



# EFFECT OF THYROID HORMONES IN MALES WITH INFERTILITY – A CROSS SECTIONAL STUDY

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## ABSTRACT

**Background:** Various authors have studied the effect of thyroid hormones to estimate the male factor in infertility. Some have concluded that thyroid hormones have a role to play in determining the quality of sperms and some state that the hormones do not have any effect on spermatogenesis. This study was done to observe the effect of thyroid hormones in the affected males.

**Materials and Methods:** The male partners of 71 infertile couples participated in the study. Semen analysis was done in the affected males after an abstinence of three days. Thyroid hormones estimation and semen analysis was done on the same day. The males were grouped as Oligospermic, severe Oligospermic and Azoospermic after semen analysis. Normospermic males were used as a control group.

**Result:** The age range of the affected males was 24 – 53 years. The mean years of marital duration were 7.7 years. The thyroid hormonal level was within normal limits in all the 71 males investigated. In semen analysis, 17 males were Normospermic, 22 males were Oligospermic, 22 were severe Oligospermic and 10 were Azoospermic. The mean sperm count was 9.18 million/ml in Oligospermic, 3.3 million/ml in severely Oligospermic, Nil in Azoospermic and 123.86 million/ml in Normospermic males.

**Conclusion:** Thyroid hormones do not have any effect on spermatogenesis in males.

**Key Words:** Thyroid, Hormone, Infertility, Oligospermia, Azoospermia

## INTRODUCTION

Infertility affects a significant number of married couples and the desire to beget a child in the affected population is of utmost importance in their lives. Out of every 100 affected couples, the male and the female factors are almost on par and the latter being marginally higher<sup>1</sup>. In some cases, the cause is unknown and infertility can also occur with both the partners being affected. For investigation of the male factor in the affected couples, semen analysis is of prime importance. The quality and quantity of semen determines a positive conception when the affected factor is male. In a significant percentage the affected partner in infertility is usually a male<sup>2</sup>. In affected male partners of infertile couples, the quality and quantity of semen differs. A recognizable decline in the semen quality been also observed in the south Indian population<sup>3</sup>.

Sex hormones play an important role in spermatogenesis which maintains the sperm quality and quantity. Many

studies have elaborated the influence and importance of sex hormones in spermatogenesis and sperm count. Thyroid hormones play a significant role in the metabolism of the human body and also in the reproductive cycle in females. However not many studies exist which elucidate the effect of thyroid hormones in spermatogenesis.

Many studies highlight the effect of thyroid hormone in female reproduction hence this study aims to probe the influence of thyroid hormones in spermatogenesis, sperm quality and quantity in affected males. In many studies on animal models like rats and goats demonstrate the presence of thyroid receptors in the testis especially in the sertoli cells. This regulation of thyroid hormone in animal models has been brought upon by the hypothalamo hypophyseal testicular axis which governs the sperm production. In humans the presence of thyroid receptors in the sertoli cells are disputed. In specific T3 does not inhibit receptors in the testis and the role of thyroid regulating hormone on the testis is indeterminate<sup>4</sup>.

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The presence of thyroid receptors in the sertoli cells in animal models influence germ cell production and maturation. The presence of Sertoli cells to the germ cells in humans is 1:11 when compared to the animal model. In humans thyroid hormones do not seem to influence spermatogenesis according to standard texts.

## MATERIALS AND METHODS

71 male partners of infertile couples attending the infertility clinic in a tertiary care hospital volunteered to participate in the study. After sexual abstinence of three days, the volunteers were made to collect semen in a sterile container which was analyzed using automated sperm analyzer. Prior to semen analysis, blood sample was collected in a sterile container and estimation of thyroid hormones was done.

Parameters of semen Analysis were determined based on WHO guidelines 2010<sup>7</sup>.

- Age
- Marital status
- Volume of semen
- Ph
- Sperm concentration
- WBC concentration
- Liquefaction duration

Thyroid hormone estimation was done to find the serum levels of

- T3
- T4
- TSH

Based on the sperm count the volunteers (n=71) were classified into four groups

Group -1 = Oligospermic males (22)

Group -2 = Severe Oligospermia (22)

Group -3 = Azoospermia (10)

Group -4 = Normospermic males (Used as a control group) (17)

## STATISTICAL ANALYSIS

The observations and the numerical quotients obtained from the study were statistically analyzed using SPSS software version 16 to ascertain the statistical significance of the study.

