

Creatine Kinase (CK) activity increased in obese women in region of Brak

Ashati/Libya

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Abstract Creatine kinase (CK) plays an important role in cellular metabolism. There is a high activity of the enzyme in skeletal muscle fibers, especially type II fibers. The aim of the study was to investigate whether the CK enzyme activity in serum related to obesity in women. We analyzed 61 samples of women in region of Brak, Libya, aged 21 to 69 years, divided into two groups according to their body mass index (BMI), Obese and lean group. Blood samples were collected to measure the activity of CK and CK-MB in serum. 2 sample t-test applied to show the difference and Pearson correlation used to assess the correlation between serum CK and body mass index (BMI). Ck activity was significantly higher in obese women compared with lean once and CK activity positively correlated with BMI. In conclusion CK activity was affected by obesity and BMI.

Key words: Body mass index (BMI), creatin kinase (CK), CKMB, Obesity.

زيادة نشاط إنزيم الكرياتين كايينيز (CK) في النساء اللاتي لديهن سمنة في منطقة براك الشاطئ

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المخلص يلعب إنزيم CK دور في الأيض الخلوي فهو يزود بالـATP للتفاعلات الخلوية. يوجد نشاط عالي من الإنزيم في العضلات الهيكلية خصوصاً الألياف من النوع الثاني. أكدت مجموعة من الدراسات زيادة نشاط إنزيم CK مع زيادة الكتلة العضلية بالتالي فان الهدف من هذه الدراسة هو معرفة ما إذا كان نشاط إنزيم CK في المصل متعلق بالسمنة في النساء. جمعت عدد 61 عينة من النساء الاصحاء تراوحت أعمارهن بين 21-69 سنة. قُسمت العينات الى مجموعتين على حسب الكتلة العضلية لديهن. سُحبت منهن عينات دم لقياس نشاط إنزيمي CK-MB & T.CK. أوضحت النتائج المتحصل عليها وجود فروق معنوية في نشاط الإنزيم بين المجموعتين باستخدام إختبار t حيث كان نشاط الإنزيم أعلى في النساء اللاتي يعانين من السمنة، كما تبين باستخدام إختبار الارتباط وجود علاقة إرتباط موجب بين نشاط الإنزيم الكلي وموشر كتلة الجسم. نستنتج من هذه الدراسة ان نشاط إنزيم CK يتاثر بكل من الكتلة العضلية للجسم وأيضا بزيادة الوزن او السمنة.

الكلمات المفتاحية: السمنة، أنزيم الكرياتين كايينيز (CK)، CKMB، موشر كتلة الجسم (BMI).

Introduction

Obesity is not just a heavy weight, a huge body and a slow movement, but it is a fundamental problem that carries with it what is more serious. Many diseases are related to obesity such as and type 2 diabetes and metabolic syndrome (1). Many studies of obese subjects have reported an increase in cardiac work, representing 40 to 190 % more than normal body weight (2). Obese subjects have increased body mass that requires a greater metabolic energy exchange both at rest and especially during physical exercise [3] Creatine Kinase (CK) is a dimeric globular protein consisting of two subunits. It buffers cellular adenosine tri phosphate (ATP) and adenosine mono phosphate (ADP) concentrations by catalysing the reversible reaction; it transfers high energy phosphates from phosphocreatine to ADP to generate ATP that provided rapidly for cellular ATPases [4], [5]. High activity of the enzyme is found in type II fibers of the skeletal muscle [6], "In which, cytosolic CK is tightly coupled to glycolysis, whereas mitochondrial fatty acid

oxidation capacity and glucose uptake are limited, rendering these fibers relatively insulin resistant" [7], [8]. An association has been shown by several studies between predominance of this fiber of skeletal muscle and weight gain. Overfeeding of healthy young men with relatively higher type II fiber proportions induced a greater gain of fat mass [9].

Serum CK activity reflect skeletal muscle cytosolic CK activity after three days of rest and in the absence of tissue damage, which is predominantly derived from type II fibers [10]. The main purpose of this study was to estimate whether serum CK is associated with obesity in women?

