A Biological Effect of Sex Hormone Binding Globulin and Testosterone in Polycystic Ovary Syndrome (PCOS) Obese Women

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ABSTRACT:

Aim of the present study is to evaluate hormones like free testosterone and sex hormone binding globulin in obese women with polycystic ovary syndrome (PCOS) This study showed that biological hormones such as testosterone were significantly higher that reflects low Sex hormone binding globulin (SHBG) in Obese woman with polycystic ovary syndrome (PCOS) compared to the age-matched controls having normal body weight and ovulatory menstruation.

KEYWORDS:Testosterone, Sex hormone binding globulin (SHBG), polycystic ovarian syndrome (PCOS), Luteinizing hormone (LH), Follicle stimulating hormone (FSH),Body mass index (BMI), Enzyme linked immune sorbent assay (ELISA).

INTRODUCTION:

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder of reproductive-aged women, with an estimated prevalence of 4-8% (1) and is the most frequent cause of oligoanovulatory infertility (2). It is a true syndrome with a heterogenous collection of signs and symptoms. There are several clinical features which define the syndrome like menstrual cycle disturbances, infertility, obesity, hirsutism, acne. There are many biochemical features like increased serum levels of luteinizing hormone, testosterone, and rostenedione and insulin (3). It has been suggested that this condition occurs in as many as 4 to 10% of women in reproductive age group of 15 to 45 years with early onset in puberty (4). Furthermore, obese patients with polycystic ovary syndrome (PCOS) have more severe cardio metabolic risk factors, compared with their lean counterparts. (5). It has been found that women with polycystic ovary syndrome (PCOS) are mainly overweight or obese showing the evidence that increase in body weight increases hyperandrogenic state in women.

Sex hormone binding globulin (SHBG) is a protein that binds to both testosterone and estradiol (6). Therefore, it is important to measure Sex hormone binding globulin (SHBG) in all patients being evaluated for polycystic ovarian syndrome (PCOS).

The Sex hormone binding globulin (SHBG) is a steroid binding glycoprotein which is synthesized in the liver binding to testosterone with high affinity and estradiol with low affinity (7). There are many studies showing that insulin a hormone secreted by beta cells of pancreas is a potent inhibitor of Sex hormone binding globulin (SHBG) production by HepG2 cells (8) and reduces the stimulatory effect of estradiol and thyroxine (9). Sex hormone binding globulin (SHBG) levels are decreased by androgens, administration of anabolic steroids (10), Low Sex hormone binding globulin (SHBG) levels increase the probability of Type 2 Diabetes (11).

This study therefore sought to assess the biological hormones such as Sex hormone binding globulin (SHBG) and testosterone in obese women with polycystic ovarian disease (pcos).

MATERIALS AND METHODS:

In this study test subjects of about 100 obese females of age 18 - 45 yrs who are diagnosed with polycystic ovarian syndrome (PCOS) with increased Luteinizing hormone (LH) and normal or decreased follicle stimulating hormone (FSH) were taken. Control subjects included 100 age matched non-obese females with normal body massindex. Obesity was defined as BMI of at least 30 kg/m2.

All these subjects were subjected to medical examination as per fixed proforma.

History regarding menstrual cycles, allergy and drugs were assessed by interview and questionnaire. Anthropometric measurements like height, weight, BP and BMI were recorded in both the groups.

5ml of venous blood was collected after an overnight fast and centrifuged. Serum was collected and then analyzed for hormones like Free Testosterone, Sex hormone binding globulin (SHBG) are measured by using Enzyme Linked Immuno Assay (ELISA) using microtitre plate.

RESULTS:

It was found that among the 100 obese females of age 18 - 45 yrs who are diagnosed with polycystic ovarian syndrome (PCOS), Table 1 and the percentage of people with abnormal Sex hormone binding globulin (SHBG) evels. Out of the 100 cases, 52% have Sex hormone binding globulin (SHBG) levels <40nmol/L. Controls have levels in normal range. Sex hormone binding globulin (SHBG) levels showed significant decrease.

