

Study the Effect of Sex Hormones in Diabetic Women

Aufaira shaker nsaif, MSC*

Abstract:

Objectives: The purpose of our study was to investigate the association of C-peptide and steroid hormones (progesterone and testosterone) and type 2 diabetes in diabetic women under 42 years age.

Materials and Methods: Thirty, type 2 diabetic women under 42 years old (35-42) years and 30 non diabetic women as control were investigated in this study, age and sex matched. Sex hormones (progesterone and testosterone) were measured by using minividas (Biomerieux). Also serum C-peptide was measured by using gamma counter (Wallac) and fasting blood sugar by using spectrophotometer. All measurements were done in the National Diabetes Center (NDC) / Al-Mustansiriya University, Baghdad - Iraq.

Results: the progesterone, testosterone, FBS and C-peptide of diabetic women were 2.963 ± 1.29 pmol/l, 0.150 ± 0.300 pmol/l, 132.53 ± 9.69 mg/l and 4.25 ± 1.16 ng/l respectively; while the control healthy women were 2.865 ± 0.988 pmol/l, 0.295 ± 0.196 pmol/l, 87.45 ± 7.53 mg/l and 3.76 ± 0.49 ng/l respectively. Differences between diabetic and control women for the testosterone, FBS and C-peptide were statistically significant and for the progesterone were statistically insignificant.

Conclusion: There is a strong association between the sex hormones and type 2 diabetes mellitus.

Key words: sex hormones, diabetes

Introduction:

Worldwide, diabetes was diagnosed by physician according to the WHO guidelines definition; over 246 million people worldwide suffer from diabetes, 122 million of who were women. This numbers is expected to rise to 192 million by the year 2025.^[1] While the male/female ratio afflicted with diabetes is roughly equal, women are uniquely and often more severely, affected by the complications of diabetes.^[2]

Our understanding of the medical and physiological aspects of female's sexual function is poor relative to our understanding of men's sexual physiology and function. It is recognized that diabetes can be interfere with female sexuality in a multi-factorial manner, including both psychological and physiological dimensions.^[3, 4] Sex hormones had wide range of effect on patho-physiology of women, the best studied class of female sexual dysfunctions is the arousal disorder.^[5]

During premenopausal period insulin resistance become more prevalent and many women notice that their blood sugar levels increase, due to sex hormones effect; also, they notice that when a woman reaches menopause the body becomes more sensitive to insulin like it was prior to premenopausal period, and the levels of estrogen and progesterone decline.^[6]

Diabetes mellitus (DM) may lead to disruption of normal sexual function in both men and women via diabetic induced damage to the nerves and blood vessels essential for normal function of the genital organs. Sex differences and the role of gonadal hormones in modulating insulin sensitivity and glucose tolerance are of increasing interest and importance because of the increasing prevalence of type 2 diabetes mellitus and the metabolic abnormalities associated with aging. Body composition is closely associated with insulin

sensitivity, and increased body fat, particularly in the visceral compartment, is a risk factor for developing type 2 diabetes mellitus. Sex differences in body composition and/or insulin sensitivity are evident in humans throughout the lifespan.

Ovarian hormones influence insulin sensitivity across the menstrual cycle, during pregnancy, and in the menopausal transition. Similarly, estrogens and progestins used for contraception and hormone replacement therapy affect glucoregulation. Non human primates and humans have similar life histories and reproductive characteristics.

As a result, non human primates provide a valuable model for investigating factors related to insulin sensitivity. Studies of non human primates have contributed significantly to our understanding of sex differences and the influence of sex steroids in this context.^[7]

Objectives:

The purpose of our study was to investigate the association of C-peptide and steroid hormones (progesterone and testosterone) and the type 2 diabetes in diabetic women under 42 years age.

Materials and Methods:

Subject:

Thirty type 2 diabetic women under 42 years old (35-42) years and 30 non diabetic women as control were investigated in this study, age and sex matched.

