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Predication of Biochemical Changes and Vitamin D Level in Obese Women

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Abstract: **Vitamin D, obesity and obesity-related chronic disease among ethnic minorities'. Ethnic minorities had substantially greater rates of vitamin D insufficiency ([25 (OH)D]<50 nmol/L) than their white counterparts. The aim of the present study is assess vitamin D status in Saudi obese women to predict the biochemical changes and insulin level. Two hundred seventy one Saudi women, aged between 20-40 years, living in Jeddah, Saudi Arabia , in CEOR clinic. [25 (OH)D], fasting serum glucose, total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride (TG). By using Automatic Linear Regression, serum [25(OH)D] was displayed as a predictive factor of obesity at (P< 0.018, importance 8%). showed the importance predictors the effect on BMI. It reflects the importance of each of the significant variables, along with the effect direction and the P-value. The model accuracy was found to be a very high accurate value with accuracy (91.7%). The significant variables arranged in descending order of importance were as follows: Tissue fat (22%), HC (19%), BMC (17%), fat free (11%), A/G ratio (10%), serum [25(OH)D] (8%), WHR (5%), Tissue (4%) and LDL (4%). It was conclude that, serum [25(OH)D] was presented as a predictive factor of obesity at .The model accuracy was found to be a very high accurate .**

Keywords: **Obesity- vitamin D- Biochemical changes**

I. INTRODUCTION

It was reported that "poor vitamin D status may contribute to high risk for insulin resistance, obesity, and cardiovascular disease in Asian Indians". They found that moderate elevations of PTH may stimulate weight gain and insulin resistance. They suggested evaluate the influence of optimum vitamin D supplementation on risk determents related to insulin resistance in Asian Indians. They suggested also that greatly pigmented urbanized ethnic groups are at high risk for insulin resistance and obesity [1].Increasing 25-hydroxy vitamin D levels after weight loss in obese women correlate with improvement in insulin resistance". They found that serum [25 (OH)D] levels were low in obese women and correlated inversely with severity measures of obesity. Weight loss of 10% after low-calorie diet increased [25 (OH)D] levels, and this increase was mainly associated with improvement of insulin resistance [2].

Previous study reported that, "vitamin D, obesity and obesity-related chronic disease among ethnic minorities". They reported that ethnic minorities had substantially

greater rates of vitamin D insufficiency ([25 (OH)D]<50 nmol/L) than their white counterparts. There was indication sustaining relations between vitamin D deficiency and obesity-related chronic diseases such as diabetes, cardiovascular disease and the metabolic syndrome [3]. low vitamin D status among obese adolescents". They found that the prevalence rate of low vitamin D status among obese adolescents was 100% in females and 91% in males [4].

The "extent of obesity in Saudi women and the association between vitamin D status and different measures of adiposity". They found that a total of 30.7% of the women were overweight with BMI 25-<30 kg/m2 and 38.5% were obese with BMI≥30 kg/m2. Obesity was more prevalent among the postmenopausal women [5]. The authors suggested that obesity associated vitamin D insufficiency is possible due to the reduced bioavailability of vitamin D3 for its kidnapping in body fat compartments. They recommended that vitamin D status may improve body weight reducing [6].

The "relation between vitamin D deficiency and obesity; they ascertained vitamin D levels in a small population in Galicia and their relationship with obesity". They found that vitamin D deficiency occurred in this population just as in other Caucasian populations and also in relation to obesity. They suggested that vitamin D should be taken in daily clinical practice [7].The "effects of vitamin D supplementation on body fat accumulation, and metabolic risk factors in obese adults with low vitamin D levels". They found that treatment with vitamin D for 26 weeks increased levels of [25 (OH)D] while low plasma [25 (OH)D] did not effect on obesity complications in obese adults [8].

