Original Article

The Effect of Fasting Period and Low-Fat Diet on The Testosterone and Follicle Stimulating Hormone of Male Rats

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Abstract

Nourishment is essential for the continuity of life in all animals' kinds. Fasting is one of the world's most widespread fitness and health fads for enhancing their health and simplifying their lives. The low-fat diet is one of the most used applications to maintain the levels of different hormones and therefore decreased the risk of diseases such as cardiovascular disease. Thus, the current study was designed to investigate the effect of a low-Fat Diet in tow period strategy of fasting in 14 hours and 20 hours by using 36 healthy young male albino rats on testosterone and follicle stimulation hormone.

Keywords: Fasting, Testosterone, FSH, rats, feed.

Introduction

Fasting is the deliberate abstention from eating and is a dietary habit that alternates between fasting and eating intervals. Instead of being a typical diet, it should be regarded as an eating behavior. Moreover, is one of the most popular fitness and health fads in the world right now [1]. Previous studies illustrated that it may significantly impact the body and brain and may even help to live longer [2]. Since, researchers have proved that intermittent fasting has benefits effect on disease symptoms and progression of Alzheimer's disease, epilepsy, and multiple sclerosis [1,3]. Furthermore, many studies showed that fasting have anticancer effects by reducing tumor progression, enhancing death of cancer cells, and elevating the effectiveness and tolerability of chemotherapy and radiotherapies [4,5]. Fasting is used as a feeding strategy in therapeutic treatment under specific circumstances, which can be classified as intermittent or periodic, based on the duration [6]. Intermittent fasting can be alternate-day ≥14 h or 48 h fasting per week, and periodic fasting is typically a minimum of 3 days fasting every 2 or more weeks [4].

Nutrition and other elements in diet has different factor on an organism's biological and homeostasis of reproductive, health, and illness [7]. Testosterone plays a fundamental role in male physiology and reproductive health [8]. The major tissues involved in insulin action, such as the liver, fat, and muscle tissues, are essentially affected by testosterone by a highly complex metabolic way [9,10]. According to researchers' studies, long-term testosterone levels result in metabolic alterations, such as increased net protein breakdown, which reduces muscle mass [11,12].

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Access this article online

Quick Response Code:

Website: www.pnrjournal.com

DOI: 10.47750/pnr.2022.13.03.033

How to cite this article: Husham Qassim Mohammed, Ghadeer Sabah Bustani, Ali Mohammed Obayes, Aiman Mohammed Baqir Al-Dhalimy, The Effect of Fasting Period and Low-Fat Diet on The Testosterone and Follicle Stimulating Hormone of Male Rats, J PHARM NEGATIVE RESULTS 2022;13:211-214.

Conversely, Follicle Stimulating Hormone has a pivotal role in developing insulin resistance, obesity, metabolic syndrome, and cardiovascular disease [13]. Thus, the present study aimed to found the effect of fasting and nutrition type on Testosterone and Follicle Stimulating Hormone.

Materials and Methods

Experimental Animals of Study

The present study experiments were reviewed and approved by the Institutional Animal Care and Use Committee, Faculty of Veterinary Medicine, University of Kufa; Iraq. The percent studies was achieved at the period from 2021/4/25 to 2021/8/25, the fasting duration 45 days and the experiment was using 36 healthy young male albino rat weighing (100 ±5) gram and age tow month obtained from the College of veterinarian medicine at the University of Kufa , The animals which used in the current study were placed in the animal house at the Veterinary Medicine College, University of Kufa, in plastic cages, and the cage was integrated with wooden shelves, under natural light (12 hours) and (12 hours) in the dark. The animals were placed in cages at laboratory temperature (23-25 ° C).

Experimental Design

The experiment contains 36 animals divided into three main groups each group was divided into two subgroups; The first group without fasting animal divided in tow subgroups 6 animals in each group included; Low fat diet and control diet; the second group fasting for 14 hours and divided in tow subgroups included Low fat diet and control diet; finally, the third group fasting for 20 hours and divided in tow subgroups included Low fat diet and control diet. Furthermore, the low fat diet the overall fat calories in this diet are 7% and control diet: the overall fat calories in this diet are 34.2% [14,15].

