Male Aging Study (MMAS) and the Multiple Risk Factor Intervention Trial (MRFIT) have shown that low levels of total testosterone and SHBG (which is associated with insulin resistance) were both independent risk factors in middle-aged men who later developed diabetes [10,11]. The present study was undertaken to emphasize the relationship between serum testosterone levels and postprandial hypertriglyceridemia, on one hand, and their relation to the development of cardiovascular disease (CVD) risk in male diabetic patients, on the other.

Methods

This study included 42 male patients with T_2DM of age ranged between 30-60 years and disease duration of 1-8 years, who were attending the Diabetic Clinic at Al-Kadhimyia Teaching Hospital, during the period from December 2011 to June 2012. The study also included 42 normal male volunteers matching in their age and body mass index (BMI) with the patient group. Type 1 DM and thyroid disease patients were excluded from the study.

Ten ml were withdrawn from each patient and control subject between 2-4 hours after meal (postprandial state for lipid test) in a plain tube and centrifuged for 15 minutes at 3000 rpm after being allowed to clot at room temperature for 30 minutes. The separated sera were divided into aliquots and stored frozen at -20^{o}C, and then used for measurement of hormones. Random blood glucose, postprandial lipid profile, urea and creatinine were done immediately after separation of the serum using the available routine methods. The determination of patients' sex hormones (leutinizing hormone (LH), follicle stimulating hormone (FSH), testosterone, and SHBG) was done by Sandwich Enzyme-Linked Immuno Sorbent Assay (ELISA assay). The oral consent had been taken from all patients and controls for blood collection.

Statistical analysis

All values were expressed as mean ± standard deviation (mean ± SD). All Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS version 15.0). Independent student t-test was performed to assess differences between two means. Pearson correlation coefficient was used to determine the correlation between quantitative data. *P* value < 0.05 was considered significant [12].

Results

Table 1 shows significant differences in the mean ± SD values between the diabetic and control groups in testosterone, SHBG ($P < 0.001$; $P < 0.004$, respectively) and in LH ($P < 0.0001$), while there was no significant differences in mean values of FSH.

There is also significant differences in the mean ± SD values of glucose, TG, T-cholesterol, HDL-c ($P < 0.0001$); LDL ($P = 0.0002$) and atherogenic index $P = 0.0004$, while no significant differences in the mean values of age, BMI, urea and creatinine there were observed. In both control and patient groups serum testosterone showed inverse correlations with the postprandial TG (Figs. 1 and 2).

Discussion

The lower serum testosterone and SHBG in the present diabetic patients confirm previous studies, which have suggested a role for low androgenic activity in the development of obesity, insulin resistance and Type 2 DM in men [13-17]. Obesity is a factor, which complicates the picture of Type 2 DM. The hypothesis of hypogonadal-obesity cycle originally suggested by Cohen in 1999 stated that testosterone inhibits adipocytes lipoprotein lipase activity [18]. In cases of low testosterone, which may result from increased aromatase activity, there is an increase in the adiposity and fat deposition which may cause a decline in testosterone level. The lower SHBG in the sera of the present diabetics could be attributed to high insulin levels which decrease the release of SHBG from hepatocytes [19,20]. However, other reports attributed this decline in SHBG to high glucose or fructose concentrations, which suppress its expression in the hepatocytes [21]. The impairment in the feedback inhibition, which is normally present between testosterone and LH, is the cause of high serum LH in the present diabetics [22].