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RELATIONSHIPS BETWEEN SERUM HORMONE LEVELS AND SEMEN QUALITY AMONG INFERTILE SUDANESE MEN AT ANDROLOGY CLINIC, KHARTOUM STATE, SUDAN

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ABSTRACT

Background: Semen analysis and hormone evaluation are essential parameters in giving a definitive diagnosis in infertile males. Abnormal hormone production has been noted as a male causative factor and hormonal replacement could play a corrective role. This study aimed to determine the seminal fluid parameters (volume, viscosity, count, motility and morphology) and to assess the fertility hormone profile (Follicular stimulating hormone (FSH)), Testosterone and Prolactine (PRL)) among infertile Sudanese men in Khartoum state. **Methods:** A total of 518 infertile men were recruited to participate in this study. Semen specimen was collected from each participant either by masturbation or coitus interruptus in a sterile container. Five hundred and eighty venous bloods were collected under aseptic condition into heparinized container. After centrifugation (5,000 rpm) for 5min., the plasma was separated from packed cells and 50µl was used for hormonal analysis. The (FSH), Testosterone and PRL levels were investigated for each sample using automated immunoassay analyzer (Tosoh Bioscience, Japan). **Results:** The mean serum level of FSH (33.79 7.05 ng/ml) and Prolactin (480.76 77.63 ng/ml) were significantly higher among individual with inadequate sperm count (P .value: 0.003 and 0.002) respectively, while the serum level of Testosterone (8.40 7.56 ng/ml) was significantly lower in the group of men with inadequate sperm count (P.value:0.007). The mean level of FSH (39.87 5.19 ng/ml) and Prolactin (463.95 52.32 ng/ml) were significantly higher in the group of men with primary infertility (P. value: 0.05 and 0.01) respectively, while the mean level of testosterone (7.34 8.13 ng/ml) was significantly lower (P. value: 0.00). The mean fertility hormone levels (FSH, Prolactin and Testosterone) were within the normal reference value among the group of secondary fertility and fertility checkup males. **Conclusion:** Hormonal fertility profile assessment must be performed as part of the routine investigation of male infertility as their levels were found to highly affect sperm count and other seminal parameters.

KEYWORDS: Hormonal profile, Semen, infertility, Khartoum, Sudan.

1.1. INTRODUCTION

Hormones play a vital role in initiating and maintaining male reproductive function, yet it is not well understood how variability in the levels of some hormones impact semen quality. In addition, the utility of hormones as predictors of semen quality, as participation rates in epidemiologic studies of semen quality are generally very low. Previous studies have reported that circulating levels of specific reproductive hormones in men are associated with semen quality parameters.[1]

Infertility affects both men and women. In 50.0% of involuntarily childless couples, male infertility associated factor is found together with abnormal semen parameters. A fertile partner compensates for the fertility problem of the man and thus infertility usually becomes manifest if both partners have reduced fertility. Male fertility can be reduced as a result of: 1.Congenital or acquired urogenital abnormalities. 2. Urogenital tract infections. 3. Increased scrotal temperature (Consequence of varicocele). 4. Endocrine disturbances. 5. Genetic abnormalities. 6. Immunological factors [(2)]. Hormonal screening can be limited to determination of

FSH, Prolactin and Testosterone levels; it should be performed in all infertile men and in conditions with an increased risk of hypogonadism. In azoospermia, it is important to distinguish between obstructive and non obstructive causes. A criterion with reasonable predictive value for obstruction is a normal FSH level with bilaterally normal testicular volume. However, 29.0% of men with normal FSH appear to have defective spermatogenesis (spermatogenic arrest).[3]

Male fertility depends upon an intact hypothalamopituitary-testicular axis to initiate and maintain quantitatively and qualitatively normal spermatogenesis. Sperm count is considered lower than normal if it is fewer than 20million sperm per ml of semen, as nearly 70% of conditions that cause infertility in men can be diagnosed with history, physical examination, hormonal fertility profile and semen analysis. Thus, it is surprising how infrequent infertile males have a recognizable endocrinopathy, even though up to 20% of male infertility can be attributable to endocrinopathy. In fact, endocrine disorders which may be associated with significant medical pathology remain an important factor to consider in the etiology of male infertility because they can be amenable to treatment. However, in clinical practice, endocrine evaluation is usually done only in male with severe oligospermia or azoospermia. The hormones initially evaluated include follicle stimulating hormone (FSH) luteinizing hormone (LH), Testosterone and prolactin. Although there were much data on infertility in other African countries, no data exist on infertility in Sudan. Seven hundred and ten Sudanese couples were investigated for infertility in Khartoum Fertility Center, Sudan: 443 (62.4%) had primary infertility and 267 (37.6%) had secondary infertility. A positive male factor alone was found in 257 (36.2%) couples and a female factor in 350 (49.3%) couples: eleven (1.5%) couples had a combination of male and female factors, and the cause of infertility was unexplained in 92 (13.0%) couples. Oligozoospermia and astheno-zoospermia were factors responsible for 16.8% and 17.5% of male infertility, respectively.[4]

