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Fasting blood glucose, uric acid and calcium levels of obese Sudanese women aged 40-50 years: Case study (Wad Medani) area

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Abstract

A total of 200 apparently healthy adult Sudanese females aged 40-50 years, were invited to participate in this study. Participants were classified into two groups, non-obese, and obese (BMI-C: <25 and >30kg/m2) based on WHO1997. Fasting blood glucose and uric acid concentrations were elevated significantly (P<0.05) in obese women's serum, with means (97.57, 5.95) and (92.99, 5.28) for obese and non-obese women respectively. The finding was revealed that the calcium level has no significant difference between study participants with mean (6.68 and 7.71) for obese and non-obese women respectively. This study suggests that using the interaction between glucose and uric acid level for prediction of renal or any other cardiovascular complications in diabetic patients.

Keywords: Obesity, Serum blood glucose, Serum uric acid, Obesity in women, Diabetes.

Introduction

Obesity can be defined as a disease of extensive fat accumulation and body fat distribution to the extent that health and wellbeing are affected (WHO, 1997). However, the degree of excess fat, its distribution within the body and duration of obesity are associated with health consequences which was vary between obese individuals (WHO, 1997; Ishikawa-Takata *et al.*, 2002).

Obesity is independently associated with a 4-fold increased risk of diabetes for women and 49.9% of the population attributable to the risks of diabetes due to obesity (Okosun, 2001). It is estimated that >90% of cases of type 2 diabetes in the population could be prevented with the adoption of a prudent diet, avoidance of overweight, obesity and engagement in moderate to vigorous physical activity for at least 0.5 h/d, non-smoking and moderate alcohol consumption (Perry, 2002).

The distribution of plasma glucose concentrations changed moderately among male hyperuricemic subjects, but increased markedly among female subjects. The increase of uric acid levels is correlates with subsequent diabetes, only among hyperuricemic women. Moreover, a relatively higher incidence of diabetes is found in postmenopausal hyperuricemic women (Lin *et al*., 2004).

Small amounts of calcium are normally required for glucagon secretion; in addition, glucagon suppression by glucose is calcium-requiring. Thus, the changes in glucagon secretion caused by addition or depletion of calcium can depend on the relative amount of glucose in the milieu (Leclercq-Meyer *et al*., 1976; Lundquist *et al*., 1976; Fujita *et al*., 1988).

This study aims to determine the factors behind biochemical abnormalities indicators of early stage of some chronic metabolic diseases in Sudan. It is important that these factors should be addressed in any coordinated strategy to tackle the problem of obesity and related diseases.

The objective of the present study is to compare calcium, uric acid and fasting blood glucose between obese Sudanese women aged 40-50 years and non-obese ones.

Material and methods

Study area

This study was conducted in Wad Medani town capital of Gezira state (Nagah Abdelwahab Ahmed Mohamed, 2012). It is located about two hundred kilometers Southern Khartoum on the Blue Nile river west bank. It is situated in the middle of the agricultural districts and represents the agricultural capital of Sudan.

Sampling

Cluster sampling technique-probability from local inhabitants was invited to participate in this study. A total of 200 apparently healthy adult females aged 40-50 years were the subject of this study. All participants were absence of medical illness as sub-stained by medical history and physical examination. None had weight fluctuation more than 2kg during the last six months prior to testing and lived most of their lives in Sudan. The participants were classified into two groups, normal body weight and obese as indicated by body mass index categories (BMI-C: <25 and >30kg/m2) respectively based on WHO (1997).

Data collection was conducted during march-May 2011. For statistic analysis subjects with BMI>30 were defined as case in this study and those with BMI<25 as control.

Blood samples

Serum separated by centrifuging blood for 10 minutes at 3000RPM. Then, decanted into 5ml plain plastic tube, labeled with date, name, time of collection, identification number of the volunteer participating in this study and stored frozen at -4°C for biochemical analysis. All participated women were instructed to fast 10-12hours before blood collection, in order to obtain accurate results.

Indian Journal of Science and Technology Vol. 5 No. 2 (Feb 2012) ISSN: 0974- 6846

These tests were conducted in biochemistry laboratory, Faculty of Medicine, Gezira University. Quality assurance was conducted in Nasr Eldin Elwali Clinic and some samples were duplicated. All biochemical parameters estimation was done by the researcher.

