

## Assessment of Free Testosterone and FSH in Sudanese Alcoholic Patients

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**Abstract:** Alcoholism can lead to various medical complications, like perturbed alcohol metabolism, liver cirrhosis and hormonal changes associated with pancreatitis, osteoporosis, immune impairment and impaired fertility. Experimental and clinical studies suggest that alcohol consumption may alter both testosterone secretion and spermatogenesis. This study was carried out to measure serum levels of free testosterone and FSH in Chronic alcoholic patients. Sixty samples were collected from patients in period between February to March 2017, chosen randomly from Omdurman- Khartoum state (Sudan) and Sixty apparently, healthy individuals as controls, to assess the levels of free testosterone and FSH in Chronic alcoholic patients. Serum free testosterone and FSH were measured by using ELISA, (Enzyme -linked immunosorbent assay) and results were analyzed using statistical of package social science (SPSS), computer program. The study showed that, the serum level of free testosterone was significantly decrease, While the level of FSH was significantly increase ( $p$ -value = 0.00) in alcoholic patients compared to control group. Mean  $\pm$ SD cases versus control. (8.911 $\pm$ 4.89 versus 10.02 $\pm$ 8.57) For testosterone. (13.48 $\pm$ 7.97 versus 7.28 $\pm$ 3.67) for FSH. Also the result showed, there was significant decrease in mean level of testosterone and significant increase in FSH in alcoholic patients that intake alcohol daily compared to alcoholic patients intake alcohol sometimes pear weak. (9.81 $\pm$ 5.42 versus 10.13 $\pm$ 6.78) for testosterone (16.93 $\pm$ 10.27 versus 7.28 $\pm$ 3.67) for FSH There was significantly weak positive correlation between serum FSH in alcoholic patients and age of patients ( $r = 0.327$ ,  $p$ - value = 0.041), while there were no correlations between serum testosterone level and age of alcoholic patients ( $r=0.008$ ,  $p$ - value= 0.953 ). The result showed, there was significant positive correlation between FSH level and duration of alcohol intake( $r=0.382$ ,  $p$ - value=0.003), while there was insignificant weak negative correlation between testosterone level and duration of alcohol intake ( $r=-0.168$ ,  $p$ - value=0.078) and significant negative correlation between testosterone level and FSH level in alcoholic patients( $r= -0.311$ ,  $p$ -value=0.016) It is concluded that; the levels of testosterone is significantly decrease and the level of FSH is significantly increase in alcoholic patients compared to control group.

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### I. Introduction:

Alcohol can be categorized as a depressant drug. when consumed, about 20% is absorbed in stomach and 80% in the small intestines like other depressant drugs, it slows the pace of brain, approximately 90% of ingested alcohol is metabolized in the liver, the rest is excreted via breath and urine.<sup>(1)</sup>

Alcoholism can lead to various medical complications, like perturbed alcohol metabolism, liver cirrhosis and hormonal changes associated with pancreatitis, osteoporosis, immune impairment and impaired fertility.<sup>(2)</sup> The male reproductive system consists of three parts: hypothalamus, anterior pituitary and the testes and is finely controlled through a classic negative feedback mechanism<sup>(3)</sup>.

The hypothalamus and anterior pituitary have solely regulatory functions, mediated by its hormones. Testosterone is the primary male sex hormone and an anabolic steroid. In men, testosterone plays a key role in the developments of male reproductive tissues such as the testis and prostate, as well as promoting secondary sexual characteristics such as increased muscle and bone mass, and the growth of body hair<sup>(2)</sup> In addition, testosterone is essential for health and well being,<sup>(3)</sup>

Alcoholism, also known as alcohol use disorder (AUD), is a broad term for any drinking of alcohol that results in problems.<sup>(5)</sup> It was previously divided into two types: alcohol abuse and alcohol dependence.<sup>(6) (7)</sup> Alcohol abuse impairs reproductive activity.<sup>(1)</sup> Alcoholics are often found having fertility abnormalities with low sperm count and impaired sperm motility.<sup>(2)</sup> It causes impaired testosterone production and metabolism,

enormous testicular oxidative stress and testicular atrophy,<sup>(3)</sup>. Oxidative stress is a condition associated with an increased rate of cellular damage induced by reactive oxygen species. In a normal situation, antioxidants of plasma quench these reactive oxygen species (ROS) and protect against any likely damage to cell.<sup>(4)</sup> drinking alcohol resulted in higher levels of the stress hormone cortisol . It Lasted for 4 hours after the first drink and remained elevated for 24 hours. Cortisol acts directly on cells in the testes to inhibit the production and release of testosterone. ,<sup>(8)</sup>. Alcohol Impaired testosterone direct or/and indirect effect on pancreatic functionality, nutrition of the body and vitamins.<sup>(9)</sup>.