Materials and methods :

Healthy, women volunteers ($n = 61$) participated in the study, 21-69 years old. 34 obese their BMI between 30-40 kg/m² and 27 lean women their BMI between 18 -29.7 kg/m². Volunteers were refrained from exercise at the time of experiment and questionnaire was filled for each of them. The

anthropometric characterizations of the volunteers are presented in table[1].

All participants gave informed consent before participation. The study was approved by the medical laboratory department. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m²). Fasting blood samples was drawn into plane tubes from each subject and serum separated and stored at -20°C for biochemical analyses. Serum total Ck and CK-MB were estimated with an automated analyzer (SLECTR PRO M) in Brak general hospital using ready kits from Analyticon.

Statistical analyses were completed using Minitab version 16. Data are presented as means \pm SD. 2 sample t- test was used to compare obese and lean women. Pearson correlation was used to examine for correlation between CK and BMI. A P < 0.05 was considered significant.

Results:

The results of this study, which were conducted on 34 obese women, mean BMI was 35.9 ± 4.9 kg /m² and mean age 45.5 ± 11.1 years, and 27 lean women, their mean BMI was 23.6 ± 2.9 kg /m² and mean age was 43.1 ± 14.7 years; showed a significant differences in BMI between the two groups using two sample t-test, P value was less than 0.05 as shown in table 1.

Table 1: Characteristics of study participants

	Obese women (Mean \pm SD)	Lean women (Mean \pm SD)	P- value
Age (years)	45.5 ± 11.1	43.1 ± 14.7	0.3
Body Mass Index (kg/m ²)	35.9 ± 4.9	23.6 ± 2.9	0.001

The mean activity of total CK enzyme in obese women was 233.8 ± 48.8 U/L, while in lean women was 143.1 ± 88.2 U/L. Two sample t-test showed significant differences between the two groups, P value was less than 0.05. Also significant difference was found between two groups in the activity of CK-MB, for obese women 30.9 ± 12.8 U/L and 21.8 ± 12.3 U/ L for lean one with P value of less than 0.05 as shown in table [2].

Pearson correlation showed positive correlation between BMI and total CK in obese group (R=0.4, P-value= 0.03), with no correlation with CK-MB (R = 0.2, P-value = 0.25).

Table 2: Activity of enzyme in both groups.

	Obese women (Mean \pm SD)	Lean women (Mean \pm SD)	P- value
T. CK (U/L)	233.8 ± 48.8	143.1 ± 88.2	0.007
CK-MB (U/L)	30.9 ± 12.8	21.8 ± 12.3	0.006

T.Ck: total creatin kinsase,

Discussion

The results of this study showed an increase in total CK activity in obese women compared with normal control group, this might be related to increased muscle mass or increased fat intake [11]. Skeletal muscles are the primary source of

CK activity [12], Serum CK activity is thought to reflect CK activity from striated skeletal muscle, especially high CK type II fibers, that are associated with obesity and weight gain. As these fibers tend to be glycolytic and insulin resistant with less capacity of fatty acids oxidation compared to type I fibers, [6], [13], this is might be lead to storage of fatty acids as lipid instead of utilization [9], [14]. These results were consistent with Oudman's findings, as they illustrated that serum CK activity is independently associated with obesity in a large population sample from Netherlands with different ethnic origin [15].

In addition to that, our study demonstrated significantly high activity of CK-MB isoenzyme in obese women compared with lean women, which might be related to increased weight of the heart muscle in the obese group [16], which was not in agreement with Salvadori study [17]. However, few obese women demonstrated normal activity of the enzyme that could be related to the different ways of enzyme clearance. On the other hand, high level of enzyme activity has been found in lean women in whom hereditary factors could play a role [17].

Lastly positive correlation was found between total CK and BMI in obese women that were in agreement with Oudman's study, who illustrated that the association of CK with BMI was independent of ethnicity in multiethnic sample, implies that CK may have potential use as a biomarker for obesity risk beyond skin colour or ethnicity [15]. Many other factors could affect CK activity such as exercise and pregnancy that were excluded from our study. However, in case regular exercise and strenuous eccentric exercise serum CK activity is elevated up to 7 days after [18-20], therefore the effect of exercise still could not be excluded.

In conclusion, our study showed that serum CK activity is associated with obesity in women.

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