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Significance of vitamin B_{12} level as a risk factor metabolic syndrome in Saudi population

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Abstract
Background: Metabolic syndrome (MetS) is a group of collective disease including obesity associated with diabetic and orhypertension. Therefore, the aim of the work is for monitoring plasma vitamin B_{12}in association with BMI in Saudi subjects as a predictive biomarker for MetS. It was also our intention to provide a feasible approach for the early diagnosis of MetS.
Subjects and methods: This study was carried out on sixty subjects divided into four groups each 15 subjects: Group (I): Normal healthy subjects as control. Group (II): including patients diagnosed as type II diabetic Patients. Group (III): including hypertensive patients Group (IV): including patient's diabetic with hypertensive. Anthropometric analysis including BMI. Fasting blood samples was collected from all subjects for assay of glucose, HA1C and vitamin B_{12}.
Results: Data obtained showed that, vitamin B12 level was significantly decreased in the diabetic group, hypertensive and the combined group (diabetic + hypertensive) ($P < 0.005$) compared to control group. While the diabetic group showed a non-significant ($P > 0.05$) difference versus hypertensive group, respectively. Moreover, a non-significant decrease in Vitamin B_{12} level was occurred in the combined (diabetic + hypertensive) group ($P > 0.05$) compared to the diabetic group and hypertensive group. A negative correlation between HA1C and B_{12} was recorded ($r = -0.62$) and with BMI ($r = - 0.59$). It was concluded that, vitamin B_{12} is a promising biomarker for differentiation between Met S and other diseases for management and prevent complications.

Keywords: metabolic syndrome: vitamin B_{12}: risk factor

Introduction
The prevalence of overweight or obesity in the world population has been rising rapidly, emerging as a major global challenge. Obesity contributes to the increased risk of other metabolic disease such as diabetes, cardiovascular disease (CVD), and certain types of cancer, thereby increasing global mortality [1-3]. Therefore, development of health food and natural nutraceuticals for prevention of overweight and obesity have received substantial attention because of their less side effect [4-6]. Since natural compounds derived from food material have been consumed by human for a long time, it is regarded safer than synthetic compounds. If their efficacy on obesity and metabolic diseases can be validated scientifically, it will be easily applicable to clinical use. Middle East is no exception in the growing obesity problem. Overweight and obesity have contributed greatly to the increase of non-communicable diseases (NCDs) in the Middle East [7]. The burgeoning rate of obesity is not only indicatedin adult population, but also in children and adolescents [8].This high prevalence of obesity has paralleled the rise of diabetes and hypertension Therefore, the aim of the work is for monitoring plasma vitamin B12, in Saudi subjects as a predictive biomarker for MetS. It was also our intention to provide a feasible approach for the early diagnosis of MetS.

Subjects and Methods
All participants gave informed consent according to the protocol approved by the local ethics committee and in accordance with the ethical standards of the bioethics and research committee of the King Abdulaziz University. Sixty adult patients were included in the present study, age ranging between (18-60) years; the samples were collected from King Abdulaziz hospital, Jeddah, Saudi Arabia.

Experimental design
The subjects were divided into four groups each 15 subjects:
Group (I): Normal healthy subjects not suffering from any systemic diseases.
Group (II): including patients diagnosed as type II diabetic patients (fasting blood glucose FBG of 126 mg/dl, 5.5 mmol/l or higher).
Group (III): including hypertensive patients (BP ≥ 130/85).
Group (IV): including patient's diabetic with hypertensive.
Fasting blood samples was collected from all subjects and serum was separated and stored at -80 ^{0}c till analysis. Glycated Hb (HbA1C) measurements were bought from Bio Vision® Milpitas, CA 95035 USA. Vitamin B_{12} (V B_{12}) measurements

