Some renal function parameters in individuals with metabolic syndrome

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Received 16/10/2011 Accepted 20/5/2012

Abstract

Metabolic syndrome (MS), a cluster of risk factors for cardiovascular diseases. This syndrome characterized by: Insulin resistance, hyperinsulinemia, abdominal obesity, elevated blood pressure, lipid abnormalities and low grade inflammatory state. There are growing data demonstrated the relation between MS and renal impairment, these data revealed that individual with MS at higher risk to develop chronic kidney disease. (a) To determined the changes in renal function parameters in MS individuals.(b) determine the effect of age, sex and BMI on the measured parameters . This study was conducted during period from January to September 2011. Fifty apparently healthy individual (30 male and 20 female) were included in this work as control with age range 25±6.3 years, BMI range 21± 3.7 Kg/m^2 and weight range 55± 3.9 Kg and another fifty individual(30 male and 20 female) were selected to have at least three of the WHO criteria of MS. Data were presented as mean ± SD , 2-sample t-Test was used to show the significance changes between the two groups. The effect of age and BMI on measured parameters were determined using Person - correlation. This study revealed that MS individual shows a significant increase in SFG,TC,TG, B.Urea, S.Cr and U.Sp-G when compared to those of the controls, while HDL-C and e-GFR shows significant reduction when compared to those of control table 1. In both group e-GFR significantly correlated to individual weight (r =0.02), BMI (r =.0.075).SFG significantly correlated to B.Urea, S.Cr., e-GFR and U.Sp-G in MS individual (r = 0.03) but not in control group. In conclusion: MS individual show significant changes in renal function that may related to higher susaptability of this group to developing renal diseases

الملخص

المتلازمة الأيضية ، هي مجموعة من عوامل الخطر لأمراض القلب والأوعية الدموية و هذا التناذر يتصف ب : مقاومة الانسولين ، فرط انتاج الانسولين ، والبدانة في البطن ، وارتفاع ضغط الدم واضطرابات الدهون وتفاعل التهابي ضعيفة وكشفت البيانات أن هناك نموا في العلاقة بين مرض المتلازمة الايضية و امراض الكلوي ,ان الافراد المصابين بالمتلازمة الايضية أكثر عرضة للاصابة بامراض الكلى.: (أ) تحديد التغيرات في بعض وظائف الكلى عند الأفراد المصابين بالمتلازمة الايضية (ب) تحديد تأثير عوامل الجنس والعمر وم عامل كتلة الجسم على معايير المقاسة. أجريت هذه الدراسة في الفترة من يناير إلى سبتمبر 2011. وقد اشتملت الخمسين شخصا من الأصحاء (30 من الذكور والإناث 20) في هذا العمل كمجموعة التحكم كما سن 25 ±6.3 سنة، معامل كتلة الجسم 21 مجموعة ± 3.7 Kg/m2 ومعدل الوزن 55 كلغ ± 3.9 و خمسين فرد آخرين (30 من الذكور و 20 وقد تم اختيار الإناث) لديهم ما لا يقل عن ثلاثة من صفات المعتمدة لتشخيص المتلازمة الايضية بمعايير منظمة الصحة العالمية . وقد عرضت البيانات كمعدل ± الانحراف المعياري ، كما استخدم اختبار T لإظهار تغييرات بين المجموعتين.وتم تحديد تأثير عوامل العمر وم عامل كتلة الجسم على معايير المقاسة. كشفت هذه الدراسة أن الأفراد المصابين بالمتلازمة الايضية يظهرون زيادة معنوية في مستوى السكر في الدم ، الكولسترول الكلي ، الشحوم الثلاثية،مستوى اليوريا والكريتنين في الدم. و الكثافة النوعية للبول بالمقارنة مع مجموعة السيطرة، في حين اظهر الكولسترول البروتين ألشحمي عالي الكثافة و سرعة الترشيح الكبيبي انخفاضا كبيرا بالمقارنة مع مجموعة السيطرة. في كلا المجموعتين كانت سرعة الترشيح الكبيبي مرتبطة إلى حد كبير في الوزن (ص = 0.02) و معامل كتلة الجسم (ص =. 0.075). ارتبط مستوى السكر في الدم إلى حد كبير بمستوى اليوريا والكريتنين في الدم و سرعة الترشيح الكبيبي

و الكثافة النوعية للبول عند المصابين بالمتلازمة الايضية (ص = 0.03) الاستنتاج: يظهر المصابين بالمتلازمة الايضية تغيرات كبيرة في وظائف الكلى التي قد تتعلق بارتفاع احتمالية إصابتهم بأمراض الكلى .