## II. Material And Methods

**Study Population:** The study was carried out at College of Medical laboratory Science and the subjects were recruited from Omdurman in Khartoum state (Sudan) from period between February to March 2017. A total of 60 alcoholic patients and 60 apparently healthy individuals as controls were enrolled in this study.

### **Inclusion criteria:-**

Sudanese males alcoholic patients (age between 25-45 years) and apparently healthy volunteers (matches age and sex with the cases) were included.

**Exclusion criteria:** Alcoholic patients below 25 and above 45 years and patients with history of undergoing long term medical intervention for various reasons like Cancer, endocrine disorders, patients under hormone replacement therapy(HRT), Diabetes, Advance alcohol liver disorder, Chronic Renal Failure (CRF) were excluded.

### **Samples Collection and Preparation**

Five ml of blood samples were drawn from each individual of study population, using standard vein puncture techniques. Sample was allowed to clot and then centrifuged at 3000 rpm for 10 minutes to obtain clear, transparent serum. The separated serum was analyzed for serum **free testosterone and FSH** were estimated using ELISA,(Enzyme -linked immunosorbent assay).

The normal ranges for serum testosterone and FSH are as follows: ( 2.5 - 10.0)ng/ml , ( 10 -14 )mIU/ml---respectively. These values were used to confirm abnormal cases and then to find Correlation of chronic heavy drinking with reproductive hormones (testosterone and FSH).

### **Statistical analysis:**

Statistical analysis was performed using SPSS (SPSS, version 16),data were expressed as mean and standard deviation (M±SD), the means were compared using independent T.test and Pearson's correlation analysis was used for correlation of parameters measured, P-value < 0.05 was considered as statistically significant.

### **Ethical consideration:**

This study was approved by faculty of medical laboratory sciences, Alneelain University, Khartoum, Sudan, and ethical clearance was obtained from ministry of health. All participant Patients was signed an informed consent before samples collection.

## III. Results

The current study was designed to assessment of free testosterone and FSH in alcoholic patients.

The mean age (year) in case group was 37.16 and control group was 36.31 as in Figure (1) .The mean levels of serum testosterone among alcoholic patient

(M±SD 8.911±4.89) was significant decrease compared with control group

(M±SD 10.02±8.57) *P-value*0.008 and the mean level of serum FSH among alcoholic patient (M±SD 13.48±7.97) was significant increase compared with control group (M±SD 7.28±3.67) *p-value* 0.008 as in Table (1).

The mean level of serum testosterone among case group when divided into two groups according to alcohol intake (daily and sometimes in weak) was significant decrease and FSH was significantly increase in alcoholic patients consumed alcohol daily compared to alcoholic patients consumed alcohol sometimes pear weak as in table (2).

There was slightly positive correlation between FSH and age (Years) ( $r=0.327$ , *p-value*=0.041) as in figure (2). There was no correlation between testosterone and age (Years) ( $r=0.008$ , *p-value*=0.953) as in figure (3).

There was positive correlation between FSH and duration (Years) ( $r=0.382$ , *p-value*=0.003) as in figure (4) and there was insignificant weak negative correlation between testosterone and duration (Years) ( $r= -0.168$ , *p-value* =0.078) as in figure (5).Also there was negative correlation between FSH (IU/ml) and testosterone in alcoholic patients( $r= -0.311$ , *p-value* =0.016) as in figure (6).

