IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 3 Ser.6 (March. 2023), PP 53-57
www.iosrjournals.org

Evaluation of Reproductive Hormones among Infertile Sudanese Males in Khartoum State

Abdelrhman Mohamed Sid Ahmed[1], Salman Taha Ahmed Elmukashfi[2], Mohamed Elamin Almahy[3],Rasha Alsamani[4], Mohamed Abdelrhman Eltahir[5], Elhussein M. Ibrahim[6]

[1]*Department of Clinical Chemistry, Faculty of Medicine, Kassala University, Kassala, Sudan.*
[2]*Department of Clinical Chemistry, Faculty of Medical Laboratory Science, University of Dongola, Al Dabbah, Sudan.*
[3]*Department of Biology, Faculty of Education, Kassala University, Kassala, Sudan.*
[4]*Department of Hematology and Immunohematology, Faculty of Medicine, Kassala University, Kassala, Sudan.*
[5]*Department of Clinical Chemistry, Gadarif University, Gadarif, Sudan.*
[6]*Department of General Plastic Suergery, Faculty of Medicine, Kassala University,Kassala, Sudan.*
Correspondence author: *Abdelrhman Mohamed Sid Ahmed, Department of Clinical Chemistry, Faculty of Medicine, Kassala University, Kassala, Sudan.*

Abstract
Background:*Infertility seems to be a great worldwide problem. Male infertility is a multifaceted state and overlaps a lot factors and affects infertility in about 8–5 % of the people in the world and the man is responsible for 40% of these cases. The FSH, LH and testosterone evaluation is useful in the management of male infertility. For initiation of spermatogenesis and maturation of spermatozoa, FSH is necessary. In the infertile men, higher concentration of FSH is considered to be a reliable indicator of germinal epithelial damage, and was shown to be associated with azoospermia and severe oligozoospermia*
Objective: *The aim of the study is to analyze the levels of reproductive hormones among different groups of infertile patients.*
Materials and method: *This is a facility based study, conducted in Reproductive Care Center in AlmukNemer Street in Khartoum state. Which include 160 serum samples collected from normozoospermic, oligoathenospermic, and azoospermic men and clinical information collected by the use of questionnaire. The concentrations of reproductive hormones were measured by using a full automated tosoh AIA360 analyzer, then the data was analyzed using the statistical software package SPSS version 17.*
Result: *The results showed that the serum levels of prolactin and FSH is statistically significant increase in patient with azoospermia and oligoasthenospermia as compared to control group, with (p .value $<$ 0.05), and the serum level of LH is statistically significant increase in patient with azoospermia and insignificant increase in patient with oligoasthenospermia as compared to control group, with p .value (0.000 and 0.232), respectively. And the serum level of testosterone is statistically insignificant decrease in patient with azoospermia and insignificantly increase in patient with oligoasthenospermia as compared to control group, with p .value (0.88 and 0.129), respectively. The results also showed statistically insignificant decrease in the serum levels of testosterone and prolactin in azoospermia when compared with oligoathenospermia, with p. value (0.227 and 0.959) respectively. And showed statistically significant increase in the serum levels of FSH and LH in azoospermia when compared with oligoathenospermia, with p. value (0.002 and 0.007) respectively.*
Conclusion: *The level of serum testosterone was insignificantly decreased in patients with azoospermia and insignificantly increased in patients with oligoasthenospermia when compared with control group. The serum levels of prolactin and FSH was significantly increased in patients with azoospermia and oligoasthenospermia when compared with control group. And the serum level of LH in increased significantly in patients with azoospermia and insignificantly in oligoasthenospermia when compared with control group.The serum levels of testosterone and prolactin is insignificant decrease in azoospermia when compared with oligoathenospermia, and the serum levels of FSH and LH is significant increase in azoospermia when compared with oligoathenospermia.*