Determination of serum calcium, uric acid and fasting blood glucose

The above mentioned biochemical parameters were determined by using analysis kits (Linear Chemicals Company)**.** The absorbance and concentration of samples were read within one hour of the incubation, by digital colorimeter.

Methodology

Two hundred women with 40-50 years old were invited to participate in this study; they were described as follows; hundred non-obese women (control) and hundred obese women (case). Participants were instructed to come fasted in certain day to collect blood samples.

Data analysis

The data was analyzed by using Statistical Package for Social Sciences (SPSS), Windows version8x, 1997 SPSS, Inc, Chicago, IL, and USA. Independent t-test was used.

Table 1. Calcium, uric acid and fasting blood glucose of 200 obese and non- obese Sudanese women

Biochemical parameter	Mean±SD of non- obese women	Mean±SD of obese women	Significance
Glucose (mg/dl)	92.99±21.54	97.57±23.38	*
Uric acid(mg/dl)	5.28±1.90	5.95±1.57	*
Calcium(mg/dl)	7.71±9.32	6.68±1.88	Not significant

Key: The figures in the table is means ± standard deviation.
** significant at level 0.05.*

Results

Calcium, uric acid and fasting blood glucose of 200 obese and non-obese Sudanese women

Fasting blood glucose and uric acid concentrations were elevated significantly ($p<0.05$) in obese women's serum, with means (97.57 and 92.99) and (5.95 and 5.28) for obese and non-obese women respectively. While, calcium level revealed no significant differences between study participants with mean (6.68 and 7.71) for obese and non- obese women respectively.

Discussion

Fasting blood glucose level was elevated in obese women's serum. This result might be due to the direct effect of obesity and increasing visceral adiposity which, cause elevation of glucose and triglycerides levels. Making, obese individual, mainly those with visceral obesity more susceptible to diabetes and other metabolic syndrome. This result was similar to that stated by Okosun (2001) and Perry (2002). Also this result agreed with that obtained by Nielsen *et al*. (2000) who reported that healthy people at high risk of developing type 2 diabetes are characterized by normal glucose effectiveness at near-basal insulinemia and normal fasting rates of gluconeogenesis, impaired glucose effectiveness, increased gluconeogenesis, and endogenous glucose release, together with insulin resistance and beta-cell abnormalities.

Uric acid concentrations, was elevated in obese women's serum. This finding might be explained with the strong positive correlation between glucose and uric acid level. This interaction can be used to predict any possible complications for either obese diabetic or non-obese diabetic patients. This result was similar to those obtained by Balasubramanian (2003). WHO documented that uric acid can act on the urinary bladder mucosa and increases the blood glucose, insulin, triglycerides, and cholesterol levels. Also these finding was agreed with that obtained by Wing *et al*., (1989), Chang *et al.,* (2000), Matsubara *et al*., (2002), Lu *et al*., (2002), Devroey (2004) and Lin *et al.*, (2004). WHO cited that the increase of uric acid level, systolic blood pressure, alcohol consumption, and central obesity are important cardiovascular risk factors. This results were similar to that revealed by Woo *et al*., (1999) and Lin *et al.,* (2004). WHO mentioned: Hyperuricemic men with hypertension, would predict cardiovascular disease incidence synergistically with uric acid level.

Calcium level revealed no significant difference between study participants. This result might be to participants' dietary habits, effect of estrogen deficiency and transit of pre-menopause among study participants. This finding disagreed with that obtained by Bacon *et al*., (2004) and Sun *et al*., (2005). WHO documented that Obese premenopausal women are thought to be at low risk for osteoporosis due to increased body weight and effects of estrogen on weight-bearing bone. While the results of this study were similar to those obtained by Nordin *et al*., (2004) and Bacon *et al*., (2004). WHO reported that the menopausal rise in calculated serum ionized calcium indicates falls in gastrointestinal absorption and renal tubular reabsorption of calcium. These changes are sufficient to explain the rise in calcium requirement at the menopause.

Conclusion and recommendation

From the results of this study we can concluded that the interactions between uric acid and glucose level can be used for prediction of renal and cardiovascular complications for diabetic patients.

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Indian Journal of Science and Technology Vol. 5 No. 2 (Feb 2012) ISSN: 0974- 6846

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