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Reproductive Hormonal Assay of a Sample of Iraqi Obese Males

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Abstract

Background The World Health Organization considered obesity as a medical condition that may lead to reduced life expectancy and/or increased health problems. While much of the focus on the impairments caused by obesity is on somatic health, recent data suggest that reproductive health may also be impacted.

Objective To quantify the relation between obesity and the reproductive hormones.

Methods This cross-sectional study was carried out at nutrition clinic in three teaching hospitals and one obesity clinic in a medical college in Baghdad. The body mass index (BMI) calculation, blood sugar, serum cholesterol, triglyceride, testosterone, prolactin, follicular stimulating hormone (FSH), and luteinizing hormone (LH) were measured.

Results Ninety-five adult obese males participated in this study. Serum testosterone had significant negative correlation with BMI, weight, serum cholesterol, and serum triglyceride while serum LH had significant positive correlation with BMI (p value was 0.013), weight (p value was 0.027), and serum triglyceride (p value was 0.049).

Conclusion Male obesity has significant effect on serum level of testosterone and LH.

Keywords Obesity, reproductive hormones

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List of abbreviations: BMI = Body mass index, FPG = Fasting plasma glucose, FSH = Follicular stimulating hormone, LH = Luteinizing hormone, PRL = Prolactin, S.Chol = Serum cholesterol, S.TG = Serum triglyceride, T = Testosterone

Introduction

The obesity epidemic is a growing public health concern. Indeed, the American Medical Association classified obesity as a disease [(1)]. Previously, much of the focus on the impairments caused by obesity was on somatic health but the recent data suggested that reproductive health may also be impacted [(2)]. Obesity can influence the normal concentrations of male sex hormones at different levels in form of reduced central production and an increased peripheral degradation [(3,4)]. The reproductive hormonal profiles of most obese men deviate from what is considered to be normal levels. Obese men tend to present with elevated estrogen and low testosterone (T) and follicular stimulating hormone (FSH) levels [(3)]. Obese men exhibit decreased levels of total T and increased estrogens levels. Decreased T and T/estrogen ratios have been documented among infertile obese men compared with infertile non-obese men and fertile obese men [(5)]. Grossly obese men may show an unequivocal reduction of free T levels, where luteinizing hormone (LH) and FSH levels are usually low or inappropriately normal, suggesting that the dominant suppression occurs at the hypothalamic-

pituitary level [6]. Several reports showed that obese men exhibit significant decrease in androgen level, which was correlated with the degree of obesity [6,7]. It has been shown that body mass index (BMI) was positively related to estradiol levels and inversely related to total T level [8]. There was also a strong inverse relation between BMI and a lower T/LH ratio among men with a BMI ≥35 kg/m^2 [9].

The effects of increased BMI in Iraqi men on the reproductive hormones level have not been subjected to the same degree of research as Iraqi females. Therefore, this study was designed to assess the pattern of reproductive hormones among obese males, specifically: (T, prolactin (PRL), FSH, LH) and to investigate the correlations between obesity and the reproductive hormones.

Methods

A cross-sectional study was carried out at nutrition clinic in three teaching hospitals in Baghdad (Al-Imamein Al-Kadhimein Medical City, Al-Kindy Teaching Hospital and Al-Yarmouk Teaching Hospital) and at Obesity Clinic in Al-Kindy Medical College for the period from 20th of February 2016 till 5th of July 2017. All adult males who visited the clinics for obesity were asked to participate in the study. Consecutive sampling was used to collect the sample after taking their informed consent.

Ninety-five adult males (18 to 65 years of age) with BMI of greater than or equal to 30 were included. Those with history of hypertension or on antihypertensive drugs, those who were previously diagnosed to be aspermic or azoospermic, and/or those who were diagnosed to have endocrine diseases or on treatment for these diseases were excluded from the study.

Socio-demographic characteristics of each participant were obtained, focusing on age, residency (rural or urban), marital status (single, married, widow, or divorced), occupation (type of occupation), and smoking (current and ex-smoking). Physical examination was done to all participants stressing on height and weight measurements (to calculate the BMI), and blood pressure measurement were done. The weight was measured (to nearest 0.5 Kg), in erect position without shoes, coats, or overalls with an electronic scale. Height was measured by using tape height measure which is suitable to measure a person's height with an approximation of ±1 mm. BMI was calculated as body weight/height² (Kg/m²). Participants were classified as class 1 obesity if their BMI is (30-34.9 kg/m^2), class 2 obesity if their BMI is (35-39.9 kg/m^2), and class 3 obesity if their BMI is (40 kg/m^2 or more) [10]. Blood pressure was measured using mercury sphygmomanometer in sitting position.