Keyword: *Infertile Male, Testosterone, Prolactin, FSH, LH, Sudanese.*

Date of Submission: 26-02-2023 Date of Acceptance: 10-03-2023

I. Introduction

According to WHO infertility is defined as a failure to conceive after a year of regular intercourses without contraception [(1)]. Infertility affects about 8% to 12% of the world's population and in about half of cases, men are either the single cause or contribute to couple's infertility [(2)]. The successful and complete male germ cell development is dependent on the balanced endocrine [(3)]. FSH stimulates spermatogenesis and LH stimulates the production of testosterone, which in turn may act on the cells of the seminiferous tubules and stimulates spermatogenesis [(4)]. The failure of pituitary to secret FSH and LH will result in disruption of testicular function leading to infertility [(5)]. The increased FSH level in men indicate damaged seminiferous tubule [(6)]. Prolactin (PRL), stimulate production of milk in females, elevated level of prolactin decrease the levels estrogen in women and testosterone in men [(7)]. Testosterone is the primary male sex hormone . In male, testosterone plays a key role in the development of male reproductive tissues such as testes and prostate, as well as promoting secondary sexual characteristics[(8)]. Adult testosterone effects are more clearly demonstrable in males than in females, but are likely important to both sexes [(9)]. Testosterone is necessary for normal sperm development [(10)]. Testosterone also regulates the population of thromboxane A_2 receptors on megakaryocytes and platelets[(11 & 12)].The recent study was intended to assess serum levels of reproductive hormones among infertile Sudanese male.

II. Materials And Methods

2.1 Study design: This is a facility based study.
2.2 Study area: Reproductive Care Center in AlmukNemer Street in Khartoum state.
2.3 Study duration: The study was carried out during the period from December 2016 to September 2019.
2.4 Study population: Infertile Sudanese male referred to the study setting, by various fertility centers and hospitals in Khartoum state during study period.
2.5 Inclusion criteria: Male with oligoasthenospermia and azoospermia as test group and normal males (age group 24 – 78 years) belonging to the same socioeconomic status were selected as control group.
2.6 Exclusion criteria: Infertile male under hormonal treatment and diabetic patients.
2.7 Sample size: One hundred and sixty samples were collected in this study. Which is divided into two groups, a 80 samples collected from infertile male patients (oligoasthenospermia and azoospermia) as case group, and the rest of samples (80 samples) collected from apparently healthy individuals as control group.
2.8 Collection of blood specimens and analysis: Before collection, a local antiseptic (70% alcohol) was used to clean the skin, venous blood (about 4 ml) was be taken from each participant in plain container, then centrifuged at 3000 rpm for 3-5 minute to obtain serum used for measurement of hormones (FSH, LH, prolactin, and total testosterone.).
2.9 Collection of semen specimens and analysis: Semen was collected by masturbation into a sterile plastic specimen container at the hospital. Subjects were instructed to abstain from ejaculation for at least 72 hours prior to producing the semen sample. The sample was liquefied for at least 20 minutes, but no longer than 1 hour prior to performing a routine semen analysis, which included measurements of volume, pH, sperm concentration, sperm motility and morphology and direct microscopic examination.
Estimation of sperm counting will be done using the Neubauer chamber. Sperm analysis was carried out according to the World Health Organization guidelines, based on the sperm concentration the infertile subjects were classified as follows:

- Normozoospermia (> 20 million sperm /ml and normal semen profile).
- Oligoasthenospermia (<20 million sperm/ml and motility grade C or D).
- Azoospermia (no spermatozoa).

In proven fertile controls, the sperm count ranged from 20 – 120 million sperm /ml.
2.10 Instrument: A full automated tosoh AIA360 analyzer instrument.
2.11 Data collection: Direct questionnaire was done to obtain clinical data for each participant, seminal specimens and blood specimens was collected.
2.12 Data analysis: Data was analyzed using Statistical Package for Social Science Software (SPSS).
2.13 Ethical considerations: This study was approved by the research committee, College of Medical Laboratory Sciences, Shendi University. Informed consent was obtained from each participant before taking the specimens. Also verbal consent was obtained fromadministrative in reproductive care center.

III. Results

This is a facility based study conducted in Khartoum state in the Reproductive Care Center during the period from December 2016 to September 2019. This study included 160 samples, 80 from these samples were collected from infertile males as case group (40 of them collected from azoospermia 25% and the rest from oligoathenospermia 25%) and the rest of the samples collected from normal male (normozoospermia 50%) as control group, to assess the reproductive hormones among infertile Sudanese males in Khartoum state. The data

collected by the use of questionnaire, semen specimens and blood specimens and the levels of reproductive hormones is measured by Tosoh auto analyzer instrument. Then the collected data is analyzed by the use of SPSS, and the results is presented in tables.