MATERIALS AND METHODS

This is cross sectional analytical study was conducted during the period from March 2015 to October 2016 to assess the fertility hormone profile Follicular stimulating hormone (FSH), Testosterone and Prolactine (PRL) among infertile males attending Andrology Clinic at Reproductive Health Care Centers (RHCC), Khartoum State. Ethical clearance was obtained from the ethical committee of the National Ribat University and the Reproductive Health Care Center. In addition personal consent was obtained from each. A total of 518 individuals (464 infertile and 54fertility checkup men) were recruited to participate in this study. After accepting to participate in the study each candidate was given clear written and spoken instructions concerning the collection of the semen sample by the clinician. These emphasized that semen sample needs to be complete and loss of any fraction of the sample reported. The man passed urine, washed hands and penis with soap, to reduce the risk of contamination. The specimen was collected after 3–5 days of abstinence by masturbation or coitus interruptus into sterile wide mouth container. The following information were recorded on the request form: Name, age, code number, the period of abstinence, the date and time of collection, the completeness of the sample, any difficulties in producing the sample and the time of collection. A private room near the laboratory was availed for collection of semen, in order to limit the exposure of semen to fluctuations in temperature and to control time between collection and analysis. All the seminal fluid specimens (518) were processed under aseptic conditions. The volume of seminal fluid was measured by decanting whole sample into a graduated centrifuge tube and the volume recorded in ml±0.1. Microscopic study of sperm count and motility were determine by adding 10 µg of liquefied semen using Computer-aided sperm analysis (CASA) based on WHO criteria.[5] Five hundred and eighty venous bloods were collected under aseptic condition into heparinized container. After centrifugation (5,000 rpm) for 5min., the plasma was separated from packed cells and 50µl was used for hormonal analysis. The Follicular stimulating hormone (FSH), Prolactin (PRL) and serum Testosterone levels were investigated for each sample using automated immunoassay analyzer. The normal reference values for FSH: 2.7–18.6 ng/ml, Testosterone: 9.0–30.16 ng/ml and Prolactin: 97.2–440.1 ng/ml.

RESULTS

The study included a total of 518 males (464 infertile and 54 routine fertility check up) at the Andrology clinic of the reproductive health care center (RHCC) at Khartoum State. The predominant number of the study group (74.1%) presented with primary infertility (Table: 1). The seminal fluid characteristics revealed that 25.1% of studied population had Oligo-asthenozoospermia, 18.7% Asthenozoospermia and 18.0% Azoo-spermia (Table: 2).

The 518 men recruited in this study had their fertility hormones profile estimated including FSH (R.V: 2.7–18.6 ng/ml, Prolactin (R.V: .2–440.1 ng/ml) and Testosterone (R.V: 9.0–30.16 ng/ml).The mean hormone levels for the total population were found to be (16.68 2.53 ng/ml) for plasma FSH, (385.97 56.75 ng/ml) for plasma Prolactin and (13.45 7.05 ng/ml) for serumTestosterone. The mean levels of plasma FSH and Prolactin were significantly higher (P .value: 0.037 and 0.039) respectively. On the other hand the mean level of the serum Testosterone was significantly lower than that of the reference value (P .value:0.00) (Table: 3) The mean level of plasma FSH (33.79 7.05 ng/ml) and Prolactin (480.76 77.63 ng/ml) were significantly higher among individual with inadequate sperm count (P .value: 0.003 and 0.002) respectively, while the serum level of Testosterone (8.40 7.56 ng/ml) was significantly lower in the group of men with inadequate sperm count (P. value:

0.007) (Table:4). The mean fertility hormone levels (plasma FSH, Prolactin and serum Testosterone) were within the normal reference value among the group of secondary fertility and fertility checkup males (Table: 5).