were bought from Aviva System Biology ® USA

Statistical analysis

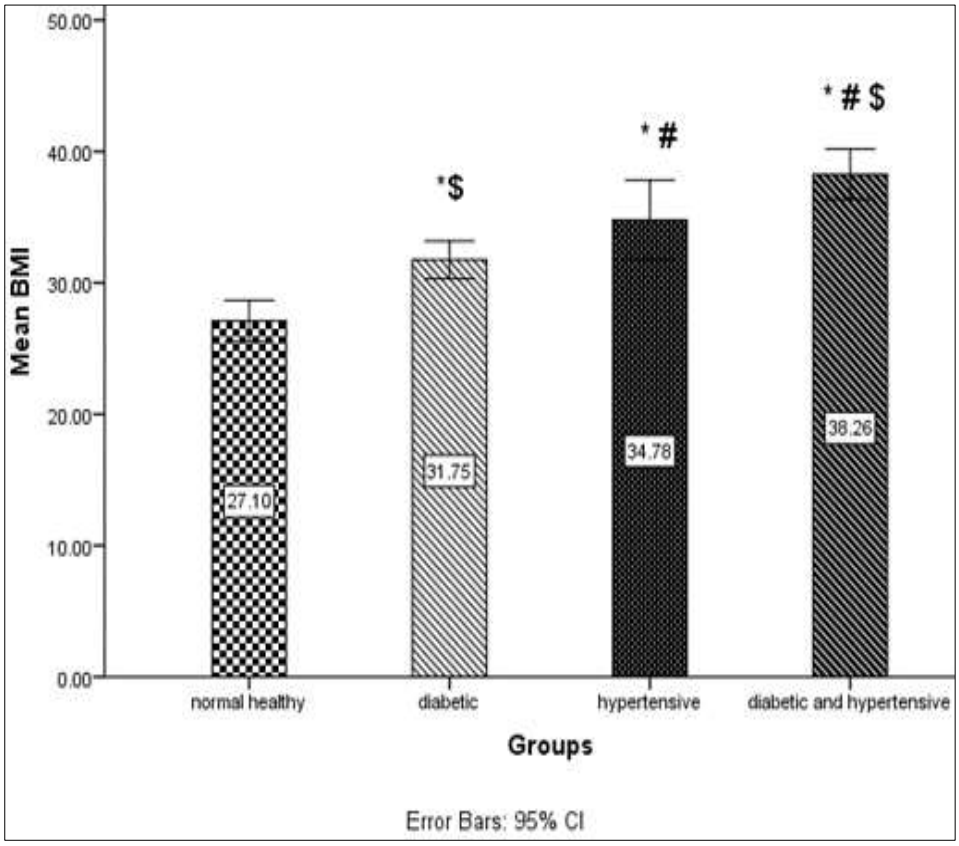
One-way analysis of variance (ANOVA) and the least significant differences (LSD) were calculated. Statistical comparisons among the various groups were conducted using a (Graph Pad prism program and excel 2016 data analysis). Statistical significance is set at $\alpha < P = 0.05$.

Results

Body mass index (BMI)

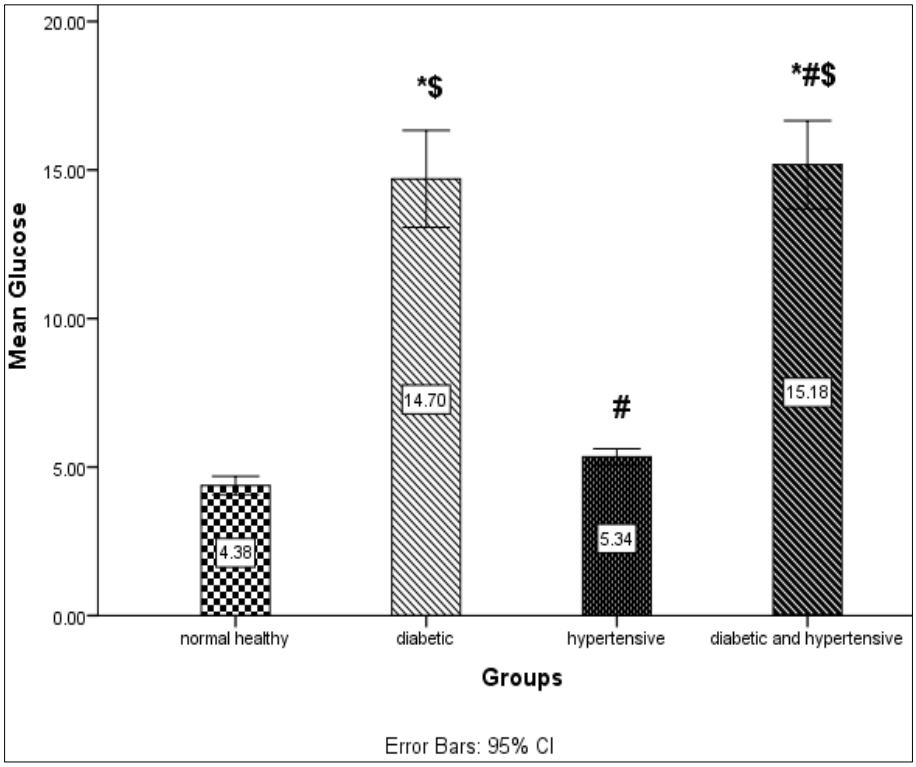
As shown in figure 1, a significant increase in body mass index ($P < 0.05$) of all tested groups diabetic group ($P < 0.00$), hypertensive group ($P < 0.00$) and the combined (diabetic + hypertensive) group ($P < 0.00$) compared to the control healthy group. Moreover, the combined (diabetic + hypertensive) group showed a significant ($P < 0.001$) increase in BMI compared to each diabetic group and hypertensive Group. As shown from (Fig 2 and 3), a significant increase in glucoseand HA1C levels ($P< 0.05, 0.001$) was found for the diabetic and the combined (diabetic + hypertensive) groups compared with the control group, respectively. Moreover, the combined group (diabetic + hypertensive) demonstrated a significant increase in glucose and HA1C levels ($P < 0.05$) compared with the hypertensive group. However, serum glucose level for the hypotensive group versus control group was non-significant changes ($P > 0.05$).