Methods:

Sex hormones (progesterone and testosterone) were measured by using minividas (Biomerieux). Also serum C-peptide was measured by using gamma counter (Wallac) and fasting blood sugar by using spectrophotometer. All measurements were done in the National Diabetes Center (NDC) / Al-Mustansiriya University, Baghdad - Iraq. All

patients were informed about the aim and the suspected benefit of the study before obtaining their agreements for participation according to the medical research and ethical regulations, thus an oral consent was taken from all enrolled participants.

Results:

The result we obtained for the progesterone, testosterone, FBS and C-peptide of diabetic women

2.963±1.29 pmol/l, 0.150±300 pmol/l, 132.53±9.69 mg/l and 4.25±1.16 ng/l respectively; while the control healthy women were 2.865±0.988 pmol/l, 0.295±0.196 pmol/l, 87.45±7.53 mg/l and 3.76±0.49 ng/l respectively. Differences between diabetic and control women, for the testosterone, FBS and C-peptide were statistically significant, but for the progesterone was statistically insignificant. (Table 1)

Table (1) biochemical parameters investigated in the study.

	Progesterone pmol/l	Testosterone pmol/l	FBS mg/100ml	C-peptide ng/mL
Diabetic (m+/- SD)	2.963+/-1.29	0.150+/-300	132.53+/-9.69	4.25+/-1.16
Control (m+/- SD)	2.865+/-0.988	0.295+/-0.196	87.45+/-7.53	3.76+/-0.49
p-value	0.762	0.004	0.000	0.044
T-test	0.304	3.059	18.456	2.078

Discussion:

Most women who are approaching menopause are aware that it will cause their hormone levels to change, however most women are not aware that it can also cause a change in the levels of blood glucose. This is a problem for diabetic women, in fact sometimes diabetics only discover they are approaching menopause when they suffer hypoglycemia. Menopause can be tougher for a woman suffering from diabetes because they have to monitor their blood glucose levels as well as manage the symptoms of menopause. It is also highly likely that a diabetic woman will need to change the dosage of their medication or insulin as a direct result of menopause. During perimenopause many women find that their blood sugar levels increase, during this time the body becomes more resistant to insulin which causes this increase in blood sugar levels.^[8]

The amount of C-peptide in the blood can indicate the presence or absence of disease. For example, abnormally low amounts of C-peptide in the blood suggest the insulin production is too low (or absent) because of type I diabetes, also known as juvenile or insulin-dependent diabetes. Abnormally high amounts of C-peptide warn of the possible presence of a tumor called an insulinoma that secretes insulin. Normal levels of C-peptide may signal that all is well and the normal value is 1.7 to 3.5 ng/mL (nanograms per milliliter). However, in a person with diabetes, a normal level of C-peptide indicates the body is making plenty of insulin but the body is just not responding properly to it. This is the hallmark of type 2 diabetes (adult insulin-resistant diabetes). C-peptide, therefore, plays a crucial diagnostic role as regards insulin.^[9]

The literature to date is not clear as to whether menopause is associated with increased insulin resistance. Several groups have shown increased fasting insulin^[10, 11] and increased fasting glucose levels^[12, 13] in postmenopausal compared with

premenopausal women, which would imply worsened insulin resistance with the menopause. However, insulin sensitivity is known to worsen with advancing age and increasing central obesity, making it difficult to tease out the effect of menopause from these processes.

Studies using accurate measures of insulin resistance, such as the euglycemic hyperinsulinemic clamp or the frequently sampled iv glucose tolerance test, are scarce^[14, 15] showed reduced insulin sensitivity (i.e. higher insulin resistance) in postmenopausal women compared with BMI-matched premenopausal women. However, others have shown no differences in insulin sensitivity in postmenopausal compared with premenopausal women.^[16, 17]

DeNino et al.^[15] compared measures of insulin resistance and visceral adipose tissue in age-grouped women ranging from 20–78 years they found that reduced insulin sensitivity did not appear until women were older than 60 year and had accumulated levels of visceral fat that approximated the levels seen in men, suggesting a possible threshold effect of abdominal fat on insulin resistance.^[15] Guthrie et al.^[18] reported prospective data on 265 healthy perimenopausal women with normal fasting glucose.

Conclusion:

The sex hormones have strong effect on developing of diabetes in women.

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* medical laboratory science National diabetes center