González-Molero and others reported "Hypovitaminosis D and incidence of obesity". They conclude that vitamin D deficiency had a link with obesity developing.In study [9], VDR TaqI that is associated with obesity in the Greek population". They found VDR role as cause for obesity and they suggested its further validation towards therapeutic interference in obese subjects. The aim of the present study is assess calcitriol level in Saudi obese women to predict the biochemical changes and insulin level

II. SUBJECTS AND METHODS

Two hundred seventy one Saudi women, aged between 20-40 years, living in Jeddah, Saudi Arabia (Latitude 21.4500 degrees North and Longitude 39.8167 degrees East) were contacted by phone to explain the study importance and to arrange an appointment in CEOR clinic. Women who agreed to participate in the study were signed a written informed consent and answered a questionnaire concerning to demographic information, medical history, lifestyle and drug intake. The subjects should be free of all diseases that interfere with obesity such as polycystic ovary syndrome, diabetes mellitus, hyperthyroidism, hyperprolactinaemia, menstrual disturbance, hypertension, psychiatric disorder. he study was conducted from November 2013 to September 2014. The study was approved by the Human Research Ethics Committee of CEOR, KAU and was in agreement with ethical standards of the Helsinki Declaration of 1975. Studied subjects were medically examined at the CEOR clinic, provided blood samples and measured their fat distribution by dual energy X-ray absorptiometry (DXA).

III. ANTHROPOMETRIC MEASUREMENTS

The anthropometric characteristics are reordered; age, body weight, height, body mass index (BMI) and waist to hip ratio (WHR). The BMI was calculated as weight in kilograms (kg) per square height in meter (m2); the weight in Kg (women were wearing light clothes and no shoes) and height in centimeter (cm) were measured by a balance (Detecto, MO,USA; range of weight 0.1-180 kg and range of height 0-200 cm). The WHR was measured as waist circumference (WC) in cm divided by hip circumference (HC) in cm. The WC and HC were determined using a flexible tape (range 0-150 cm). The WHO STEPS protocol for WC measurement should be made at the approximate midpoint between the lower margin of the last palpable rib and the

top of the iliac crest while HC measurement should be taken around the widest portion of the buttocks .

IV. BIOCHEMICAL ANALYSIS

Venous blood was collected in the morning after fasting for 8 hrs. Serum samples were centrifuged at 3,000 g/ 15 min by (Clay – Adams, USA) centrifuge then stored at -80°C until examined the following parameters, [25 (OH)D], fasting serum glucose, total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride (TG) . Biochemical kit for the determination of [25(OH)D] was obtained from DiaSorin Inc, Stillwater, MN, USA and measured by using LIASON autoanalyzer while glucose, TC, HDL, LDL, TG were measured by using VITROS 250 Chemistry System Autoanalyzer supplied by Ortho-Clinical Diagnostics, Jonson & Jonson Co., USA.

V. STATISTICAL ANALYSIS

Statistical analysis of the data was carried out using computer program package(SPSS, version 22).One-Way ANOVA test was used to examine differences among the groups for different variables. A relationship between vitamin D status and BMI was assessed by Bivariate Pearson correlation analysis. Automatic Linear Regression was used to predict the factor of obesity. Differences were considered significant at P <0.05.

VI. RESULTS

The present study was performed to assess the vitamin D status in Saudi obese women. Therefore, serum [25(OH)D] was evaluated for the total women and for the stratified women according to the obesity category. Furthermore, the current study aimed to predict the factors that contribute to vitamin D influence through building a predictive model. Moreover, this study aimed to build a predictive model that can be used to estimate the BMI for the Saudi women based on the significant factors. An example will be shown to evaluate the predicted models obtained .Figure 4.1 showed a highly prevalence of vitamin D deficiency and insufficiency as expressed by (serum [25(OH)D] <24.9 and 25-74.9 nmol/L, respectively), in all studied women (47.6% and 44.3%, respectively), regardless of BMI. The same finding of vitamin D deficiency and insufficiency were found when the women stratified to their BMI, in control group (43.8% and 46.9%, respectively), overweight group (44.3% and 49.4%, respectively) and obese group (59.7% and 32.3%, respectively).By using Automatic Linear Regression, serum [25(OH)D] was displayed as a predictive factor of obesity at (P< 0.018, importance 8%). Table 1 showed the importance predictors the effect on BMI. The table reflects the importance of each of the significant variables, along with the effect direction and the P-value. The model accuracy was found to be a very high accurate value with accuracy (91.7%). The significant variables arranged in descending order of importance were as follows: Tissue fat (22%), HC (19%), BMC (17%), fat free (11%), A/G ratio (10%), serum [25(OH)D] (8%), WHR (5%), Tissue (4%) and LDL (4%).