The results of the study showed statistically insignificant decrease in the testosterone level in azoospermia and insignificant increase in oligoathenospermia when compared with control group, the means of testosterone level in azoospermia and oligoathenospermia is (12.5 and 14.0) and in control group is (12.6) with p. value (0.88 and 0.129) respectively, that illustrated in table 3.1. And showed statistically significant increase in the levels of prolactin and FSH in case group (azoospermia and oligoathenospermia) when compared with control group, the means of prolactin and FSH levels in case group is (azoospermia: 242.5, 18.1 and oligoathenospermia: 244.0, 9.9) and in control group is (162.4 and 6.7) with p. value (< 0.05) respectively, that illustrated in tables 3.2 and 3.3. The results of the study also showed statistically significant increase in the level of LH in azoospermia when compared with control group, the mean of LH level in azoospermia is (6.7) and in control group is (4.7) with p. value (0.000) respectively, and insignificant increase in the level of LH in oligoathenospermia when compared with control group, the means of LH level in oligoathenospermia is (5.2) and in control group is (4.7) with p. value (0.232) respectively, that illustrated in table 3.4.

The results of the study showed statistically insignificant decrease in the levels of testosterone and prolactin in azoospermia when compared with oligoathenospermia, the means of testosterone and prolactin levels in azoospermia is (12.1 and 242.5) and in oligoathenospermia is (14.0 and 244.1) with p. value (0.227 and 0.959) respectively, that illustrated in table 3.5. And showed statistically significant increase in the levels of FSH and LH in azoospermia when compared with oligoathenospermia, the means of FSH and LH levels in azoospermia is (18.1 and 6.7) and in oligoathenospermia is (9.9 and 5.2) with p. value (0.002 and 0.007) respectively, that illustrated in table 3.5.

Table 3.1: Independent sample T. test showed the mean of testosterone level among case (azoospermia and oligoathenospermia) group and control group.

Study groups		No	Mean (mIU/ml)	Std. Dev	P.Value
Azoospermia	**Case**	40	12.5	7.22	0.88
	Control	80	12.6	3.40	
Oligoathenospermia	**Case**	40	14.0	6.67	0.129
	Control	80	12.6	3.40	

P. value ≤ 0.05 is considered significant

Table 3.2: Independent sample T. test showed the mean of prolactin level among case (azoospermia and oligoathenospermia) group and control group.

Study groups		No	Mean (mIU/ml)	Std. Dev	P.Value
Azoospermia	**Case**	40	242.5	123.5	0.000
	Control	80	162.4	88.6	
Oligoathenospermia	**Case**	40	244.0	172.1	0.001
	Control	80	162.4	88.6	

P. value ≤ 0.05 is considered significant

Table 3.3: Independent sample T. test showed the mean of FSH level among case (azoospermia and oligoathenospermia) group and control group.

Study groups		No	Mean (mIU/ml)	Std. Dev	P.Value
Azoospermia	**Case**	40	18.1	12.67	0.000
	Control	80	6.7	3.42	
Oligoathenospermia	**Case**	40	9.9	8.2	0.003
	Control	80	6.7	3.42	

P. value ≤ 0.05 is considered significant

Table 3.4: Independent sample T. test showed the mean of LH level among case (azoospermia and oligoathenospermia) group and control group.

Study groups		No	Mean (mIU/ml)	Std. Dev	P.Value
Azoospermia	**Case**	40	7.6	4.65	0.000
	Control	80	4.7	1.70	
Oligoathenospermia	**Case**	40	5.2	2.05	0.232
	Control	80	4.7	1.70	

P. value ≤ 0.05 is considered significant

Table 3.5: Paired sample T. test showed the mean of plasma levels of testosterone, prolactin, FSH and LH among azoospermia and oligoathenospermia.

Paired Group	Mean (mIU/ml)	No	Std. Deviation	P.Value
Testosterone level (AZO)	12.1	40	7.22	0.227
Testosterone level (OAS)	14.0	40	6.67	
Prolactin level (AZO)	242.5	40	123.5	0.959
Prolactin level (OAS)	244.1	40	172.1	
FSH level (AZO)	18.1	40	12.67	0.002
FSH level (OAS)	9.9	40	8.15	
LH level (AZO)	7.6	40	4.65	0.007
LH level (OAS)	5.2	40	2.05	

P. value ≤ 0.05 is considered significant

IV. Discussion:

This is a facility based study conducted in Khartoum state in the Reproductive Care Center during the period from December 2016 to September 2019. This study included 160 samples, 80 from these samples were collected from infertile males as case group (40 of them collected from azoospermia 25% and the rest from oligoathenospermia 25%) and the rest of the samples collected from normal male (normozoospermia 50%) as control group, to assess the reproductive hormones among infertile Sudanese males. The data collected by the use of questionnaire, semen specimens and blood specimens and the levels of reproductive hormones is measured by Tosoh auto analyzer instrument. Then the collected data is analyzed by the use of SPSS.

