

University of Science and Technology
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Advancement

Evaluation of Gonadotropins and Testosterone Levels
in Sudanese Males with Type2 Diabetes Mellitus

A Thesis

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Abstract

Background: Diabetes mellitus (DM) is one of the major public health problems and its increase incidence is closely related to a decrease in birth rates. Testosterone is the principal male hormone affected by body fat composition. Increasing in body fat composition beside diabetes disease worsen the status leading to more lowering in testosterone hormone level.

Testosterone level is usually decreased with the passage of age.

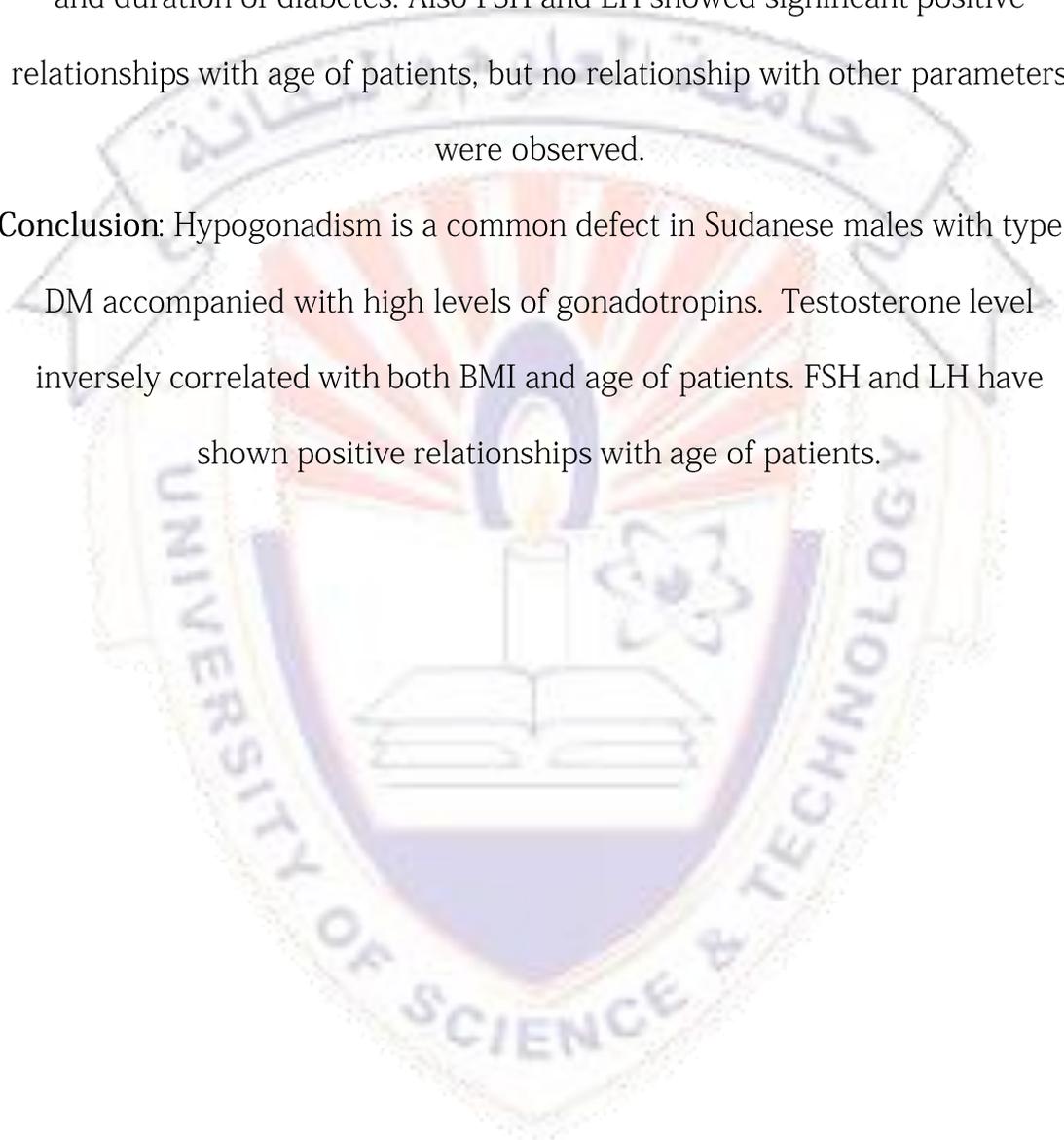
Objective: The aim of the study was to evaluate the levels of gonadotropins and testosterone in Sudanese males with type2 diabetes mellitus.