Venous blood samples were withdrawn from each participant and sent for fasting plasma glucose (FPG), serum cholesterol (S.Chol), serum triglyceride (S.TG), serum T, serum PRL, serum FSH, and serum LH. Participant was considered diabetic if his FPG ≥ 7.0 mmol/l [11]. S.Chol was considered of desirable level when it was < 200 mg/dl, borderline high when it was 200-239 mg/dl, and high when it was ≥ 240 mg/dl. S.TG was considered normal when it was < 150 mg/dl, borderline high when it was 150-199 mg/dl, and high when it was ≥ 200 mg/dl [12]. Normal ranges for the reproductive hormones were considered as follows: serum T (2.8-11 ng/ml), serum PRL (2.5-15 ng/ml), serum FSH (1.4–15.4 mIU/ml), and serum LH (1.24–7.8 mIU/ml) [13].

Data entered and analyzed using SPSS (Statistical Packages for Social Sciences) program, version 18. Descriptive data were expressed as means and standard deviations for continuous measurements and as frequencies and percentages for categorical measurements. Differences of Reproductive hormones according to obesity classes were compared using analysis of variance (ANOVA) test. Relationships between reproductive hormones and obesity parameters were studied by Pearson correlation test. P<0.05 was set as statistically significant.

Results

Ninety-five obese men participated in this study with mean (±SD) BMI was (39.23±4.41) kg/m^2. One fifth of them (20%) were of class 1 obesity,

43 (45.3%) were of class 2, and 33 (34.7%) were of class 3 obesity.

Socio-demographic, clinical, and laboratory characteristics of the participants were shown in table 1.

Table 1. Socio-demographic, clinical, and laboratory characteristics of the participants

Variable		No	%
Age (years) Mean±SD (Range)		32.62±7.02 (21-46)	
Residency	Rural	7	7.4
	Urban	88	92.6
Marital Status	Single	43	45.3
	Married	52	54.7
Occupation	Employed	30	31.6
	Unemployed	54	56.8
	Student	11	11.6
Smoking	Current	36	37.9
	Ex	18	18.9
	Never	41	43.2
Diabetes	Yes	18	18.9
	No	77	81.1
Cholesterol (mg/dl)	(Mean±SD)	265.83±85.59	
	High	60	63.2
	Borderline	4	4.2
	Normal	31	32.6
Triglyceride (mg/dl)	(Mean±SD)	275.35±92.05	
	High	68	71.6
	Borderline	16	16.8
	Normal	11	11.6
Testosterone (ng/ml)	(Mean±SD)	2.83±2.13	
	Normal	25	26.3
	Low	70	73.7
Prolactin (ng/ml)	(Mean±SD)	13.65±7.47	
	High	7	7.4
	Normal	79	83.1
	Low	9	9.5
FSH (mIU/ml)	(Mean±SD)	4.69±2.28	
	Normal	95	100
LH (mIU/ml)	(Mean±SD)	3.61±1.52	
	High	2	2.1
	Normal	93	97.9

There was a significant difference in the mean of T, FSH, LH among different classes of obesity (p value <0.05) while no significant difference in the mean of PRL (p value >0.05) as shown in table 2.

The BMI, body weight, and S.TG had significant negative correlation with T, significant positive correlation with LH, nonsignificant correlation with PRL, and nonsignificant correlation with FSH. S.Chol had significant negative correlation with T, nonsignificant correlation with PRL, and nonsignificant correlation with FSH and LH as shown in table 3.