The main ingredients of diet are yellow corn and soybeans, in addition to sunflower oil, where the protein amounts in these diets were 23%, but the carbohydrate and fat ratios varied depending on the kind of food [16]. The high-fat diet was supplemented with a high proportion of sunflower oil, and the total energy of this diet was 4400. It was devoid of sunflower oil in a low-fat diet since its energy was based on yellow corn and soybeans; the energy of this diet was 2812. The stander diet comprised a proportion of sunflower oil and had 3604 calories. During the experiment, the feed consumption and defecation rate were calculated every 24 hours. We grind the ingredients of this diet thoroughly, then blend these substances (yellow corn and soybeans), add premix, limestone, and disodium carbonate, and last add sunflower oil and mix it with the rest of the ingredients. Each meal is mixed for a total of 10 minutes to verify that the diet's components are consistent. The percent of calorie in HFD depend on some reference [17–19]

Laboratory Analysis of Hormones

the ELISA kits employs the sandwich- elisa precept. a pre-coated Micro ELISA plate with an antibody specific for rat LEP is included in kit. In the micro elisa plate well, standard or sample is combined with the specified Ab. after that, a Biotinylated revelation Ab particular for rat leptin hormone and an Avidn-Horseradish Peroxidase (HRP) integrate are gradually add to every microplate well and incubate. Unwanted elements are wiped away. Each well is filled with a substrate solution. just the detecting Ab biotinylated, and the conjugation of Avdin-HRP turns blue. when a pause solution is included, the enzyme-substrate process has ground to a stop, a colour varies to yellowish. An absorption spectrum is determined spectrophotometrically at 450 nm by used spectrophotometer for each testosterone and FSH then found the concentrating by stander curve of graph as showed in figure 1 and 2.