Methods: It is analytical cross sectional study conducted in (Al-Amal National Hospital and Khartoum University Clinic Center) in Khartoum State, Sudan, during the period from October/2013 to June/2014. A total of 300 Sudanese patients with type2 DM as test group and 100 apparently healthy volunteers matched in age were included in this study. Serum testosterone levels were measured using EIA technique, follicle stimulating hormone (FSH) and luteinizing hormone (LH) were measured by RIA technique, weight and height were measured then BMI calculated and HbA1c was measured by using Cobas automated analyzer. Data were analyzed using statistical package for social science (SPSS) program, independent t-test was used for comparison between test and control groups and the impact of clinical variables on fertility hormones was determined by Pearson' s correlation.

Results: Independent t-test analysis showed that, serum testosterone level was significantly lower in type2 DM patients in comparison with control

group with P-value (0.000), this accompanied with significantly higher levels of FSH and LH hormones (p value = 0.01, 0.02 respectively). Pearson's correlation analysis revealed that testosterone hormone was inversely correlated with BMI and age of patients, while no relationships with HbA1c and duration of diabetes. Also FSH and LH showed significant positive relationships with age of patients, but no relationship with other parameters were observed.

Conclusion: Hypogonadism is a common defect in Sudanese males with type2 DM accompanied with high levels of gonadotropins. Testosterone level inversely correlated with both BMI and age of patients. FSH and LH have shown positive relationships with age of patients.



المستخلص

خلفية: يعد مرض السكري من المشاكل الصحية الرئيسية و يرتبط معدل الإصابة به بالانخفاض في معدل المواليد. التيستستيرون هو هرمون الذكورة الرئيسي يتأثر بمحتوى الجسم من الدهون، وزيادة هذه الدهون بجانب مرض السكري يزيد من إنخفاض مستوى الهرمون. عندما يتقدم العمر بالذكور يقل لديهم مستوى هرمون التيستستيرون.

أهداف الدراسة: هذه الدراسة تهدف الى تقييم مستوى موجهاات الغدد التناسلية (الجوناودوتروبين) وهرمون التيستستيرون في مجموعة من المرضى الذكور السودانيين.

طرق البحث. هذه الدراسة دراسة تحليلية مقطعية عرضية أجريت في مستشفى الامل الوطني وعيادة مستشفى جامعة الخرطوم بولاية الخرطوم بالسودان في الفترة ما بين أكتوبر/٢٠١٣ الى يونيو/٢٠١٤. شملت الدراسة ٣٠٠ سوداني مريض بالنوع الثاني من مرض السكري كمجموعة اختباريه و ١٠٠ متطوع سليم كمجموعة ضابطة وكانت المجموعتان متطابقتان في العمر. تم قياس مستويات التيستستيرون في مصل الدم باستخدام تقنية المقاييسه الانزيميه المناعيه وقياس هرموني اللوتين والهرمون المنبه للجريب باستخدام تقنية المقاييسه الاشعاعية المناعية، وتم قياس الطول والوزن ومن ثم حساب مؤشر كتلة الجسم، وتم قياس نسبة خضاب الدم السكري بجهاز كوباس الالي. تم تحليل النتائج باستخدام برنامج الحزم الاحصائية للعلوم الاجتماعيه، لمقارنة متوسط النتائج بين المجموعه الاختباريه والمجموعه الضابطة تم استخدام اختبار (ت)، واستخدام معامل ارتباط بيرسون لمعرفة العلاقات الارتباطية بين المجموعات. **النتائج:** اظهر اختبار وجود فروق ذات دلالة احصائية في متوسط مستويات هرمونات التيستستيرون واللوتين والهرمون المنبه للجريب لدى مرضى السكري من النوع الثاني عندما قورنت بالمجموعه الضابطة كل من هرمون اللوتين كان هنالك انخفاض في مستوى هرمون التيستستيرون وارتفاع. من الاصحاء والهرمون المنبه للجريب في المجموعه الاختبارية عندما قورنت بالمجموعه الضابطة . كما اظهر معامل ارتباط بيرسون ان للتيستستيرون علاقه عكسية هامة ذات دلالة احصائية مع مؤشر كتلة الجسم واعداد المرضى ولكنه لا توجد علاقه للتستوستيرون مع خضاب الدم السكري والمده الزمنية للمرض عند المرضى بالسكري. أيضا أظهرت الدراسة ان لهرمون اللوتين والهرمون المنبه للجريب علاقه طردية هامة ذات موجبة مع أعمار المرضى وليس مع باقي المتغيرات. دلالة احصائية