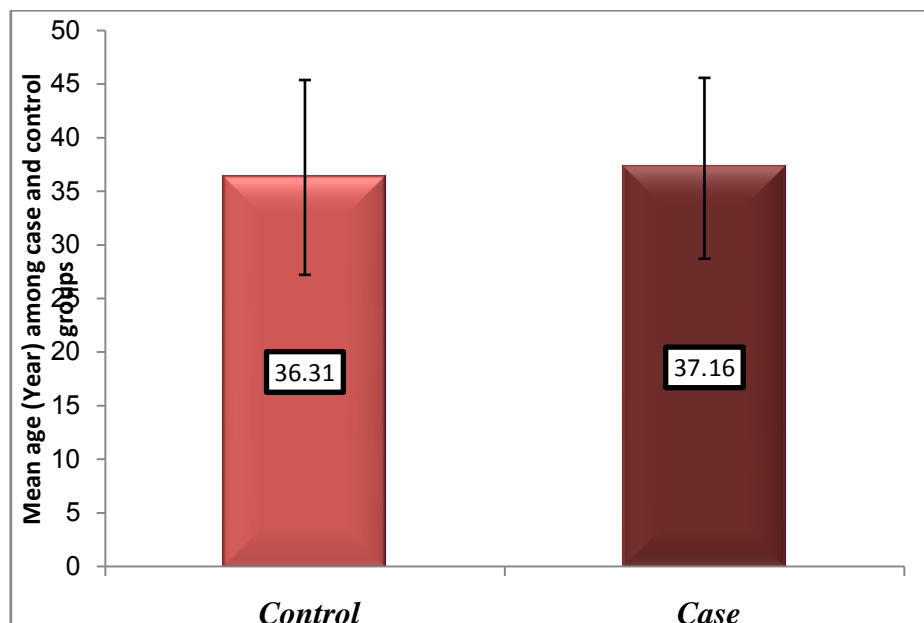


Figure (1) mean age (Years) among case and control groups

Table (1) mean concentration of FSH and testosterone among alcoholic patients and control group

Parameters	Control (Mean±SD) N = 60	Case (Mean±SD) N = 60	P-value
FSH (mIU/ml)	7.28±3.67	13.48±7.97	0.002
Testosterone (IU/ml)	10.02±8.57	8.911±4.89	0.008

P-value ≤ 0.05 consider as significant

Table 2 mean concentration of FSH and testosterone according to alcohol intake (daily and some times)

Parameters	Sometimes (Mean±SD) N = 21	Daily (Mean±SD) N = 39	P-value
FSH (mIU/ml)	7.28±3.67	16.93±10.27	0.001
Testosterone (IU/ml)	10.13±6.78	9.81±5.42	0.022

P-value ≤ 0.05 consider as significant

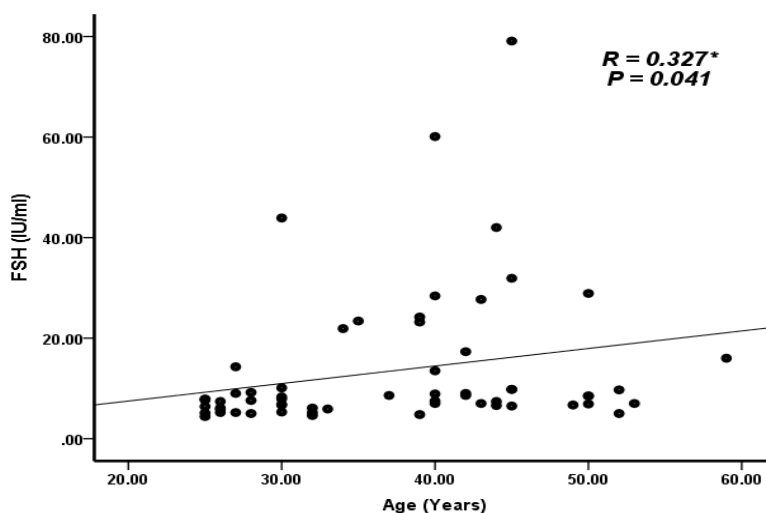


Figure (2) correlation between age (Years) and FSH (mIU/ml), (r=0.327, p- value=0.041)