Table 1: Distribution of the studied population by type of infertility.

Category of the participant	Frequency	Percent
Primary	384	74.1%
Secondary	80	15.5%
Fertility checkup	54	10.4%
Total	518	100.0%

Table 2: Distribution of the studied population by seminal categories.

Seminal categories	Frequency	Percent
Azoo-spermia	93	18.0%
Normozoospermia	99	19.1%
Oligozoospermia	42	8.1%
Asthenozoospermia	97	18.7%
Severe-oligoasthenospermia	55	10.6%
Oligo-asthenozoospermia	130	25.1%
Asthenoteratozoospermia	1	0.2%
Oligo-necrozoospermia	1	0.2%
Total	518	100.0%

Table 3: The mean level of fertility hormones among the studied population (n=518).

Hormonal profile	Mean hormone level ±S.D (ng/ml)	Mean hormone reference value(ng/ml)	P value
FSH	16.68±2.53	11.4(2.7–18.6)	0.037
Testosterone	13.45±7.05	17.8(9.0–30.16)	0.000
Prolactin	385.97±56.75	268.6(97.2–440.1)	0.039

Table 4: The relation between sperm count and the mean fertility hormone levels.

Sperm count status	Mean hormonal levels ± S.D(ng/ml)		
	FSH	Testosterone	Prolactin
Adequate (n=217)	14.42±4.46	17.07±15.37	278.22±41.73
Inadequate (n=301)	33.79±7.05	8.40±7.56	480.76±77.63
P .value	0.003	0.007	0.002

Table 5: The relation between types of infertility and fertility hormone levels.

Category of the participant	Mean hormonal levels ± S.D(ng/ml)		
	FSH	Testosterone	Prolactin
Primary (n=384)	39.87±5.19	7.34±4.13	463.95±52.32
Secondary (n=79)	17.79±6.78	12.81±5.53	177.71±22.5
Fertility checkup (n=54)	18.52±5.47	15.43±4.75	246.30±69.94
P .value	0.05	0.00	0.01

DISCUSSION

Diagnosis of infertility in both males and females has a global significance and require assessment of factors involved in males and females infertility. Primary male infertility was the commonest among the study group, this is in disagreement with Albert and his colleagues who reported lower percentage of primary infertile men than our results (41.3% vs. 83.0%) and high percent of males with secondary infertility (58.7% vs. 17.0%).[6]

In the present study seminal analysis revealed that around one fifth of the specimens were normozoospermic and almost equal percentage of the specimen showed azoospermia while the majority of the subjects showed abnormal sperm count and / or morphology (oligo - asthenozoospermia, asthenozoospermia, severe oligoasthenospermia, oligozoospermia, asthenoteratozoospermia and oligonecrozoospermia. Farnaz, *et al* reported higher

percentage of asthenozoospermia (54.0%) and oligozoospermia (23.0%) compared to our findings. On the other hand they reported very low percentages of individuals with azoospermia (4.0%) and oligo-asthenozoospermia (17.0%). Very low percentage of normozoospermia (2.0%) was reported by Farnaz and his colleagues.[7]

Sigman and coworkers reported very high percentages of asthenoteratozoospermia (49.0%) and oligo-necrozoospermia (9.0%) compared to our results. Normozoospermia and azoospermia (14.0% each), asthenospermia (6.0%), Oligospermia and teratospermia (4.0% each) reported by Sigman and coworkers were lower than our results while Turek, *et al*, reported higher percentages of normozoospermia (55.0%) and asthenospermia (26.0%) than the percentages of our study. Azoospermia (11.0%) and oligozoospermia (8.0%) reported by Turek, *et al* were almost similar to our study.[8] [9] Conflicting results from different studies could be due to different cultural, social, economic and environmental situations.