Introduction

Metabolic syndrome (MS), a cluster of risk factors for cardiovascular diseases . This syndrome characterized by: Insulin resistance, hyperinsulinemia, abdominal obesity, elevated blood pressure, lipid abnormalities and low grade inflammatory state [12,3] . There are growing data demonstrated the relation between MS and renal impairment, these data revealed that individual with MS at higher risk to develop chronic kidney disease [4]. Chen and his collogues described that MS individuals had 80-130% higher risk to develop renal impairment than non-MS subject [3]. Also they described the relationship among increase serum fasting glucose (SFG)more than 6.1 mmol/L, hypertension, low e-GFR and Microalbuminuria[2]. Muntner *et al*, described the strong association between renal manifestation and lipid abnormalities that include low high density lipoprotein (HDL-C) and high serum triglycerides (TG) in MS individuals [5]. Kambham et al, described focal segmental glumerolosclorsis association with central obesity that now referred as (obesity related glumerolopathy)[6]. Moreover the low grade inflammatory that seen in MS individuals may related to release of adipocytic-cytokines that include: Leptin,IL-6 ,TNF-α and adipoaectin that involve at least partially in promoting renal impairment as described by Wiss[7]. Urinary specific gravity (U.Sp-G) that reflect the glumerolar filtration and dilution/ concentration ability of kidney, was related to MS by the fact that MS individual have elevated SFG and for each 1% increase in SFG there are 0.004 unit increase in U.Sp-G as described by Schumann and Schweitzer[8]. This study was design to describe the changes in some renal function parameters in individuals with MS. Also define the changes in e-GFR and urinary specific gravity in MS individuals. The effect of age, BMI and individuals weight on these parameters were also studied.

Subjects and Methods

This study was conducted during period from January to September 2011. This study received approval from Ethics and scientific committee in department of clinical pharmacy – university of Mosul. Fifty apparently healthy individual (30 male and 20 female) were included in this work as control with age range 25±6.3 years, BMI range 21± 3.7 Kg/m^2 and weight range 55± 3.9 Kg and another fifty individual(30 male and 20 female) were selected to have at least three of the WHO criteria of MS that include: BMI ≥25 Kg/m^2, BP ≥ 140-110 mmHg, serum fasting glucose ≥ 7.1 mmol/L, hypertriglyceridemia with diminish of HDL level [9]. The age range 25±5.76 years, BMI range 27± 4.8 Kg/m^2 and weight range 69.8± 65Kg. The effect of sex was eliminated by using symmetrical number of each sex. Serum fasting glucose assayed by glucose oxidase /peroxidase colorimetric method[10], Total serum cholesterol by Richmond-enzymatic methods[11], HDL- c measured by Lopez-Virella method[12] and serum triglycerides were measured using Fossati-enzymatic method [13] serum creatinine measured by Jaffa reaction method[14]Blood urea was measured using Mc Neely method[15] and urinary specific gravity was measured by Uriometer ,while estimated GFR was calculated using the following equation[16]:

e-GFR= (140-age)× Wt/ 72× S.Cr

note: in female this equation multiplied by 0.85

Data were presented as mean ± SD, 2-sample t-Test was used to show the significance changes between the two groups. The effect of age and

BMI on measured parameters were determined using Person - correlation.

Results

This study revealed that MS individual shows a significant increase in SFG,TC,TG, B.Urea, S.Cr and U.Sp-G when compared to those of the controls, while HDL-C and e-GFR shows significant reduction when compared to those of control table 1. In both group e-GFR significantly correlated to individual weight (r =0.02), BMI (r =.0.075).

SFG significantly correlated to B.Urea, S.Cr., e-GFR and U.Sp-G in MS individual (r = 0.03) but not in control group.

Table (1):- Biochemical parameters in individuals with MS and control groups.

	Parameter	Control	MS individual
	Serum fasting glucose (mmol/L)	5.17± 0.36	7.34± 0.29***
	Total cholesterol (mmol/L)	5.13±0 .46	6.61± .71***
	Serum triglycerides (mmol/L)	1.67± 0.25	1.75±0.5**
	High Density lipoprotein- cholesterol (mmol/L)	0.99± 0.15	0.90± 0.13*
	Blood urea (mmol/L)	6.12± 0.83	8.76±1.16**
	Serum creatinine (mmol/L)	0.94± 0.19	1.4±0.05***
	Estimated glumerolar filtration rate (ml/min/1.73m^2)	97.9± 30.7	66.33± 9.08**
	Urinary specific gravity (mOsmol/L)	1.0213± 0.0038	1.0355± 0.0046**

Note: P<0.05=*,P<001=**, P<0.001=*

Discussion

This study demonstrated that a significant changes in all renal function parameters measured in this work and this related to many factors. The significant increase in S.Cr , B.Urea and U.Sp.-G with significant reduction in GFR may related to sustain hyperglycemia that associated with MS that cause irreversible damage to renal structures and this result agree with results obtained by Segure *et al*[17]. The significant reduction in GFR may related to the significant elevation in S.TG that seen in MS individuals and this agree with result obtained by Samulsson *et al*. how described significant deterioration in GFR with significant elevation in S.TG that reflect as increase in S.Cr [18]. The significant increase in S.Cr may related to significant reduction in HDL-C in MS individuals and this agree with results obtain by Muntner *et al*. how described a negative relation between S.Cr and HDL-C in MS individuals[5]. The significant reduction in e-GFR that seen MS individuals agree with results obtained by Chen et al. how demonstrated a significant reduction in GFR less than 60 ml/min/1.73 m^2 in MS individuals and related it to the sustain increase in BP that occur due to increase in adrenergic activity that caused by sustain hyperglycemia and dyslipidemia in this group[3,19]. The sustain high BP lead to peripheral arteries damage that ended with left

ventricular heart failure leading to significant reduction in renal perfusion that in turn leading to significant reduction in GFR and increase S.Cr[20-22]. In conclusion : MS individual show significant changes in renal function that may related to higher susptability of this group to developing renal diseases .

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