## RESULTS

The age range of all the volunteers was from 24 - 53years with a mean of 35 years. The duration of married life

in the affected couples was 2-15 years with a mean of 7.7years; Group wise distribution is depicted in Table -1. The parameters of semen analysis are depicted in Table -2. The thyroid hormone level estimation in the group wise was within normal limits in all the 71 males investigated. Group wise distribution of thyroid hormones T3, T4 & TSH estimation is depicted in Table -3. Analysis of variables for thyroid hormones is depicted in Table -3. In semen analysis, 17 males were Normospermic. 22 males were Oligospermic, 22 males were severe Oligospermic and 10 males were Azoospermic. The mean sperm count was 9.18 million/ml in Oligospermic males, 3.3 million/ml in severely Oligospermic males, Nil in Azoospermic males and 123.86 million/ml in Normospermic males. Analysis of variables for the sperm count is depicted in Table -2.

## DISCUSSION

Thyroid hormones have effect on spermatogenesis in animal models, as receptors are present in the testis and influence the quality of sperms. Some authors have studied the effect of thyroid hormones on the quality of sperms but a direct and conclusive evidence still eludes<sup>5</sup>. These studies elaborate the effect of sertoli cells rather than on the germ cells. Since such studies have been done on smaller sample size, the actual cause and effect in the case of thyroid hormones cannot be definitely established. However some studies have indicated that there is deterioration in the quality of sperms due to defective spermatogenesis arising primarily out of morphological abnormalities of sertoli cells<sup>6</sup>.

Few authors have suggested that hormonal therapy should be considered for treating hormonal insufficiency and a reproductive endocrinologist should be included to perform a hormonal assessment which should be made a part of investigations for male infertility<sup>8</sup>. Semen analysis is the sole and reliable test to estimate the male factor in infertility. Since a majority of male factor in infertility is due to deficient sperm count and abnormal sperm parameters which is due to a error in the control mechanism of pre and post testicular reasons<sup>9</sup>.

LH and FSH have more significant role to play in spermatogenesis as they stimulate gametogenesis than thyroid hormones. Although other endocrine hormone receptors are found in the parts of the male reproductive system, it is highly unlikely that hormones other than LH and FSH influence the outcome of spermatogenesis in cases of male infertility<sup>10</sup>.

Studies performed in males with infertility to find out the relationship between hypothyroidism and spermatogenesis have also primarily state that the effect of FSH and LH on the testis and sertoli cells in particular conclude

that the influence of the above mentioned hormones are not direct<sup>11</sup>. Most of the studies which establish a link between hypothyroidism, hyperthyroidism and spermatogenesis have been performed in western subjects and not many studies exist on Indian test subjects and the one such study done does not find any significant effect of thyroid hormones in male infertility<sup>12</sup>.

### CONCLUSION

To conclude this study does not establish any direct link between thyroid hormones and spermatogenesis in male infertility. However since the sample size of this study is relatively modest, extending the study with a larger sample size might validate the present findings. Also widening the parameters and methodology with repeated blood samples and semen analysis might establish a direct effect on thyroid hormones on spermatogenesis in males with infertility.

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**Table 1: Age and Marital values of Test subjects**

Parameters	Normal fertile Men N =17		Oligospermic Men N=22		Sever Oligospermic Men=22		Azoospermic Men N=10	
	Mean	range	Mean	range	Mean	range	Mean	range
Age	35.62	27-45	36.86	25-50	34.27	24-53	33.5	25-50
Marital status	6.6	2-15	10.22	2-20	6.52	2-15	7.5	2-15

**Table 2: Semen parameters of the test Subjects**

Semen parameters	Normal fertile Men N = 17		Oligospermic Men N=22		Sever Oligospermic Men=22		Azoospermic Men N=10		Anova P value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Volume(ml)	1.6	±0.094	1.6	±0.072	1.5	±0.06	1.5	±0.15	0.00
PH	7.5	±0.441	7.7	±0.35	7.3	±0.33	7.3	±0.73	0.016
Sperm concentration(million/ml)	123.86	±7.28	9.18	±0.417	3.31	±0.15	0	0	0.00
Liquefaction duration(min)	18	±1.05	16.84	±0.7654	18.437	±0.83	18.29	±1.82	0.00
WBC Concentration	<1		<1		<1		<1		

**Table 3: Mean and Standard Deviation values of Thyroid hormones of test subjects**

Thyroid hormones	Normal fertile Men N = 17		Oligospermic Men N=22		Sever Oligospermic Men=22		Azoospermic Men N=10		One way Anova p value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
TSH $\mu$ U/mL ( 0.5-5.0 $\mu$ U/mL)	2.00	±1.26	1.81	±.99	1.80	±1.80	1.87	±.82	0.96
T3ng/dL. (80-160 ng/dL)	1.26	±1.069	1.32	±.53	1.36	±.516	1.37	±.11	0.96
T4 ng/dL (4.5-11.5ng/dl)	7.91	±7.48	7.69	±1.40	7.82	±.895	8.03	±.34	0.996