Figure (3) showed that vitamin B_{12} level was significantly decreased in the diabetic group, hypertensive and the combined group (diabetic + hypertensive) ($P < 0.005$) compared to control group. While the diabetic group (+) group showed a non-significant ($P > 0.05$) difference versus hypertensive group, respectively. Moreover, a non-significant decrease in Vitamin B_{12} level was occurred in the combined (diabetic + hypertensive) group ($P > 0.05$) compared to the diabetic group and hypertensive group. A negative correlation was found between BMI, glucose and HA1C levels and B_{12} level.



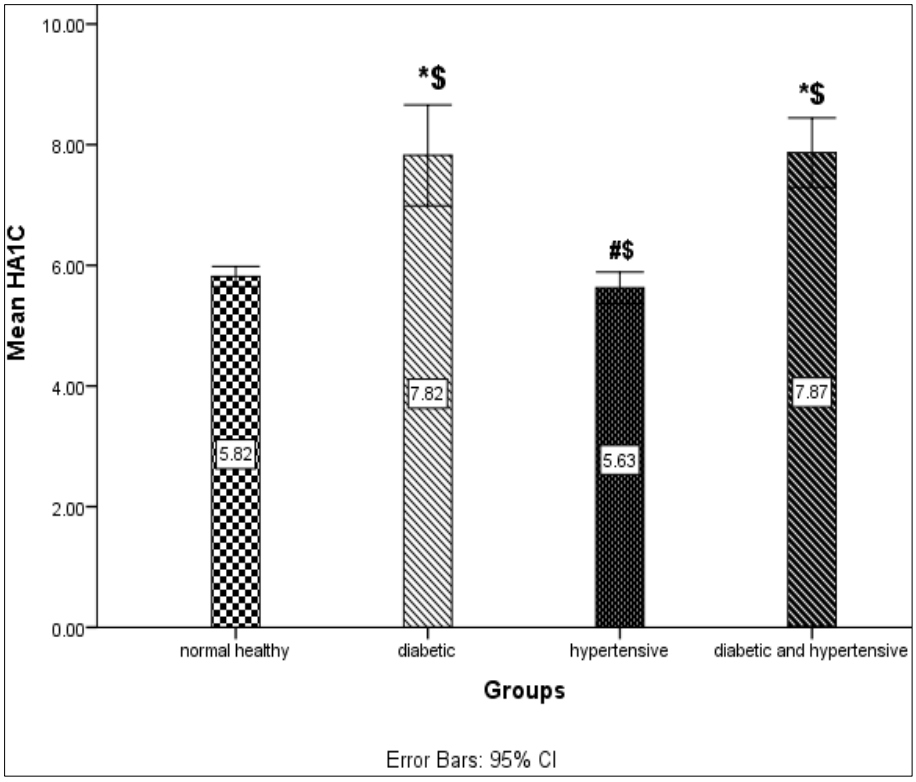
* Significant versus control group, # significant versus diabetic group, $ significant versus hypertensive group.

Fig 1: Mean± S.E of body mass index (BMI) of control healthy, diabetic, hypertensive and (diabetic and hypertensive) groups.



