Estimation of dehydroepiandrosterone sulfate hormone (DHEA-S) as predictor of type 2 Diabetes Mellitus occurrence at AL-Najaf Province

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Abstract

The diabetic mellitus (DM) disease is a danger risk and a cause for rising public health anxiety at both develop and non-developing countries. T2DM is described by insulin resistances and/or abnormal insulin secretions from pancreas. Dehydroepiandrosterone sulfate: is a significant mammalian steroid hormone, the synthesis of this hormone from pregnenolone in the body. DHEA is a source of production of other hormones that the body need like estrogens and testosterone. Objectives: To study Serum DHEA-S hormone estimation as predictor of T2DM in relative with other limitations in diabetic patient. Material and Method: the study designed as case control experimental study was conducted on diabetic patient at Al-Seder Hospital at AL-Najaf City-Iraq from February to April 2020. Results: the results of this study show there is significantly differences in (p ≤ 0.05) between T2DM patients and control group, there is significant decrease in DHEA-S hormone levels at patient, while in regarding to thyroid hormones the T3 and T4 were significantly decrease on other hand TSH was increased. The lipid and sugar profiles were significantly increased at (P ≤ 0.05). Conclusion: our study conducted There is a main relationship between DHEA-S hormone level and T2DM. This supports that DHEA-S level is reversely related with the diabetes progression.

Keyword: DHEA-S, HbA1C, Thyroid hormones

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Introduction

The diabetic mellitus (DM) disease is a danger risk and a cause for rising public health anxiety at both develop and non-developing countries. It is a group of diseases obvious by increased level of blood glucose in body and categorized by disorders of carbohydrates, fats, and proteins metabolism. It is result from total or relative lack in the secretion and/or action of insulin. Dependent on the etiology, diabetic mellitus (DM) can be separated into two main forms, type 1 diabetic mellitus (T1DM) and type 2 diabetic mellitus (T2DM). T1DM arises in childhood and is because of mainly autoimmune destruction of β-cell islets in pancreas, causing absolute insulin deficiency. Peoples with T1DM to survival must take up exogenous insulin for stop the progress of ketoacidosis (Hwang and Kim, 2014).

T2DM is described as insulin resistances and/or abnormal insulin secretions from pancreas. It is more widespread among the adulthood. Individuals with T2DM are not reliant on exogenous insulin, but may need it for control of blood glucose levels (OHA) (Koo et al., 2014). The tissues and organs damaged by chronic hyperglycemia and other metabolic disorders of DM as well as dysfunction including the nervous, eye, kidney and vascular systems.

Dehydroepiandrosterone sulfate: it is vital mammalian steroid hormone, is produced in the body from pregnenolone, which is synthesized from cholesterol (Hassan et al., 2017). DHEA is synthesized mainly by adrenal gland which produce a better quantity than any other glands (Ekhlas et al., 2017).

DHEA is as a source for the production of other hormones that the body needs like estrogens and testosterones. Though, DHEA have distinguishing and clear roles in the function of heart and blood vessels (Compagnone et al., 1997). The metabolism of DHEA is in the liver and mixed with Silver to change Dehydroepiandrosterone sulfate: DHEA-S is gained interest anti-depressant material, its positive effects on auto-immune diseases such as obesity, systemic lupus, ulcerative colitis, cancers and diabetes (Talaei et al., 2010).

Glucocorticoid influence a large range of physiological functions, containing glucose and lipid metabolism, immune and anti-inflammatory response and play a vital part in the local regulation of adipose tissue function, development and distribution. It has been demonstrated that chronically elevated Glucocorticoid levels especially in adipose tissues will causes, diabetes, hyperlipidemia and hypertension (Tagawa et al., 2011). From the metabolic diseases that are the most commonly encountered worldwide is Obesity. Furthermore, its occurrence and incidence are increasing rapidly, more than half of the world population is reflected to be overweight (Formiguera and Cantón, 2004). Obesity and T2DM often arise collectively, and the studies data show that 60 to 90 percent of all patients suffering from T2DM are or have been obese, in general the obesity is measure to be a great threat for the future development of diabetes (Golay and Ybarra 2005).

The thyroid disorders occurrenceat diabetic population was mentioned to be 13.4% with greater incidence (31.4%) in females T2DM patients as matched to (6.9%) in males T2DM patient. control of Thyroid hormones insulin secretion is directly (Wang, 2013). The insulin secretion from beta cells that induce glucose secretion become very low in hypothyroidism diseases and the response of beta cells to glucose or catecholamines is increased in hyperthyroidism because of increased beta cell mass. Furthermore, insulin clearance is increased in thyrotoxicosis (Mitrou et al., 2010).
The Material and Methods:

The study is case-control directed in diabetic center at (Al-Sadder Teaching Hospital) in Najaf Province-Iraq from February to April 2020. An 25 diabetic patients were included in this study; the study also involves 25 healthy control. Five ml of blood is withdrawn from beta-diabetic patients and healthy control group for biochemical tests.