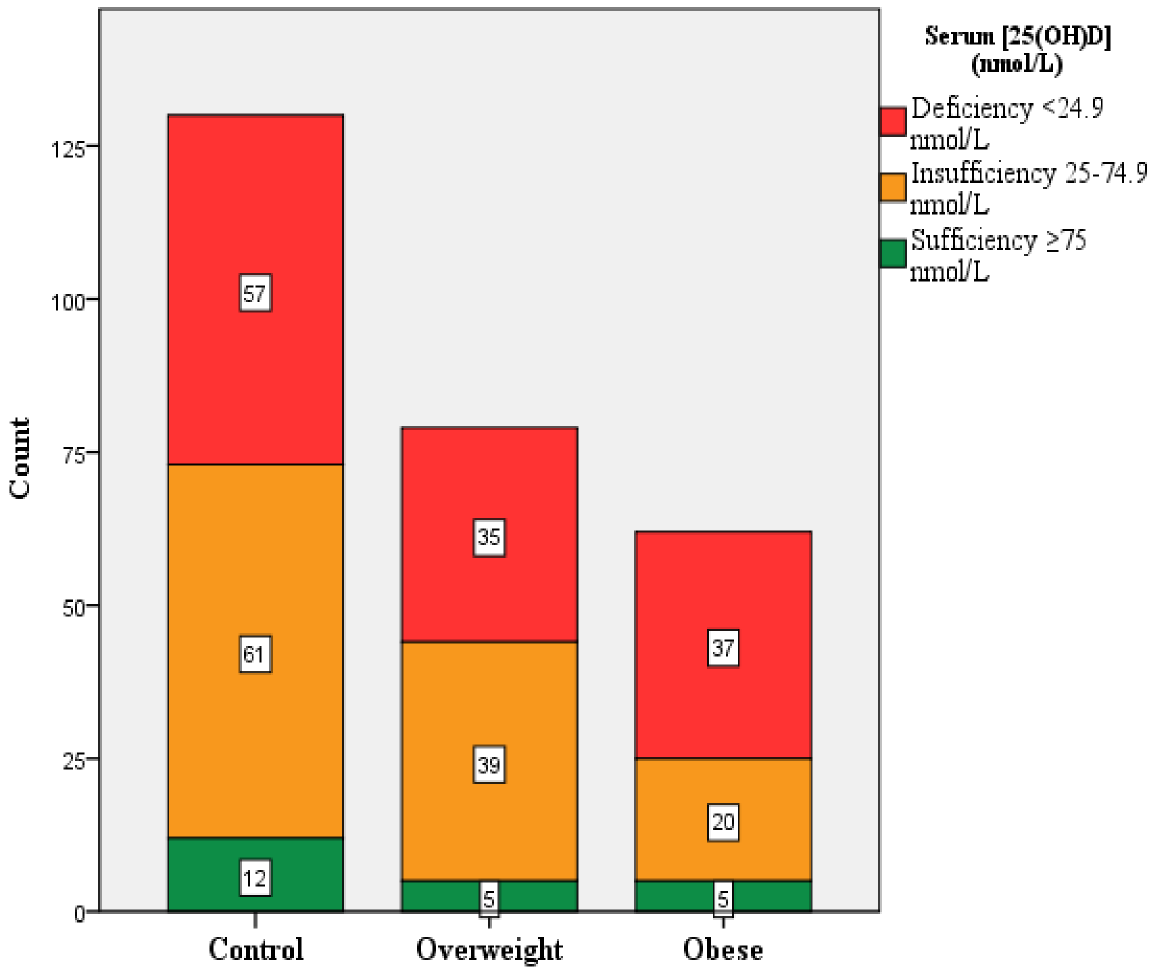

Fig.1. Vitamin D status between studied groups

Table 1. Metabolic and physiological parameters between different groups; control, overweight and obese women

