert direct stimulatory effects on granulosa cell function (e.g. progesterone production) (11). Another pathway by which hypothyroidism may impact on fertility is by altering the peripheral metabolism of estrogen and by decreasing SHBG production. Both pathways may result in an abnormal feedback at the pituitary level (12). Disturbances in normal pulsatile release of LH and hyperprolactinemia can result in menstrual dysfunction, ranging from anovulatory cycles with menorrhagia, oligomenorrhea or amenorrhea (11). In a study on Indian women, Joshi et al found 68.2% of menstrual abnormalities in hypothyroid women compared with 12.2% of healthy controls (13). Thyroid dysfunction is a common cause of infertility which can be easily managed by correcting the appropriate levels of thyroid hormones.

For better management of infertility case, further studies need to be done with the large sample size and investigate the beneficial effect of drug treatment by long-term follow-up, which are necessary to validate the variation in T3, T4 and TSH levels. In addition to thyroid profile other endocrine hormones like prolactin should be considered in infertility.

Conclusion:

Thyroid disorders may lead to menstrual irregularities and anovulation resulting in infertility. Hence, estimation of serum T3, T4 and TSH levels should be included in the infertility workup. The patient may be treated accordingly with medications and can revert back to the fertile state.

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