Table 1: Sex hormone binding globulin (nmol/l) in cases and controls

Sex hormone binding globulin (nmol/l)	Cases		Controls	
No	%	No	%	
<40	52	52.0	0	0.0
40-120	16	16.0	42	42.0
>120	0	0.0	1	1.0
Total	100	100.0	100	100.0

P<0.001**, Significant, Fisher Exact test

Table 2 the percentage of people with abnormal testosterone levels. Out of the 100 cases, 53% have testosterone levels >0.9ng/mL and 47% have levels in normal range. Controls have levels in normal range.

Table 2: Testosterone levels (ng/ml) in cases and controls

Testosterone levels (ng/ml)	Cases		Controls	
No	%	No	%	
<0.1	0	0.0	0	0.0
0.1-0.9	47	47.0	100	100.0

>0.9	53	53.0	0 0	0.0
Total	100	100.0	1 0 0	100. 0

P<0.001**, Significant, Fisher Exact test

Table 3 and shows the comparison of the study parameters with the controls and cases. The results clearly show a significant decrease in Sex hormone binding globulin (SHBG), increase in testosterone levels with a p value of < 0.001.

Table 3: Comparison of study variables in two groups

Variables	Cases	Controls	P value
Sex hormone binding globulin (nmol/l)	48.46 26.18	72.64 23.01	<0.00 1**
Testosterone levels (ng/ml)	1.200.81	0.420.23	<0.00 1**

DISCUSSION:

Polycystic ovarian syndrome (PCOS) is multi-factorial endocrine disorder associated with derangement in the metabolic profile and endocrine pattern.In the present study, we have attempted to measure hormones like testosterone and sex hormone binding globulin. A low Sex hormone binding globulin (SHBG) concentration is associated with adverse cardiovascular risk factors (12) and is considered an independent risk marker for the development of type 2 diabetes in women (13, 14).The clearance and bioavailability of testosterone are affected by the concentration of Sex hormone binding globulin (SHBG) (15), and variations in Sex hormone binding globulin (SHBG) levels would therefore be expected to influence the variability in serum testosterone.

Sex hormone binding globulin (SHBG) is a glycoprote in primarily produced in the liver and most commonly found in the bloodstream. It binds to any of 17 sex hormones, including testosterone and estrogen, and transports these chemicals throughout the body. Testosterone and sex hormones are referred to as "bound" when attached to SHBG. When these hormones are not bound to Sex hormone binding globulin (SHBG), they are referred to as "free", or "bioavailable", and can freely exert their effects upon your body. Sex Hormone Binding Globulin orSex hormone binding globulin (SHBG) is essential to maximizing the availability of testosterone, the substance every woman wants to measure

It is well-known that a proper balance of testosterone and other sex hormones have a crucial impact on our health. Recent research has unveiled that imbalances of sex hormonesare often preceded by abnormalities in Sex hormone binding globulin (SHBG). High levels of sex hormones can lead to excess growth of cells leading to the formation of certain cancers such as breast cancer (16). Low Sex hormone binding globulin (SHBG) is also associated with elevated levels of triglycerides and low-density lipoprotein (LDL)(17). Because of this, low levels of Sex hormone binding globulin (SHBG) are linked with multiple cardiovascular illnesses in both sexes, including heart disease,type 2 diabetes, and high blood pressure (18).

Our results show that in polycystic ovarian syndrome (PCOS) obese woman the level of testosterone was significantly higher and found low Sex hormone binding globulin (SHBG) level compared to our control subjects.

CONCLUSION:

This study shows that there is a significant change in serum testosterone levels and Sex hormone binding globulin (SHBG). It is found that patients with increase in serum testosterone levels have significant decrease in sex hormone binding globulin levels. Therefore, it is very important to measure free testosterone as well as Sex hormone binding globulin (SHBG) in most women being evaluated for hormonal disorders. Excessive body weight in polycystic ovarian syndrome (PCOS) hastens or exacerbates the complications of the disease.

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