Variables	Control (n= 130)	Overweight (n= 79)	Obese (n= 62)	*P*-value
Serum [25(OH)D] (nmol/L)	36.0 ± 26.2	31.5 ± 21.8	30.6 ± 19.9	0.231
Serum Calcium (mmol/L)	2.29 ± 0.39	2.37 ± 0.37	2.35 ± 0.42	0.299
Serum Fasting Glucose (mmol/L)	3.5 ± 2	3.7 ± 1.3	3.6 ± 1.2	0.902
Serum Cholesterol (mmol/L)	4.0 ± 1.1	4.3 ± 1.2	4.3 ± 1.2	0.296
Serum Triglycerides (mmol/L)	0.73 ± 0.3	0.82 ± 0.34	1.11 ± 0.6	0.0001***
Serum HDL (mmol/L)	1.2 ± 0.3	1.2 ± 0.4	1.1 ± 0.4	0.515
Serum LDL (mmol/L)	2.5 ± 0.8	2.7 ± 0.9	2.7 ± 0.87	0.320

Values are presented as means±SD; HDL: high density lipoprotein; LDL: low density lipoprotein; *** Highly significant P< 0.0001.

VII. DISCUSSION

A highly prevalence of vitamin D deficiency and insufficiency were shown in present study in all studied women (47.6% and 44.3%, respectively), in control women

(43.8% and 46.9%, respectively), in overweight women (44.3% and 49.4%, respectively) and in obese women (59.7% and 32.3%, respectively).

This prevalence may be explained by traditional lifestyles and Islamic clothing that covered skin from sun exposure since vitamin D is considered as a photoreceptor retained the UVB radiation [11],, or may be due to race and ethnicity [13], moreover, foods are too low in vitamin D amount to achieve a [25(OH)D] level of 75 nmol/L [14]. This finding was consistent in several studies around the world. It was reported that vitamin D deficiency has a high prevalence over the world; they determined risk factors for vitamin D deficiency as low sun exposure, skin pigmentation, sunscreen use, skin covering clothes and a diet low in fish and dairy products. In other study done by [15], concluded that insufficient vitamin D status is prevalent in Asia, Europe, Middle East and Africa, Latin America, North America, and Oceania–through a survey of published literature. Depending on the region, between 50% and more than 90% of people had [25(OH)D] concentrations below 50 nmol/L. In Europe and Asia, vitamin D status was stated by [16], who concluded that vitamin D deficiency is common in Southern Europe, the Middle East, India, China and Japan. It is less common in Northern Europe and Southeast Asia. He demonstrated that important factors are skin type, sex, clothing, nutrition, food fortification, supplement use, BMI and degree of urbanization. In Saudi Arabia, it was confirmed vitamin D deficiency among healthy Saudi pre- and postmenopausal women that is attributed to obesity, poor exposure to sunlight, poor dietary vitamin-D supplementation and age. Another study , Akbar and others reported severe vitamin D deficiency is associated with decreased circulating endothelial progenitor cells and endothelial dysfunction in patients with Type 2 diabetes mellitus [16].

Recent studies suggested a hypothesis that vitamin D deficiency is the cause of obesity and that obesity can be reversed by improving vitamin D status [17].However, the hypothesis of a negative relationship between serum [25(OH)D] and BMI was achieved after classifying our data to three categories according to their vitamin D level (deficiency, insufficiency and sufficiency) as serum [25(OH)D] (<24.9, 25-74.9 and ≥75 nmol/L, respectively), After this stratification, a negative association was presented for the sufficient group in obese women and this relation was exhibited as mathematical equation which let us unable to predict the woman BMI from the her vitamin D level or predict the vitamin D level from her BMI.

The possible mechanisms that explain this link between obesity and serum [25(OH)D] are; reduced bioavailability of cholecalciferol for its kidnapping in body fat tissue [19], ethnic and gender decreased exposure to sunlight because of limited mobility or cosmetic problems [20]. Furthermore, many parameters may play as important factors were not measured in this study such as a negative feedback from elevated 1,25(OH)D and parathyroid hormone levels effect on hepatic synthesis of [25(OH)D] [21], insulin resistance vitamin D receptor (VDR) [23].

However, elevated in serum LDL is also stated as a predictor for obesity since the obesity is responsible of metabolic disorder [25],this result is confirmed between low plasma [25(OH)D] levels and an adverse lipid profile as LDL [26].

It was conclude that, the results showed that serum [25(OH)D] was presented as a predictive factor of obesity at .The model accuracy was found to be a very high accurate value with accuracy .

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