The patients are engaged for measurements of the following parameters:

1. The Determination of Humans Serum levels of DHEAS were quantitatively determined in subjects’ by Elecsys e411-Cobas using commercially available kit (Roche).
2. Determination of lipid profile by AU480 Chemistry Analyzer from Beckman Coulter (USA).
3. Determination of FBS and HbA1C concentration using automated by AU480 Chemistry Analyzer from Beckman Coulter (USA).
4. Determination of thyroid hormones concentrations using Elecsys e411-Cobas using commercially available kit (Roche).

Statistical Analysis

The Statistical Packages for SociallyScience (SPSS) programs version 24 was use for data study. The T- independent tests were used to discovery the alterations between patients group and control group, the data results were expressed as (Means ± SD (standard division). Personality correlations coefficients (r) were considered to evaluate the correlations among parameters. The p-values of (<0.05) was considered significantly and (<0.001) was considered highly significantly.

Result and Discussion

Characteristics of the study Subjects

Table (1) show the demographic characters where there is non-statistically significant difference had been found in age, gander, smoke and family history of the studied group, at all comparisons at (P< 0.05). The study showed that T2DM disease was most common in the advanced age groups this in agree with (He et al., 2010) which concluded that the disease become more complex in these age groups. From other factors is gander, Women’s with risk factor that have a greater risk for T2-DM in compare with men are important target for education. One of these danger factors is the triglyceride levels. A new analysis of 2523 adult showed that the virtual risk for T2DM in those with a triglyceride level was advanced in women than in men (Tenzer, 2014). Body mass index (BMI) also from the other factors that contribute to develop the type 2 DM especially may effect on more women than men also this reported by study. At standard, women with greater BMI were adult, fewer bodily active and more probable to obligate a familial history of T2DM. They had less diet values, BMI were toughly and definitely related with future threat of T2DM (Bao et al., 2015). The relations of body mass index and weight alteration with threat of T2DM among women group in high risk of T2DM, the subgroups study of the Diabetes Prevention Programs (DPP) randomized clinically experimental show that exhaustive lifestyle involvement including diets, bodily activity and loss of weight reduce the occurrence of type 2 diabetes through three years between women with reduced glucose tolerances (Ratner et al., 2008). the family historical of diabetes where related with a kind of metabolic abnormality and is strongest risk
influence for the progress of T2DM (van't Riet et al., 2010). There is a likely that this raised risk of T2DM is mediated, according to genetic and environmental factors between family memberships, but the exact factor accounting for increasing danger are unwell understood. Anthropometric and life routine associated threat factor such as body mass index, waist perimeter and bodily inactivity are main risk reasons for T2DM (InterAct Consortium, 2013). There is a number of public genetic variations have lately been shown to be related with T2DM, while the addition here of genetic risk reach to 20 variant related with type 2 diabetes providing slight improvement over the act of T2D M estimate models already comprising history of family (Voight et al., 2011). Also there is another study showed a weak relationship between genetic risk and the number of parents with diabetes and a score, it remains undefined whether common genetic variations related with type 2 diabetes clarifies any risk associated with family history- (Vassy et al., 2011).

From other factors that is well-known risk is Cigarette smoking at many diseases, as well as several kinds of cancers and heart diseases. there is Many studies have also described the unfavorable effects of smoking for diabetes mellitus. The Smoking rise the risk of developing diabetes, and aggravates the micro- and macro-vascular problems of diabetes (Chang, 2012). In our study showed there is no significance between healthy group and patient group at (P ≤ 0.05).

Tables (1): the demographics features at the study population

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control (Means ±SD)</th>
<th>Patients (Means ±SD)</th>
<th>P-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>25</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td>49.31 ± 8.97</td>
<td>58.75 ± 8.43</td>
<td>0.38</td>
</tr>
<tr>
<td>Gender(F/M)</td>
<td>10 / 15</td>
<td>9 / 16</td>
<td>0.94</td>
</tr>
<tr>
<td>BMI</td>
<td>25.7</td>
<td>27.5</td>
<td>0.80</td>
</tr>
<tr>
<td>Family history</td>
<td>Yes</td>
<td>NO. 3</td>
<td>NO. 7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>NO. 22</td>
<td>NO. 18</td>
</tr>
<tr>
<td>Smoking</td>
<td>Yes</td>
<td>NO. 7</td>
<td>NO. 12</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>NO. 18</td>
<td>NO. 13</td>
</tr>
</tbody>
</table>

