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PATTERN OF THYROID HORMONE PROFILE AND SEMEN QUALITY IN MALE INFERTILITY

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Abstract: **Previous studies have shown that endogenous hormones are critical to spermatogenesis and maintenance of male reproductive function. All the male reproductive hormones serve important and well known functions in the male hypothalamic pituitary gonadal axis and male reproduction. However relationship between thyroid hormones and semen quality are still not completely understood. Thus the aim of the present study is to determine the pattern and degree of associations between thyroid hormones and semen quality. Eighty men were recruited from an infertility clinic in which fresh semen samples were assessed for quality (concentration, mobility, and morphology) and the serum levels of thyroxine (T4), Triiodothyronine (T3), and Thyroid stimulating hormones (TSH) were measured. The results showed that men with abnormal semen profile had higher total T3 and T4 and lower TSH concentrations compared to those with normal semen profile,. These were however did not show any significant difference. However, further studies and observations are needed on a larger number of subjects.**

Keywords: **Male infertility, Thyroid hormones, Azoospermia, Oligospermia.**

1. INTRODUCTION

PATTERN OF THYROID PROFILE AND SEMEN QUALITY IN MALE INFERTILITY

Infertility is a worldwide problem affecting approximately 8 – 10% of couples within reproductive age group. It is estimated that globally 60 – 80 million couples suffer from infertility every year(1). Infertility brings about great psychological and social stigma mostly directed against female partners, in spite of the fact that the causes of infertility are almost equally shared between the sexes (30 % male factor,35% a female factor,30% a combination of both and 15%unexplained or idiopathic infertility) (2). Studies have reported that circulating levels of specific reproductive hormones in men are associated with semen quality parameters. A lot of work had been done on female infertility showing the effects of hyperthyroidism and hypothyroidism on female reproduction (3), However, the relationship between thyroid hormones and quality of semen is yet to be fully studied in this environment. The effects of thyroid hormones alterations on the reproductive system have been studied extensively in human subjects and animal model that have generally shown that changes from normal thyroid function resulted in decreased sexual activity and fertility (4, 5). The underlying mechanisms however are not constant throughout all species, and results from different studies disagree. Among those studies (6) suggest that thyroid dysfunction can impair the

quality semen, and lower the sperm motility and count, thus in the present study, the pattern of thyroid hormones levels and semen quality was explored in a population of men from the infertility clinic to detect the association between thyroid hormones levels and semen quality.

2. MATERIAL AND METHOD

Fifty infertile subjects were selected from the couples attending the infertility clinic in the department of obstetrics and Gynecology. Thirty normal healthy men were taken as control. The causes of infertility in the female partner of all the men were excluded by the gynecologist. The inclusion criteria comprise subjects that were between 28- 50years. Couples living together with regular unprotected coitus for at least one year and without contraception. Semen examination showing normal PH, normal viscosity with spermatozoa concentration >15 million/ml, total motility > 30% and >30% progressive motility spermatozoa should be normal. Exclusion criteria, included subjects currently on antioxidant supplements. In addition, subjects with testicular varicocele, genital infection, chronic illness and sermon systemic diseases, smokers and alcoholics (excessive alcohol drinkers) were also excluded from the study. Excluded also, were men with prior vasectomy or current use of exogenous hormones, cryptochidism, subject with pre-existing thyroid disease or taking drugs (antihypertensive, antipsychotic, steroids and chemotherapy). Subjects that are not approved by the physician or notshowing interest themselves. Taking into cognisants were subjects history of each care,, age, address, religion, occupation, and education economic states, nutritional and personal habits. Medication and history suggestive of any systemic illness. Weight (kg) and height (meter) were measured. Body mass index (BMI) was calculated by weight (kg)/height squares (m2). Subjects who fully consented and agreed to partake were asked to collect semen by masturbation into a sterile plastic specimen container at the hospital. Subjects were instructed to abstain from ejaculation for at least 72hrsprior to providing the semen samples. The sample was then liquefied for at least 30 minutes but no longer than 1 hour prior to performing the semen analysis, which includes measurement of volumes, PH, sperm concentration, sperm motility, progressive motility and sperm morphology following the guideline of World Health Organization, 2013

Sperm motility was classified into four categories: rapid progressive motile (Type A), Slow Progressive motile (Type B), Non-progressive motile and Immotile spermatozoa. Total progressive motility was defined as the combination of “Type A rapid motility and Type B slow progressive (at least 30% of sperm should have normal motility categories A +B). Sperm concentration was determined with an improved Neubauer Hemocytometer counting chamber and normal values of concentration were >15x 106 sperm/ml. spermatozoa morphology includes ejaculated volume/ml (ii) sperm concentration (million/ml) (iii) morphology-head, mid piece and tail.

