Evaluation of LH, FSH and Testosterone in Infertile Males

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Research Article

Abstract: Infertility is defined as the inability of a couple to conceive after at least 12 months of unprotected sexual intercourse. The failure of pituitary to secret FSH and LH will result in disruption of testicular function leading to infertility. Semen analysis and hormone evaluation are essential parameters in giving a definitive diagnosis in infertile males. The aim of the present study was to evaluate the levels of LH, FSH and Testosterone in infertile males. The study was a prospective cross sectional one carried out in the Department of Biochemistry. FSH, LH and testosterone levels were estimated in 30 infertile males of whom 15 were azospermic and 15 were oligospermic There was significant increase in LH and FSH levels in all groups of infertile males as compared to controls ($P< 0.05$).. The differences for the mean testosterone levels between the controls and infertile males with azospermia and oligospermia were insignificant ($p>0.05$).

Keywords: Male infertility, LH, FSH, testosterone.

Introduction

Infertility is defined as the inability of a couple to conceive after at least 12 months of unprotected sexual intercourse. It occurs worldwide but differs in incidence and prevalence. Infertility is a common gynaecological problem affecting 15% of couples attempting their first pregnancy, in which case it is called primary infertility; while those with secondary infertility are about 10% of the population. Secondary infertility could be as high as 52% in some sub-Sahara African countries and as low as 23% in some Asian countries [1]. Infertility is a common disorder and nearly one out of every six to eight couples suffers from it at any given time. Infertility among couples in their respective age is more common than hypertension, diabetes, heart diseases and even the common flu [2]. Globally, it has been estimated that approximately 10-15% couples seek medical help for the problem of infertility. In 20-25% cases the problems are attributable to the male partner, while 30-40% represent female factor. In approximately 30% of cases both partners and in 15% no specific factor can be identified [3]. The successful and complete male germ cell development is dependent on the balanced endocrine interplay of hypothalamus, pituitary and the testis. Gonadotropin releasing hormone (Gnrh) secreted by the hypothalamus elicits the release of gonadotrophins i.e. follicle stimulating hormone (FSH) and lutenizing hormone(LH) from the pituitary gland [4]. FSH binds with receptors in the sertoli cells and stimulates spermatogenesis. LH stimulates the production of testosterone in Leydig cells, which in turn may act on the Sertoli and peritubular cells of the seminiferous tubules and stimulates spermatogenesis [5]. The failure of pituitary to secret FSH and LH will result in disruption of testicular function leading to infertility. Testosterone, estradiol and inhibin control the secretion of gonadotrophins through feedback mechanism [6]. Semen analysis and hormone evaluation are essential parameters in giving a definitive diagnosis in infertile males [7]. Therefore, hormones measurement can help to determine whether the patient has gonadotropin deficiency, primary testicular failure, spermatogenic failure or androgen resistance. So the aim of the present study was to evaluate the levels of LH, FSH and Testosterone in infertile males.

Materials and Methods

The study was a prospective cross sectional one carried out in the Department of Biochemistry. 30 infertile males (age group 25-40 years) with at least 3 years duration of infertility referred by various fertility centres and hospitals to MGM Medical College and Hospital, Aurangabad during November 2012 to November 2013 were selected for the study. They were asked to complete a comprehensive questionnaire relating to their medical and personal history, lifestyle habits and exposure to gonadotoxins (such as radiation therapy and drugs used for cancer chemotherapy). 15 age-matched controls with proven fertility were selected as control group. Semen was collected from the infertile subjects by masturbation, after haven abstained from sexual intercourse for a minimum of two days and a maximum of seven days, in a private room near the laboratory in order to limit the exposure of the semen to fluctuations in temperature and also to control the time between collection and analysis. The collection was done into a clean, dry, wide-mouthed container made of glass that is non-toxic for spermatozoa. The specimen container was kept in an incubator at 30 °C temperature. The estimation of sperm counting was done

using the Neubauer haemocytometer chamber. Sperm analysis was carried out according to the World Health Organization guidelines [8]. Based on the sperm count, the subjects were classified as normospermia (> 20 million sperm /ml), oligospermia (<20 million sperm/ml) and azoospermia (no spermatozoa). In proven fertile controls, the sperm count ranged from 20 –120 million sperm /ml. 10ml fresh blood sample was aseptically collected from ante cubital vein of each subject, transferred into a clean plain labeled tube, allowed to clot, and then centrifuged at 6000 rpm for 5 minutes at room temperature. The clear serum was separated and kept at 20^0 C till assayed. Serum concentrations of follicle stimulating hormone (FSH), luteinizing hormone (LH) and testosterone were measured by Immulite 1000 using the kits supplied by Siemens. The results obtained were analysed using student t-test with SPSS version 17.

Results

Out of 30 infertile males, 15 were azospermic and 15 were oligospermic. There was significant increase in LH and FSH levels in all groups of infertile males as compared to controls (P< 0.05). The differences for the mean testosterone levels between the controls and infertile males with azospermia and oligospermia were insignificant (p>0.05). The values obtained on analyzing specimens collected form infertile males and control groups are tabulated. The mean values and standard deviation also have been calculated for comparative study of infertile males and controls. The values of subject and controls groups are also graphically represented for comparison.