Table 2. Differences of Reproductive hormones according to obesity classes

Hormones	Obesity Class 1	Obesity Class 2	Obesity Class 3	F	P value
Testosterone (ng/ml) (Mean±SD)	3.33±2.40	3.18±2.15	2.08±1.78	3.27	0.042
Prolactin (ng/ml) (Mean±SD)	15.71±7.15	13.38±7.0	12.81±8.2	0.96	0.387
FSH (mIU/ml) (Mean±SD)	3.50±1.15	5.32±2.22	4.56±2.58	4.64	0.012
LH (mIU/ml) (Mean±SD)	2.37±0.53	4.21±1.65	3.56±1.44	11.76	0.000

Table 3. Correlation of reproductive hormones with obesity parameters (r, P value)

	Testosterone	Prolactin	FSH	LH
BMI	-0.316, (0.002)	-0.046, (0.661)	0.172, (0.096)	0.253, (0.013)
Weight	-0.292, (0.004)	-0.010, (0.924)	0.154, (0.135)	0.227, (0.027)
Cholesterol	-0.209, (0.042)	-0.110, (0.289)	0.066, (0.525)	0.134, (0.195)
Triglyceride	-0.235, (0.022)	-0.082, (0.428)	0.065, (0.529)	0.203, (0.049)

(P values between parentheses)

Discussion

There was scarcity of previous studies about the prevalence of obesity among Iraqi people. However, WHO had estimated that the prevalence of obesity among adult Iraqi people in 2008 to be 29%. The prevalence of obesity among females was 36% while among males was 22%. In 2014, the prevalence among females was 14.9% and among males was 10.8% [(14)]. The Iraqi Ministry of Health, in association with WHO, declared in 2015 that the prevalence of obesity among adult Iraqi people became 33.5%. The prevalence among females was 42.6% and among males was 25.6% [(15)].

The mean age group of participants in this study was 32.62 years, 92.6% of them were from urban area, 54.7% were married and the rest were single. More than half of them 56.4% were unemployed, and 37.9% of them were currently smokers. Owing to the scarcity of literature on this subject we were unable to compare these socio-demographic characteristics with other studies.

The present study showed also that there were significant differences in the mean level of T, FSH, and LH among the different classes of obesity. It is previously known that obesity has a negative influence on the level of T [(16)]. A significant negative correlation between BMI and T was demonstrated in this study. It has been proposed that obesity may lead to suppression of hypothalamic pituitary function and inhibit the production of FSH and LH, thereby resulting in reduced testicular function and testosterone production and lower levels of intratesticular and circulating testosterone; Zohdy et al. found a significant negative correlation between BMI and serum total T [(17)]. Also, the researchers from Reproductive Biology Associates reported that high BMI in men is correlated with reduced testosterone levels [(18)]. Al-Hameid et al. showed that obesity is associated with a significant decrease in T level [(19)]. Glass et al. reported significant negative correlations between total serum T and percentage ideal body weight, and normal level of serum LH and FSH among the obese subjects [(20)].

This study showed also that there was a significant positive correlation between BMI and LH level and non-significant correlation between BMI and FSH. Hofny et al. had also reported that BMI had a significant positive correlation with LH and a non-significant correlation with serum FSH in obese infertile males compared with obese fertile males [(21)]. Al-Hameid et al. also found that obesity is associated with a significant increase in serum LH and FSH levels [(19)]. While, Jensen et al.

reported that BMI had no effect on serum FSH or LH in men [22].

The association between BMI and serum PRL level was also investigated in the present study. It was found that serum PRL level was non-significantly correlated with the BMI. Although the increased body weight may be associated with prolactinoma and that weight loss occurred with normalization of prolactin levels. A Nigerian study had found non-significant associations between BMI and serum levels of PRL, T, or LH [23].

A significant negative correlation between serum T level and both serum TG and chol levels was demonstrated in this study. Also, a significant positive correlation between serum LH and serum TG level but non-significant correlation between serum TG and FSH and prolactin were found. Adipose tissue is one of the tissues where conversion of androgens to estrogens took place, therefore, obese men usually have increased estrogen levels which inhibit the production of FSH and LH. Hagiuda et al. found a negative association between serum testosterone levels and serum TG levels and no significant association between the TG and LH or FSH levels [24].

In conclusion, the association found between BMI and some reproductive hormones may be of help to broaden the understanding of the effect of obesity on male reproductive physiologic characteristics since this study showed that there was significant negative correlation between BMI and serum T and significant positive correlation between BMI and serum LH.

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Author contribution

Dr. Abdul-Rahman: Collection of study cases, performing and doing the tests of the research. Dr. Abdul-Ameer: Interpretation the results done under her supervision.

Conflict of interest

None declared.

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