The FSH, LH and testosterone evaluation is useful in the management of male infertility (Zabul, J., et al 1994) [(13)]. For initiation of spermatogenesis and maturation of spermatozoa, FSH is necessary. In the infertile men, higher concentration of FSH is considered to be a reliable indicator of germinal epithelial damage, and was shown to be associated with azoospermia and severe oligozoospermia (Bergmann, M., et al. 1994) [(14)].

The results of the study showed statistically insignificant decrease in the testosterone level in azoospermia and insignificant increase in oligoathenospermia when compared with control group, the means of testosterone level in azoospermia and oligoathenospermia is (12.5 and 14.0) and in control group is (12.6) with p. value (0.88 and 0.129) respectively, that illustrated in table 3.1. This agree with (Babu, S.R., et al, 2004 and Tadesse, M., et al, 2016) [(15 & 16)], were found statistically insignificant difference in the level of testosterone between infertile and fertile male.

The present study showed statistically significant increase in the level of prolactin in case group (azoospermia and oligoathenospermia) when compared with control group, the means of prolactin level in case group is (azoospermia: 242.5 and oligoathenospermia: 244.0) and in control group is (162.4) with p. value (0.000 and 0.001) respectively, that illustrated in table 3.2. (Tadesse, M., 2016) [(16)]. and showed statistically significant increase in the level of FSH in case group (azoospermia and oligoathenospermia) when compared with control group, the means of FSH level in case group is (azoospermia: 18.1 and oligoathenospermia: 9.9) and in control group is (6.7) with p. value (0.000 and 0.003) respectively, that illustrated in table 3.3. (Babu, S.R., et al, 2004 and Tadesse, M., et al, 2016) [(15 & 16)], were found statistically insignificant increase in the level of FSH in all infertile male when compared with fertile male.

The results of the study also showed statistically significant increase in the level of LH in azoospermia when compared with control group, the mean of LH level in azoospermia is (6.7) and in control group is (4.7) with p. value (0.000) respectively, and insignificant increase in the level of LH in oligoathenospermia when compared with control group, the means of LH level in oligoathenospermia is (5.2) and in control group is (4.7) with p. value (0.232) respectively, that illustrated in table 3.4. (Babu, S.R., et al, 2004 and Tadesse, M., et al, 2016) [(15 & 16)], were found statistically insignificant increase in the level of LH in all infertile male when compared with fertile male.

FSH, LH and testosterone are prime regulators of germ cell development. The quantitative production of spermatozoa generally requires the presence of FSH, LH and testosterone. FSH acts directly on the seminiferous tubules whereas LH stimulates spermatogenesis indirectly via testosterone. FSH plays a key role in stimulating mitotic and meiotic DNA synthesis in spermatogonia (Anderson, R.A., et al, 1997) [(17)].

The results of the study showed statistically insignificant decrease in the levels of testosterone and prolactin in azoospermia when compared with oligoathenospermia, the means of testosterone and prolactin levels in azoospermia is (12.1 and 242.5) and in oligoathenospermia is (14.0 and 244.1) with p. value (0.227 and 0.959) respectively, that illustrated in table 3.5. And showed statistically significant increase in the levels of FSH and LH in azoospermia when compared with oligoathenospermia, the means of FSH and LH levels in azoospermia is (18.1 and 6.7) and in oligoathenospermia is (9.9 and 5.2) with p. value (0.002 and 0.007) respectively, that illustrated in table 3.5.

V. Conclusion:

From the results of this study we can conclude that the level of serum testosterone was insignificantly decreased in patients with azoospermia and insignificantly increased in patients with oligoasthenospermia when compared with control group. The serum levels of prolactin and FSH was significantly increased in patients with azoospermia and oligoasthenospermia when compared with control group. And the serum level of LH in increased significantly in patients with azoospermia and insignificantly in oligoasthenospermia when compared with control group.

The serum levels of testosterone and prolactin is insignificant decrease in azoospermia when compared with oligoathenospermia, and the serum levels of FSH and LH is significant increase in azoospermia when compared with oligoathenospermia.

Competing interests:
Authors have declared that no competing interests exist.