Table 1: Showing Serum FSH, LH and testosterone levels in different subgroups of infertile males and controls

Group	No. of subjects	Hormone levels±SD		
		LH(mIU/ml)	FSH(mIU/ml)	Testosterone(ng/ml)
Controls	15	8.44±5.40	7.70±3.52	4.90±1.25
Azospermia	15	12.51±12.12	12.24±9.65	4.84±0.92
Oligospermia	15	12.88±9.23	14.98±9.10	4.78±0.90

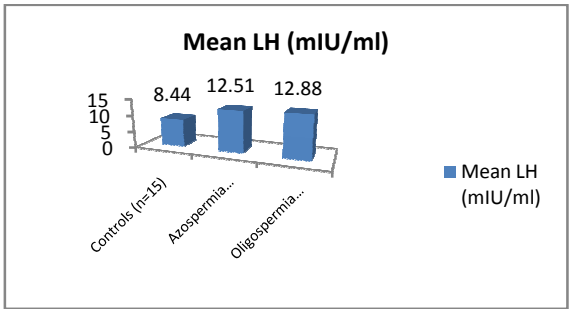

Figure 1: Comparision of mean LH levels in different subgroups of infertile males with controls

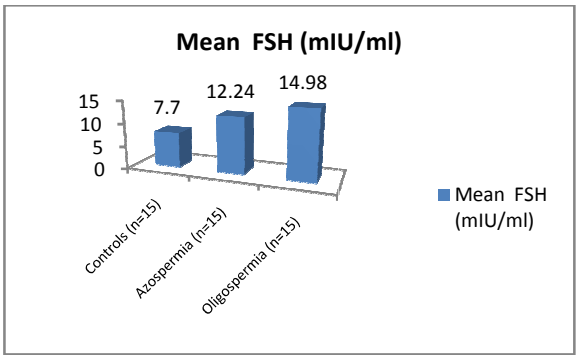

Figure 2: Comparision of mean FSH levels in different subgroups of infertile males with controls

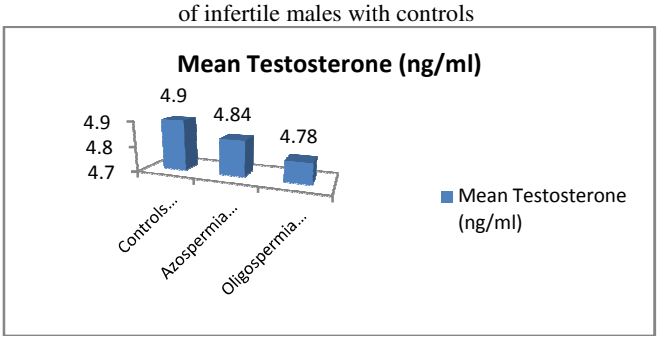

Figure 3: Comparison of mean Testosterone levels in different subgroups of infertile males with controls

Discussion

It is extremely important in the evaluation of male infertility to consider the reproductive hormone levels. It was reported that these hormones have a major role in male spermatogenesis[9]. LH, FSH and Testosterone evaluation is useful in the management of male infertility[10]. 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[11]. de Kretser *et al.* [12] reported elevated levels of serum FSH with increasing sevedty of seminiferous epithelial destruction. In the present study, gonadotropin (FSH and LH) levels were significantly elevated in infertile males when compared with the levels in proven fertile controls. These results are in accordance with the studies of Sulthan *et al.* [13]. Zabul *et al.*[10], Weinbaurer and Nieschlag [6], and Subhan et *al.*[14] who showed elevated levels of both follicle stimulating hormone and luteinizing hormones in infertile males. Elevated levels of LH in oligozoospermic and azoospermic males when compared to normal fertile men were also reported [15]. In the present study the difference in the mean serum testosterone levels between fertile and infertile men were insignificant. Similar observations were made by Smith *et al.* [16] and Subhan *et al.* [14]. 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 luteinizing hormone stimulates spermatogenesis indirectly via testosterone. FSH plays a key role in stimulating mitotic and meiotic DNA synthesis in spermatogonia [17]. The overall results clearly indicate significant increase in gonadotropins (FSH and LH) in all the subgroups (azoospermia, oligozoospermia). Although there was no significant decrease in the testosterone levels in infertile males when compared to fertile controls. The observed increase in the FSH and LH levels are to stimulate the sertoli and leydig cells for proportionate synthesis and secretion of testosterone thereby enhancing spermatogenesis. At certain yet to be determined plasma threshold of FSH and LH the high gonadotrophin level exercise a negative feedback effect on the hypothalamopituitary- testicular axis and thus the plasma testosterone become low or normal.

Conclusion

From this study it may be concluded that high plasma levels of gonadotrophins, low sperm count and low or normal levels of testosterone are pathognomonic of male infertility. The high level of gonadotrophins is an indication of testicular problems as the cause of infertility in the studied subjects. However, further studies are needed to evaluate the levels of gonadotrophins and testosterone in infertile males.

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