A sample of blood was also collected after overnight fast of 12hours on the same day that the semen sample was collected. The sera were separated from the collected blood samples. Total T3, T4 and Test were measured by enzyme linked immune sorbent assay (ELISA) using monobind kit. The inter assay CVs for both the T3 and T4 hormones were less that 8% while the TSH inter assay CVs was less that 10%. A written consent from each subject was taken after explaining the aims and objectives of the study and its benefits on individuals and society. The study was approved by the ethical committee of the Jos University teaching Hospital.

Statistical analysis. Data analyses were performed with the SPSS version 21 statistical software. The results were expressed mean+ SD for each of the quantitative values. The difference were considered to be significant at values of $p < 0.05$.

3. RESULTS

General characteristic of 80 subjects are presented in Table 1 comprising of eighty (80) men of two groups on the basis of semen profile. The group A comprised of 30 men of age group 26 to 49 years (mean 32.8 + 3.2 years) having normal semen parameters this group is considered as fertile men while group B comprised of 50 men of age group 26 to 49 years (mean 33.8 + 5.4 years) having abnormal semen parameters, this group is considered as infertile men group.

TABLE 1

GENERAL CHARACTERISTICS OF THE STUDY POPULATION

GENERAL CHARACTERISTICS	CONTROL (FERTILE) n=30		INFERTILE MALE n= 50	
	No.	%	No.	%
AGE (YEARS)				
<29	15	50.0	27	54
30 – 39	10	33.3	15	30
40 – 49	5	16.7	8	10
Mean ± SD		32.8 ± 8.2		33.8 ± 5.4
OCCUPATION				
Employed	20	66.7	32	64
Unemployed	10	33.3	18	36
AREA				
Rural	5	16.6	10	20
Urban	25	83.4	40	80
DIET				
Vegetarian	1	3.3		-
Mixed	29	96.7	50	100
FAMILY HISTORY OF INFERETILITY				
Yes	5	16.7	10	20
No	25	83.3	40	80
SPERM CHARACTERISTIC				
Fertile(Normospermic)	30	100		
Oligospermic	-	-	27	54
Azoospermic	-	-	23	6

TABLE 2

PATTERN OF SEMEN AND THYROID PROFILE (MEAN ± SD)

CHARACTERISTICS	FERTILE MEN N=30	INFERTILE MEN N = 50
Age	32.8± 3.2	33.8 ± 5.4
Sperm count (Million/ml)	68. 9 ± 9.9	27. 9 ± 13. 9
Sperm motility (%)	62. 8± 7.2	40.3 ± 14.9
Normal morphology	8.7 ± 4	83.7 ± 6.3
Total T3(nmol/l)	1.1 ± 0.4	1.2 ± 0.5
Total T4 (nmol/l)	93.7 ± 11.5	2.1 ± 1.1
TSH (mU/L	2.2 ±1.3	2. 1 ± 1.1

Table 2 shows the pattern of serum and thyroid profile of fertile men and infertile men of the study population. In the fertile men sperm counts varied from 44 to 90 million/ml with a mean of 68.9 ± 9.9 percentage of sperm motility ranged from 48 to 76 with a mean 62.8 ± 7.2 and percentage of normal sperm morphology varies from 75- 95 with mean value of 87 ± 4, but in the case of infertile men sperm count varied from 10 – 59 million/ml with mean of 27.9 ± 13.9, percentage of sperm mobility which ranged from 10.65 with mean of 40.3 ± 14.9 and percentage of normal sperm morphology varied from 69 – 90 with mean of 83.7 ± 6.3. From the same Table 2, it was found that in infertile men, the mean of T3 and T4 concentration was higher than in the fertile men while the TSH concentration was lower than in the fertile men. Despite this, there was no significant difference between the two groups.

Table 3: Comparison of Thyroid profiles in fertile men and thosewith various sperm abnormalities.