SD: standard deviation. NO: number

Biochemical Parameters of Study Groups

Figure (1) show that the lipid profiles of the patients were in increase as compare with healthy group. The cholesterol, low-density lipoproteins cholesterol (LDL-C), and very low densities lipoprotein (VLDL) and triglyceride (TG) all increased except the high density lipoprotein (HDL) was low as compared with control at (P≤0.05). Our study experimental showed there is increase and decrease in serum lipid profiles related with diabetes mellitus (DM) this at agree with study conducted by Hashim, (2015). at diabetes, there is numerous factors that may affect level of serum lipid, this is due to lipids metabolism and carbohydrates are related to each other, if there are some disorders in carbohydrates metabolism, it’s also effects on lipid metabolism, so the result revealed that there is a significantly increases in lipid profile in diabetes patients, high concentrations of cholesterol in T2DM (Jessica et al., 2010). High TG level causes increase in transfers of cholesterol esters from HDL-C and LDL-C to VLDL-C via cholesterol ester transfer proteins, thus forming (cholesterol esters) depletion, small dense
LDL particle. These minor or small dense lipoprotein particle are taken by arterial macrophages, resulting in atherogenesis. Patient with diabetes may have dyslipidemia with increased high fasting blood glucose, high triglycerides, and low-density lipoproteins (LDL) with decreased high-density lipoproteins (HDL). It is well known that reduced HDL levels are related with an increased danger of coronary heart diseases (Al-Mashhadani et al., 2006).

Figure (1): the mean concentrations of lipid profile among type 2 DM patients and control groups.

The sugar concentrations in diabetics
This study shows that there is significantly increased sugar level (FBS and HbA1c) in comparison with control at (P≤0.05) this in association with age of the patient that show play a critical role in T2DM where patient aged more than 55 years is at increased risk of being un-controlled concentrations of high (FBS and HbA1c) this in agree with study by Mubark, 2012.
Thyroid Hormones dysfunction at T2DM

Figure (3) shows the decreasing at Hormones of Thyroid gland (T3 and T4) while there is increasing at (TSH) patients in comparison with healthy group at (P≤0.05). the thyroid dysfunctions are not uncommon in patient with T2DM, the result of our study mimic the result conducted by Al-Rubaye, (2019) which reported that the hypothyroidism is more frequent among T2DM than T1DM also there is consequences of hypothyroidism become more in the advanced ages < 50 years. many studies reported that the hypothyroidism has been consider one of risk factors of developing cardiovascular diseases, mainly due to the association between elevated serum total cholesterol and LDL-C levels. At hypothyroidism the hypercholesterolemia probably results from reduced catabolism of lipoprotein, this phenomenon may be a decreased expression of lipoprotein receptors (Alsolami et al., 2018).
Dehydroepiandrosterone hormone sulfate (DHEA-S)

Table (2) shows a significant decrease at the DHEA-S levels of diabetic patients in comparison with control group according to gender, our results mimic the result of Brahimag et al., (2017) which reported that there is an inverse association between T2DM risk and DHEA-S hormone. There are many studies with experimental and clinical evidences, especially in developed countries, support variation of DHEA-S hormone levels in the case of diabetes mellitus disease, however, studies showed the relationship between T2DM and DHEA-S hormone at developing countries (Hassan et al., 2017). In other published studies, DHEA-S hormone supplementations were found to produce advantageous effects in individuals with diabetes mellitus (Kunari and Padma, 2014).

Table (2): the mean concentrations distribution between male and female for each of patients and control groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Gender</th>
<th>DHEA (Mean±SD) Female</th>
<th>DHEA (Mean±SD) Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2DM</td>
<td></td>
<td>153.72± 66.4</td>
<td>148.33 ± 58.72</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>(n=9)</td>
<td>(n=16)</td>
</tr>
</tbody>
</table>
Simple regressions analysis show that Dehydroepiandrosterone hormone sulfate (DHEA-S) was at significant negative correlation with cholesterol and TG and FBS figure (4. A, B and D)p< 0.001, while with HDL figure (4. C) there is slightly negative correlation.

### Table 1: Mean ± SD of Serum DHEA-S Concentrations Between Control and Diabetic Patients

<table>
<thead>
<tr>
<th>Group</th>
<th>Serum DHEA-S Concentration (ng/mL)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>213.5± 82.6 (n=10)</td>
<td>0.072</td>
</tr>
<tr>
<td>Diabetic</td>
<td>189.2± 71.33 (n=15)</td>
<td>0.091</td>
</tr>
</tbody>
</table>

**Figure (4):** correlation between dehydroepiandrosterone and CHOL –A, TG- B, HDL- C and FBS- D.

**Conclusions**
There is a main relationship between DHEA-S hormone levels and T2DM. This supports that DHEA-S level inversely related with the diabetes progression.

References


