Some renal function parameters in individuals with metabolic syndrome

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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 Kg/m² 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 parameters were determined using Person

GFR shows significant reduction 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.
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. 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. Chen and his colleagues described that MS individuals had 80-130% higher risk to develop renal impairment than non-MS subject. Also they described the relationship among increase serum fasting glucose (SFG) more than 6.1 mmol/L, hypertension, low e-GFR and Microalbuminuria. 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. Kambham et al. described focal segmental glomerulosclerosis association with central obesity that now referred as (obesity related glomerulopathy). 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 adipoaecin that involve at least partially in promoting renal impairment as described by Wiss. Urinary specific gravity (U.Sp-G) that reflect the glomerular 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. 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/m² 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/m², BP ≥140-110 mmHg, serum fasting glucose ≥7.1 mmol/L, hypertriglyceridemia with diminish of HDL level. The age range 25±5.76 years, BMI range 27± 4.8 Kg/m² and weight range 69.8± 65 Kg. The effect of sex was eliminated by using symmetrical number of each sex. Serum fasting glucose assayed by glucose oxidase peroxidase colorimetric method, Total serum cholesterol by Richmond enzymatic methods, HDL-C measured by Lopez-Virella method and serum triglycerides were measured using Fossati-enzymatic method serum creatinine measured by Jaffa reaction method; Blood urea was measured using Mc Neely method and urinary specific gravity was measured by Urimeter, while estimated GFR was calculated using the following equation:

\[ e\text{-GFR} = (140 \text{- age}) \times \text{Wt} / 72 \times \text{S.Cr} \]

**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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>MS individual</th>
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</thead>
<tbody>
<tr>
<td>Serum fasting glucose (mmol/L)</td>
<td>5.17± 0.36</td>
<td>7.34± 0.29***</td>
</tr>
<tr>
<td>Total cholesterol (mmol/L)</td>
<td>5.13±0 .46</td>
<td>6.61± .71***</td>
</tr>
<tr>
<td>Serum triglycerides (mmol/L)</td>
<td>1.67± 0.25</td>
<td>1.75±0.5**</td>
</tr>
<tr>
<td>High Density lipoprotein- cholesterol (mmol/L)</td>
<td>0.99± 0.15</td>
<td>0.90± 0.13*</td>
</tr>
<tr>
<td>Blood urea (mmol/L)</td>
<td>6.12± 0.83</td>
<td>8.76±1.16**</td>
</tr>
<tr>
<td>Serum creatinine (mmol/L)</td>
<td>0.94± 0.19</td>
<td>1.4±0.05***</td>
</tr>
<tr>
<td>Estimated glomerular filtration rate (ml/min/1.73m²)</td>
<td>97.9± 30.7</td>
<td>66.33± 9.08**</td>
</tr>
<tr>
<td>Urinary specific gravity (mOsmol/L)</td>
<td>1.0213± 0.0038</td>
<td>1.0355± 0.0046**</td>
</tr>
</tbody>
</table>

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 m² 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 susceptability of this group to developing renal diseases.

References