Hormones	Fertile men (n=30)	Oligospermic (n=27)	Azoospermic (n=23)
T3 (nmol/l)	1.1 ± 0.4	1.2 ± 0.4	1.2 ± 0.6
T4 (nmol/l)	93.7 ± 11.5	94.0 ± 10.2	94.5 ± 12.0
TSH (mu/L)	2.2 ± 1.3	2.1 ± 1.4	2.1 ± 1.1

In table 3, Total T3 (nmol/l) of oligospermic shows a means of 1.2 + 0.4, the T4 (nmol/L) shows mean of 94.0+ 10.2 and TSH (mU/l) with a mean of 2.1 + 0.4. None of the thyroid profile parameter showed any significant different when compared with the men having normal semen profile. Whereas in Azospermic men. Total T3 (nmol/L) showed a mean of 1.2 + 0.6, Total T4 (nmol/L) with a mean 94.5+12.0 and TSH (mU/L) 2.1 + 1.1. Out of three hormone assayed in this study none was significantly different when compared with fertile men (normal semen profile).

4. DISCUSSION

The relationship between thyroid profile and semen quality in male infertility has been a subject of investigation for some time now. In this study none of the subjects had any manifestation of thyroid dysfunction,. The thyroid gland, which previously was not implicated to have any impact on spermatogenesis and male infertility, is now being recognized as having important role in male reproductive function (7). The effect of thyroid hormones alteration on the reproductive system have been studied extensively in human subjects and animal models that have generally shown that changes from normal thyroid function resulted in decreased sexual activity and fertility.

Over the years, it has been established that the two most common types of thyroid disease are hypothyrodism and hyperthyrodism. Studies assessing the role of hypo-and hyperthyroidism in male infertility have been conducted in human subjects. Hypothyrodism may result in a decrease in the sex hormones binding globulin (SHBG)levels and a decrease in total semen testosterone levels, as well as decrease in the LH and follicle stimulations hormones (FSH) levels (6).

In cases of prolonged pre-pubertal hypothyroidism due to drop in LH and FSH levels, the leydig and Sertoli cells, respectively and less stimulated to differentiate into mature cells, negatively affecting spermatogenesis. This increase the number of cells in the testes but decrease the number of mature cells. Thus, in patients with hypothyroidism, increase testicular size is observed along with a significant drop in mature germ cells within the seminiferous tubule (7). Other studies concluded that hypothyrodism adversely affected semen quality bycompromising semen volume and progressive sperm mobility (8; Krasses and Ponstikides, 2004[9] also conducted another study on human subjects with hypothyroidism and they reported abnormal sperm morphology and decrease mobility in patients. It is therefore evident that hypothyrodism adversely affect male fertility but no relationship was established with semen quality.

In the current studies, T3 and T4 showed high levels of the hormones in men with abnormal semen parameter, but not statistically significant. Several studies on hyperthyroidism had reported adverse effects on male reproductive organs and fertility(10)..Thyroid hormones levels were measured and recorded, and the overall result indicated that all three patients had low sperm count as well as decrease sperm motility. However, such abnormalities were corrected when the patients were treated for thyroid diseases. Kidd et, al, 1979 also investigated 5 patients of Grave's disease and found 4 of 5 subjects had total sperm count of less than 40 million/ml whereas only one had sperm density less than 4 million/ml.

In a previous work done by Manoj et al, 2012[11], it was observed that T4, though it was within normal limits in both the study group, but it level was significantly increase in men with abnormal semen parameters. This may be one of the reason given by Chandra et al, 2012 that results from different studies from thyroid profiles and infertility disagree with other. T3 and TSH were not found to be significantly different. There result agrees with those of Poppe et al (2006).

Nonetheless, the limitations we expected in this study would have been in the collection of a single semen sample to assess semen parameter and also the collection of a single blood sample to measure the serum hormone levels. The work of Uhler et al, 2003 who actually collected multiple semen sample (between 2 and 4) and blood samples and it was found that it would not actually affect the results significantly.

Multiple collection of the samples may even limit the participation rate of the recruited subjects. (Manoj et al, 2012).

One of the major limitations in this present study is that because the study was conducted among men through an infertility clinic. Our ability to generalize the results to the general populace may be limited.

Conflict of Interest

There is no conflict of interest existing among author and co-authors.

5. CONCLUSION

It's been shown shat thyroid hormone function and semen quality have a direct effect on spermatogenesis, and male fertility. However, there is porosity in the studies of the function and effect of TH and semen quality in this part of world. Although researches has shown a direct or indirect relationship of Thyroid function and defects in male infertility, within the framework of this research such was not proven.

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