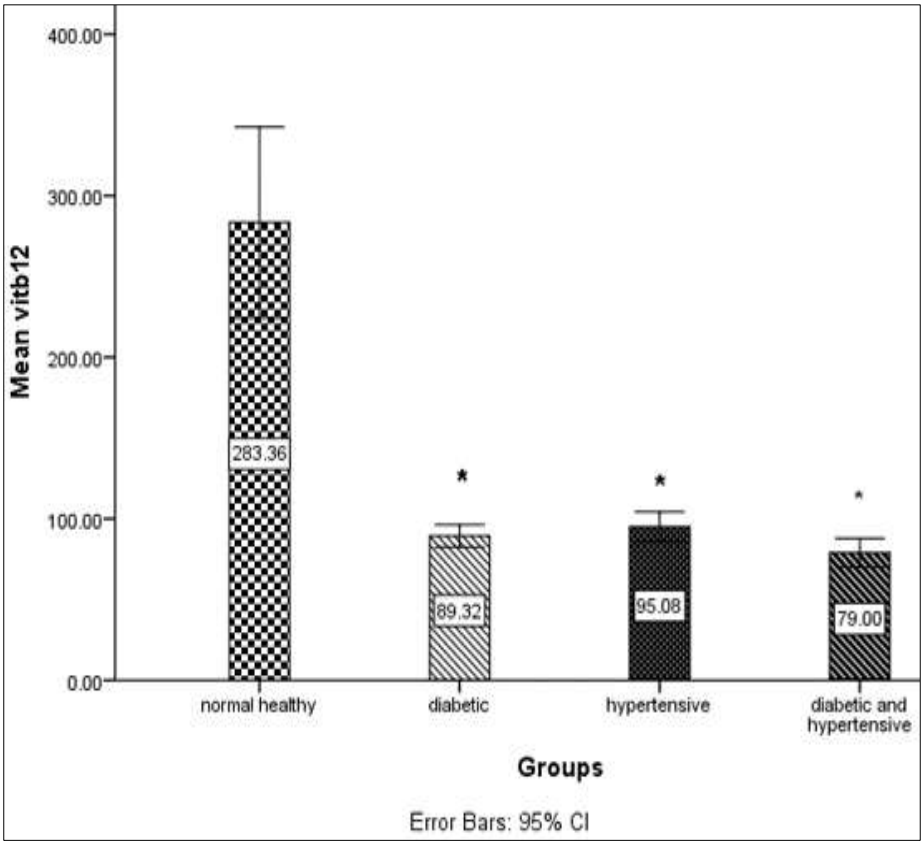
* Significant versus control group, # significant versus diabetic group, $ significant versus hypertensive group.

Fig 2: Mean± S.E of serum glucose level (mmol /l) of control healthy, diabetic, hypertensive and (diabetic and hypertensive) groups.



* Significant versus control group, # significant versus diabetic group, $ significant versus hypertensive group.

Fig 3: Mean ± S.E of HA1c for control, control healthy, diabetic, hypertensive and (diabetic and hypertensive) groups.



* Significant versus control group, # significant versus diabetic group, $ significant versus hypertensive group.

Fig 4: Mean ± S.E of serum Vitamin B12 level for control, control healthy, diabetic, hypertensive and (diabetic and hypertensive) groups.

Discussion

Middle East is no exception in the growing obesity problem. The obesity has contributed greatly to the increase of non-communicable diseases (NCDs) in the Middle East MetS [10-12].The risk factors associated with MetS are considerd as important biomarkers for early identification and diagnosis to fast intervention and mangment. The curent studty investigated the association of changes of serum level of vitamin B_{12} with MetS as good senstive biomarker for early prediction complication to Mangene it. It was found that, a significane increase in body mass index ($P < 0.05$) of all tested groups diabetic group ($P < 0.00$), hypertensive group ($P < 0.00$) and the combined (diabetic + hypertensive) group ($P < 0.00$) compared to the control healthy group. Moreover, the combined (diabetic + hypertensive) group showed a significant ($P < 0.001$) increase in BMI compared to each diabetic group and hypertensive group. The BMI is a good indicator for obesity and overweighed subjects. Previous study revealed that, belly fat and BMI is higher in obese with diabetic or hypertensive subjects than that diabetic or hypertensive only [16]. This is in accordance with our study. The results obtained showed that, a significant increase in HA1C level ($P < 0.05$) was produced for the diabetic and the combined (diabetic + hypertensive) groups compared to the control group, respectively. Moreover, the combined group (diabetic + hypertensive) demonstrated a significant increase in glucose level ($P < 0.05$) compared to the hypertensive group. However, serum glucose level for the hypotensive group versus control group was non-significant ($P > 0.05$). Data obtained showed that vitamin B_{12} level was significantly decreased in the diabetic group, hypertensive and the combined group (diabetic + hypertensive) ($P < 0.005$) compared to control group. While the diabetic showed a non-significant ($P > 0.05$) difference versus hypertensive group, respectively. Moreover, a non-significant decrease in Vitamin B_{12} level was occurred in the combined (diabetic + hypertensive) group ($P > 0.05$) compared to the diabetic group and hypertensive group.Data from previous studies revealed that level of vitamin B_{12} possibly reduced due to the glycation of hemoglobin with hyperglycemia and caused anemia. Serum vitamin B12 levels of diabetic subjects were significantly reduced compared with control [13]. A negative correlation was observed between HA1C and vitamin B12 level ($r=0.63$). These changes were correlated with the incidence of the disease and was of a higher significance with genesis of complications, suggesting that hyperglycemia associated glycation may occur for early predication of complications [14, 15]. The reduced level of vitamin B12 may open window in interpretation the anemic causes of diabetic complications [16-18].

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