1. INTRODUCTION

Diabetes Mellitus is a syndrome of disordered metabolism, generally because of combination of hereditary and environmental causes, leading to abnormally high blood sugar levels (hyperglycaemia) ⁽¹⁾. It expands due to reduction in production of insulin in case of type 1 or resistance to insulin effects in case of type 2 and gestational diabetes ⁽²⁾. The two types characterized by hyperglycemia, which is responsible for acute signs of diabetes. Monogenic forms, e.g. maturity onset diabetes of the young (MODY) constitute 1-5 % of all cases of diabetes ⁽³⁾.

Diabetes mellitus occurs throughout the world and especially type 2 is more common in the more developed countries. Asia and Africa are the two main continents where type2 diabetes is expected to have greatest increase in prevalence ⁽⁴⁾.

Type2 diabetes is chronic disease which is expected to be associated with ten years shorter life ⁽²⁾. Type 2 diabetes, in the developed countries is the main cause of non traumatic blindness and kidney failure ⁽⁵⁾. It has also been associated with an increased risk of cognitive dysfunction and dementia through disease processes such as Alzheimer's disease and vascular dementia ⁽⁶⁾. Major complications in males include sexual dysfunction and frequent infections ⁽⁷⁾.

Most of the studies in diabetic men have defined hypogonadism just on the testosterone levels basically ⁽⁸⁾.

Hypogonadism is a medical term for decreased functional activity of the gonads (ovaries or testes) ⁽⁹⁾.

In diabetes mellitus, a higher amount of glycated hemoglobin is observed, indicating poorer control of blood glucose levels. The glycated hemoglobin has been associated with cardiovascular disease, nephropathy, and retinopathy ⁽¹⁰⁾.

According to the few reports about the prevalence of diabetes in Sudan, Eiman *et al* (2014) reported a prevalence of diabetes of 3.4 % in 1996. Ten years later, the Sudan household health survey (SHHS) 2006 found that the prevalence of diabetes increased to 12% ⁽¹¹⁾. Sudan is also reported to be one among 7 countries having a medium prevalence of 9-12 % as reported by Boutayeb *et al* ⁽¹²⁾. This indicates that Diabetes Mellitus is dramatically increasing in Sudan while little data is available about the effect of diabetes on male fertility in Sudan. Abdallah *et al* has studied the association between male infertility and diabetes mellitus by analyzing only the seminal fluid in his study ⁽¹³⁾, and recently in 2016 and in concurrence with our study, Abd Elkarim *et al* has evaluated the testosterone and prolactin levels among 40 Sudanese men with type 2 DM in Khartoum state ⁽¹⁴⁾. Before published their article in 2016, we were unable to find any data concerning the effect of the DM on Sudanese men fertility.

1.1 Rationale

Interest on this study came from the fact that diabetes mellitus is the most common health problem which affects worldwide population. It has high prevalence in Sudan and it is thought to be linked to poor glycemic control and high rate of complications. Hypogonadism, a serious complication of diabetes which affects general health and well being of men, must be defined in Sudan. Furthermore, the magnitude of contribution of obesity and subnormal fertility hormones associated with type2 diabetes need to be quantified. It is worth to mention that a little data, according to the best of our knowledge is available concerning the effect of diabetes on male fertility in Sudan. Since most of the literature about the effect of diabetes on fertility was form the East and West, we thought that Sudanese male diabetic community have different behavior resulting in the effect of diabetes on male fertility.

1.2 Objectives:

The study was aim to evaluate the gonadotropins and testosterone in Sudanese males with type2 diabetes mellitus.

To achieve this objective the study was designed:

1. To measure testosterone, FSH, LH, BMI in test and control groups and measure HbA1c in control group.
2. To compare mean concentration of hormones (testosterone, FSH, LH) between test group and control group.
3. To compare mean levels of testosterone and gonadotropins hormones according to age groups between test group and control group.
4. To correlate testosterone and gonadotropins hormones to study variables (BMI, HbA1c, age of patients and duration of diabetes).
5. To correlate testosterone to BMI categories.
6. To correlate testosterone of the hypogonadal group (<3ng/ml) to FSH and LH hormones.