The mean levels of plasma FSH and Prolactin were significantly higher (P. value: 0.003 and 002) in the group of infertile men with inadequate sperm count compared to those with adequate sperm count, in comparison to mean serum level of Testosterone which was statistically lower (P.value: 0.007) in those with inadequate sperm count. Jimoh and his colleagues reported that the mean levels of plasma FSH and Prolactin were higher in infertile men with inadequate sperm count compared to those with normal count; while the mean serum level of Testosterone was lower among those with inadequate sperm count. The means levels of plasma FSH, Prolactin and serum Testosterone among the subjects with inadequate sperm count in our results were higher than that reported by Jimoh and his colleagues. The subjects with adequate sperm count revealed high means of plasma FSH and Prolactin than that reported by Jimoh, *et al*, while the mean of serum Testosterone was equal to our study.[1] Ramesh, *et al*, reported low mean level of plasma FSH and Testosterone level among infertile men suffering from inadequate sperm count.[10] Badreldein and his coworkers in Red Sea State-Sudan, reported lower mean serum levels of plasma FSH, prolactin and serum Testosterone among infertile men with lower sperm count than our results.[11]

The current study showed a significant increase of the mean plasma FSH and Prolactin and decrease serum Testosterone levels among primary infertile males, while secondary infertility and fertility checkup males revealed normal levels. This agrees with a study done by Geidam, *et al*, in Nigeria, who reported that, the mean plasma FSH and Prolactin in primary infertile males were higher than reference range for fertile men.[12]

CONCLUSION

The levels of plasma FSH, Prolactin and serum Testosterone associated with semen quality parameters among men from an infertility clinic, which included both infertile men and fertile men who were partners in an infertile relationship.

The primary infertile males showed elevated levels of plasma FSH and Prolactin and decreased serum Testosterone level compared to those with secondary infertility and the fertility checkup males who had normal. Hormonal fertility profile assessment must be performed as part of the routine investigation of male infertility as their levels were found to highly affect sperm count and other seminal parameters. Further investigations of additional male populations are needed for a better understanding of the relationship between hormones and semen quality.

REFERENCES

1. Jimoh, A; Olawuyi, T; Omotoso, G ; Oyewopo, O; Dare, J. Semen parameters and hormone profile of men investigated for infertility. Journal of Basic and applied Sciences, 2012; 8: 110–113.
2. Jungwirth, A; Diemer, T; Dohle, GR; Giwercman, A; Kopa, Z; Tournaye, H; Krausz, C. Guidelines on male infertility. European Association of Urology, 2013; (6): 6–19.
3. Hofstra, S; Loves, B; Wageningen, J; Ruinemans-Koerts, I. Janssen, H. High prevalence of hypogonadotropic hypogonadism in men referred for obesity treatment. Medicine Journal, 2008; (66)3: 5–9.
4. Andreas, J; Aleksander, G; Herman ,T ; Thorsten ,D ; Gert, D; Csilla, K. European Association (EAU) Working Group on Male Infertility. European Urology Guidelines on Male Infertility, 2012; 7: 56–69.
5. World Health Organization. Laboratory manual for the examination of human semen and sperm-cervical mucus interaction; 4th edition, Cambridge, 1999: 356–411.
6. Albert, Opoku; Daniel, Boateng; Dan Yedu, Quansah; Kweku, Bedu-Addo; Frank, Ankobea-Krokoe. Semen Characteristics of male infertile couples in the Kumasi Metropolis: A study of primary and secondary infertile couples. British Journal of Medicine and Medical Research, 2014; (4)6: 1432 –1441.
7. Farnaz, Sohrabvand; Mohammed, Jafari; Mamak, Shariat; Fedyeh, Haghollahi; Mandana, Lotfi. Frequency and epidemiology aspects of male infertility. Acta Medica Iranica Journal, 2014; (53)4: 231–235.
8. Sigman, M; Jonathan, P; Jarow, S. Spermogram in male infertile. Walsh Urology Journal, 2007; 9: 609–650.
9. Turek, PJ; Pera, RA. The current and future genetic screening for male infertility. Urolology Journal, 2002; (29)4: 767–792.

10. Ramesh, Babu; Sadhnani, M; Swarna, P; Padmavathi, P; Reddy. P. Evaluation of FSH, LH and Testosterone levels in different subgroups of infertility males. Indian Journal of clinical biochemistry, 2004; (19)1: 45–49.
11. Badreldein, Hassan Elabid; Hussien, Elhady; Akram, Hamed. Assessment of fertility hormones among infertile men in Red Sea State, Sudan. International Journal of Health Sciences and Research, 2014; (4)5: 71–75.
12. Geidam, A D; Yawe, K D; Adebayo, A E; Idrisa, A. Hormonal profile of men investigated for infertility at the University of Maiduguri in northern Nigeria. Singapore Medical Journal, 2008; (49)7: 538–541.