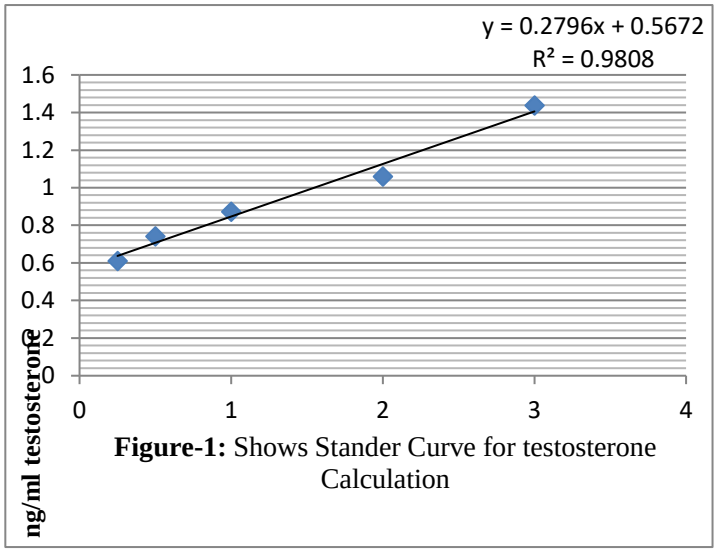

Figure-1: Shows Stander Curve for testosterone Calculation

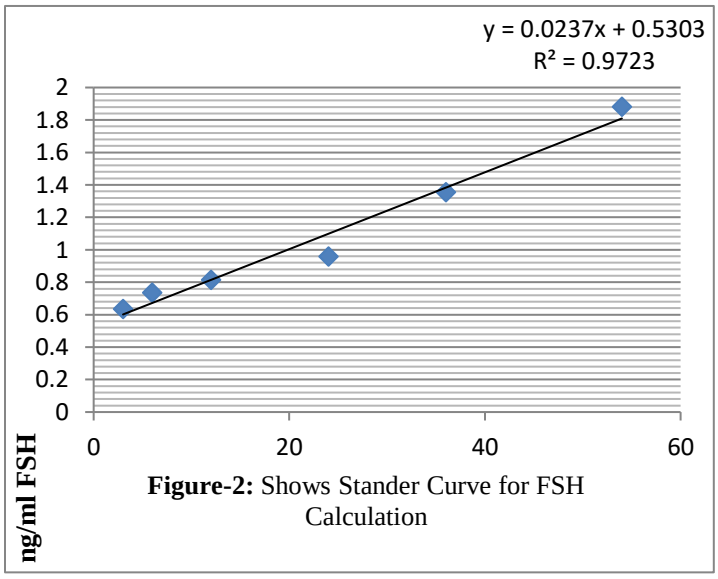

Figure-2: Shows Stander Curve for FSH Calculation

Statistical Analysis

This study uses the analysis of variance by applied the one-way type of statistic and determining the significance value of differences among groups in SPSS version 20 statistical analysis of the experimental results. The standard error is seen as its average se, with the p value of 0.05 deemed significant. The significant statistical difference test and used least significant difference for knowledge significance level among treatment methods. (SAS, 2012).

Results

The result in table 1 illustrated the fasting in long time (20 h) increased the levels of FSH and Testosterone in control groups significantly. In opposite that is significant decreased in the levels of FSH and testosterone with the period of fasting time sequence. On other hand the result showed and illustrated that levels of testosterone and FSH of low fat diet without fasting is higher significantly than control group. Moreover, the result showed the levels of hormones in low fat diet group at fasting period significant diseased compared with the control group at both 14 and 2o hours.

Table 1: concentration of FSH and Testosterone in the different fasting period

	Parameters / Groups	Testosterone (ng/ml)	FSH (ng/ml)
Without fasting	Control	0.228 a	4 a
	Low fat diet	0.655 b	15.5 b
Fasting 14 h	Control	0.110 c	8 c
	Low fat diet	0.152 a	3.6 a
Fasting 20 h	Control	0.426 b	13 b
	Low fat diet	0.114 d	7.2 c

a, b, c, d; letters denote differences between groups, $p < 0.05$

Discussion: -

The researcher proved that long term effect of testosterone deficiency impairs metabolism and is associated with muscle degradation and metabolic disease [11]. The serum concentrations of testosterone intact adult male rats increased during long 20-hour term fasting and decreased significantly in short term 14-hour on a normal way of nutrition diet, while decreased concomitant reductions occur in hormone secretion in using the low-fat diet as shown in table-1, Moreover, that interesting the previous study about effect of Ramadan fasting on hormonal level showed significant decreased on the level of testosterone and significant increase of the FSH [20], that instructs to the negative feedback system that controls testosterone secretion which the decreased of the testosterone level lead to change in hypothalamus–pituitary portal system, thus stimulating the secretion of FSH and LH from the anterior pituitary [21–23]. While, contrary to our findings, studies showed testosterone was decreased at 48 h fasting in the fasting rats [24]. Moreover, the results of experiments by other researchers confirm the findings of the above study [25,26], which shows that all quantitative variations observed in gonadotrophin-releasing hormone and sex hormones are within the normal range and do not cause specific clinical changes. On other hand, the low-fat diet (calories in this diet are 7%) causes significant increase of testosterone and FSH compared with the control groups that. However, it is shown that a low fat diet reduces the biologically active and free testosterone in serum moreover lead to changes in pituitary and testicular activity and liver metabolism induced by diet [7,8,27]. The present study approved previous research which showed low-fat diet lead to decreased the testosterone levels in men[27,28]. The result showed the decreased of hormonal level in the blood serum by fasting that lead to conclusion the fasting causes stability and maintains of the hormonal levels as proved by the previous study applauded in mice [29] and humans [30], which showed that fasting causes caloric restriction.

Conclusion

The present study confirmed and proved that fasting enhances hormonal balance and shows 20 hours of fasting more effect than 14 hour, Moreover, The results of this study indicate that the best period is a fasting period of 14 hours and the best diet is a low-fat diet.

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