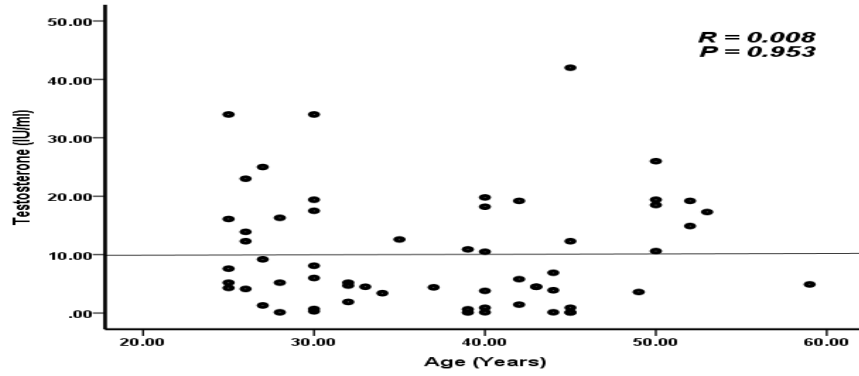


Figure (3) correlation between age (Years) and testosterone (IU/ml), ( $r=0.008$ ,  $p$ -value= $0.953$ )

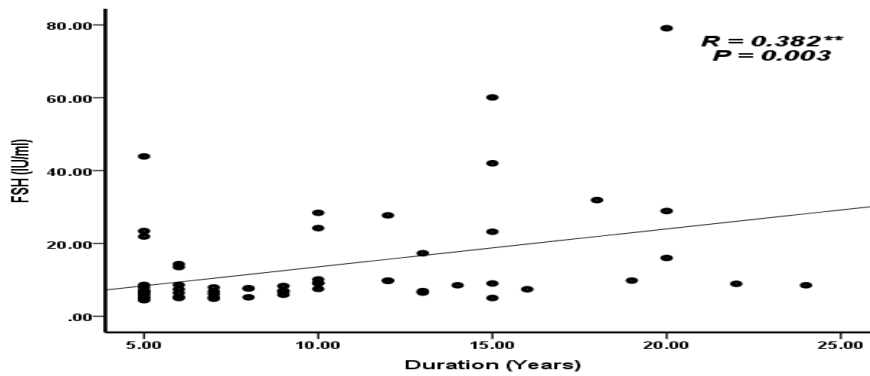


Figure 4 correlation between duration (Years) and FSH (mIU/ml), ( $r=0.382$ ,  $p$ -value= $0.003$ )

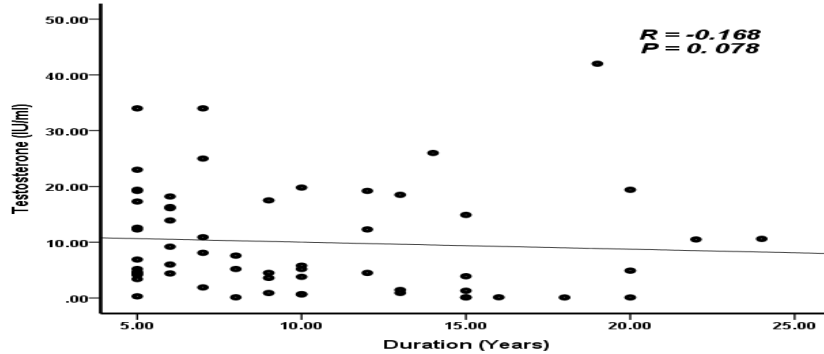


Figure (5) correlation between duration (Years) and testosterone (IU/ml), ( $r= -0.168$ ,  $p$ -value = $0.078$ )

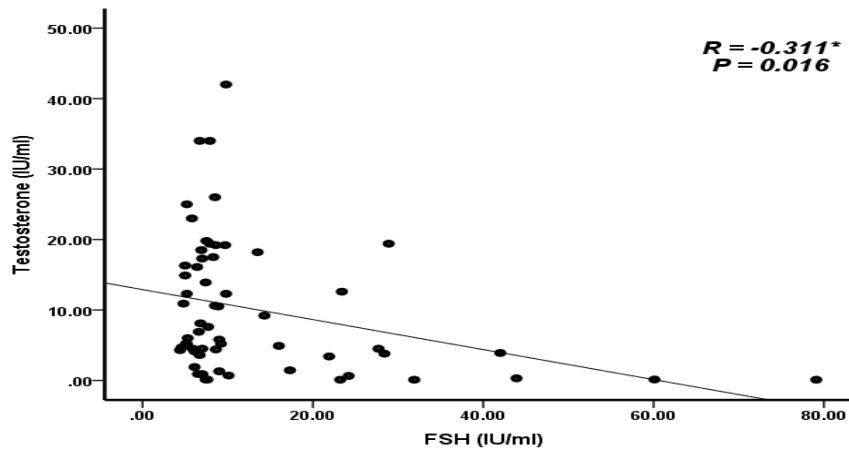


Figure (6) correlation between FSH (mIU/ml) and testosterone (IU/ml), ( $r= -0.311$ ,  $p$ -value = $0.016$ )