Reference:

[1]. Bablok, L., Dziadecki, W., Szymusik, I., Wolczynski, S., Kurzawa, R., Pawelczyk, L., Jedrzejczak, P., Hanke, W., Kaminski, P. and Wielgos, M., (2011). Patterns of infertility in Poland–multicenter study. Neuroendocrinology Letters, 32(6), pp.799-804.

[2]. Connétable, D., Timoshevskii, V., Masenelli, B., Beille, J., Marcus, J., Barbara, B., Saitta, A.M., Rignanese, G.M., Mélinon, P., Yamanaka, S. and Blase, X., (2003). Superconductivity in Doped s p 3 Semiconductors: The Case of the Clathrates. Physical review letters, 91(24), p.247001.

[3]. Krester, D.M. (1979) Endocrinology of Male Infertility. Brit. Med. Bullet. 35 (2), 187-192.

[4]. Donnel, L., R.I. Mc Lachlan, N.G. Wreford and Robertson, D.M. (1994) Testosterone promotes the conversion of round spermatids between stages vii and viii of the rat spermatogenic cycle. Endocrinology. 135 (4), 2608-2614.

[5]. Weinbauer, G.F and Nieschlag, E. (1995) Gonadotropin control of testicular germ cell development. Adv. Exp. Med. Biol. 317, 55-65.

[6]. Bergmann, M., Behre, H. and Nieschlag, E. (1994) Serum FSH and testicular morphology in male infertility. Clin. Endocrinol. 40, 133-136.

[7]. Bole-Feysot, C., Goffin, V., Edery, M., Binart, N. and Kelly, P.A., (1998). Prolactin (PRL) and its receptor: actions, signal transduction pathways and phenotypes observed in PRL receptor knockout mice. Endocrine reviews, 19(3), pp.225-268.

[8]. Tuck, S. and Francis, R., (2009). Testosterone, bone and osteoporosis. Advances in the management of testosterone deficiency, 37, pp.123-132.

[9]. Dewailly, D., Andersen, C.Y., Balen, A., Broekmans, F., Dilaver, N., Fanchin, R., Griesinger, G., Kelsey, T.W., La Marca, A., Lambalk, C. and Mason, H., (2014). The physiology and clinical utility of anti-Müllerian hormone in women. Human reproduction update, 20(3), pp.370-385.

[10]. Mehta, P.H., Jones, A.C. and Josephs, R.A., (2008). The social endocrinology of dominance: basal testosterone predicts cortisol changes and behavior following victory and defeat. Journal of personality and social psychology, 94(6), p.1078.

[11]. Ajayi, A.L., (2005). Should the sickle cell trait be reclassified as a disease state?. European Journal of Internal Medicine, 16(6), p.463.

[12]. Ajayi, A.A. and Akintomide, A.O., (1995). The efficacy and tolerability of amlodipine and hydrochlorothiazide in Nigerians with essential hypertension. Journal of the National Medical Association, 87(7), p.485.

[13]. Zabul, J., Mierzejewski, W. and Rogoza, A. (1994) Usefulness of examining gonadotropin hormones and testosterone in men with abnormal semen. Ginekol-pol. 65 (2), 71-74.

[14]. Bergmann, M., Behre, H. and Nieschlag, E. (1994) Serum FSH and testicular morphology in male infertility. Clin. Endocrinol. 40, 133-136.

[15]. Babu, S.R., Sadhnani, M.D., Swarna, M., Padmavathi, P. and Reddy, P.P., (2004). Evaluation of FSH, LH and testosterone levels in different subgroups of infertile males. Indian Journal of Clinical Biochemistry, 19, pp.45-49.

[16]. Tadesse, M., Aragaw, D., Dimah, B., Efa, F., Abdella, K., Kebede, W., Abdissa, K. and Abebe, G., (2016). Drug resistance-conferring mutations in Mycobacterium tuberculosis from pulmonary tuberculosis patients in Southwest Ethiopia. International journal of mycobacteriology, 5(2), pp.185-191.

[17]. Anderson, R.A., Wallace, E.M., Groome.N.P.,Bellis, A.J. and Wu,F.C.W (1997). Physiological relationships between inhibin B, follicle stimulating hormone secretion and spermatogenesis in normal men and response to gonadotrophin suppression by exogenous testosterone. Hum. Reprod. 12, 746-7.

Abdelrhman Mohamed Sid Ahmed, et. al. "Evaluation of Reproductive Hormones among Infertile Sudanese Males in Khartoum State." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(3), 2023, pp.53-57.