#### IV. Discussion

Alcohol can be categorized as a depressant drug. when consumed , about 20% is absorbed in stomach and 80% in the small intestines like other depressant drugs.<sup>(1)</sup> In men chronic heavy drinking interferes with reproductive hormones which are responsible for sexual maturation, sperm development and fertility.<sup>(10)</sup>

Result of this study showed that, there was significantly decrease in the mean level of testosterone and significant increase in mean level of FSH in alcoholic patients compared to control group. ( p- value=0.000) Reduction in the serum testosterone could be due to decreased synthesis. As testosterone levels decreases, levels of LH and FSH would increase to stimulate the production of more testosterone. The result agreed with another study performed on a group of alcohol abusers and control group, the patients had significantly low plasma testosterone, alcohol is directly toxic to the testes; causing reduced testosterone levels. Alcohol abusers displayed significantly lower levels of plasma testosterone. (P<0.001).Decreased serum testosterone level in alcoholics might be due to increased oxidative stress and decrease in antioxidant levels.<sup>(10)</sup>

Also the result is similar to another result which suggested that alcohol consumption seems to alter sperm parameters and testicular pathology.<sup>(11)</sup>

Another previous study found low testosterone levels, and normal LH, FSH and prolactin values. Thus, hypotestosteronemia may explain the observed reduction of the seminal plasma volume. In addition, a higher percentage of morphologically abnormal spermatozoa was observed in these men compared with controls.<sup>(12)</sup> the result in agreement with another result carried by (Vicari *etal.*,2002) which reported that, Alcohol has been shown to have a deleterious effect at all levels of male reproductive system. It interferes with the HPT axis regulation resulting in an impairment of luteinizing hormone (LH) and follicular stimulating hormone (FSH) secretion. Moreover, a progressive testicular damage and the consequent decrease of sex hormones leads to a loss of secondary sexual characteristics and the onset of erectile dysfunction and infertility.<sup>(13)</sup> On the other hand, sperm parameter abnormalities have been reported to be significantly associated with elevated serum LH, FSH, and 17 $\beta$ -estradiol levels and significantly decreased serum testosterone levels, thus suggesting the presence of a primary testiculopathy in men drinking ethanol.<sup>(14)</sup> The result disagreed with another result done by Goverde and colleagues which did not found any statistically significant difference for seminal fluid volume and testicular hormones in alcoholic patients.<sup>(15)</sup> Another previous study found that ; low serum testosterone level in alcohol abusers was accompanied by low serum LH and FSH levels. This suggests that the hypothalamic cells, which produce luteinizing hormone releasing hormone (LHRH), do not function correctly to the feedback when testosterone level is decreased. The inability of the pituitary gland to respond appropriately to a decline in testosterone implies that alcohol has a central effect on the interaction between the nervous system and endocrine system.<sup>(16)</sup>

Result in this study showed that, the mean level of serum testosterone among case group when divided into two groups according to alcohol intake (daily and sometimes in weak) was significantly decrease and FSH was significantly increase in alcoholic patients consumed alcohol daily compared to alcoholic patients consumed alcohol sometimes pear weak.(p, value $\leq$  0.05). Also the result showed, there was slightly positive correlation between FSH and age (Years) (r=0.327, p- value=0.041), while there was no correlation between testosterone and age (Years) (r=0.008, p – value=0.953) .

The result found positive correlation between FSH and duration (Years) (r=0.382, p- value=0.003) and there was insignificant weak negative correlation between testosterone and duration (Years) (r= -0.168, p- value =0.078) . This result disagreed with another results which showed, no correlation has been found with the duration of alcohol consumption.<sup>(17)</sup> Also there was negative correlation between FSH (IU/ml) and testosterone in alcoholic patients(r= -0.311, p- value =0.016). This result agreed with another result carried by (Remzi *eta l.*, 2004) which reported that, as testosterone levels decreases, levels of LH and FSH would increase to stimulate the production of more testosterone.<sup>(3)</sup>

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