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Full Length Research Paper

Cigarette Smoking is a Risk factor of Renal Functions Impairment

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Abstract

Recently the adverse effects of smoking on renal function have gained more attention. Therefore, we aim to assess renal biomarkers in cigarette smoking subjects. In this case-control study (n 90) volunteer males, age ranged (22-71) years old were enrolled, (n 60) smokers and (n 30) anon-smoker. Serum Cystatin C, creatinine and urinary Microalbuminuria were measured using fully-automated (Mispa-12, Germany) and (Mindary-380, China) respectively. The Statistical analyses showed that there was a significant difference in means of renal biomarkers of smokers when compared with means of control group, p.value was (0.000, 0.000 and 0.000), respectively, as well as cystatin c and MAU were significantly increased in smoker groups (5-9 years, >10 years), p.values (0.000, 0.000), respectively, meanwhile MAU in the same duration also revealed significant values (0.001, 0.000), respectively. Positive correlations between number of cigarette smoked per day and serum cystatin c, was obtained (p.value= 0.000, r= 0.620), and positive correlations between number of cigarette smoked per day and urinary Microalbuminuria, (p.value= 0.000, r= 0.536). conclusion: cigarette smoking increases the specific renal biomarkers and is risk factor leading to renal impairment.

Keywords: Cigarette, smoke, urine, creatinine.

INTRODUCTION

The fight against cigarette smoking is a global challenge. Worldwide 1.2 billion people smoked in 2000, a number that is projected to increase to 1.6 billion by 2030, Halmai, 2013. The 21st century is likely to see 1 billion tobacco deaths, most of them in low-income countries. In contrast, the 20th century saw 100 million tobacco deaths, most of them in Western countries and the former socialist economies, Prabhatjha, 2006. Chronic cigarette consumption is harmful in both active and passive smokers and it has a role in the initiation and progression of certain chronic kidney diseases (CKD), type 2 diabetes mellitus and in the progression of diabetic nephropathy and cardiovascular complications of diabetes mellitus (DM). It is also evident that chronic kidney failure raises the risk of cardiovascular morbidity and mortality, thus tobacco use can be considered as a factor which induces or aggravates processes that diminish life quality or even shorten life expectancy. Noteworthy is the„ memory for smoking" of the human, namely the deleterious effects of tobacco consumption do not last only until the cessation of cigarette smoking but even many years, Halmai, 2013.

A recent preliminary report suggests that smoking-related hemodynamic events may have an acute influence on renal function and risk factor for the development and progression of chronic kidney disease (CKD) in community, Yacoub and Habib, 2010, that is a

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risk factor for end-stage Renal disease, ESRD, Orth and Hallan, 2008. Regarding the adverse effect of smoking on renal biomarkers, many studies suggest a higher prevalence of microalbuminuria in smokers compared to non-smokers, and raise the possibility of renal glomerular injury, Hammer, 2016. Microalbuminuria (MAU) (defined as urinary albumin excretion of 30 - 300 mg/day), is an early sign of Renal damage. It is demonstrated that renal risk is elevated even in the high normal range of Microalbuminuria (below 30 mg/day), Koroshi, 2007.

Cystatin C (CysC) is a basic protein with a molecular weight of 13kDa and a member of the cysteine protease inhibitor family that is measurable in body fluids. It is completely filtered by the glomerulus and its concentration is closely correlated with the glomerular filtration rate. Serum (Cys C) levels are less affected by biological factors and rise 1–2 days earlier than creatinine in the setting of acute kidney injury. Therefore, (Cys C) can be used as an alternative renal biomarker to creatinine, because it is filtered in the glomeruli and is reabsorbed in the proximal tubule where it is completely catabolized. Serum Creatinine level is commonly used to estimate renal function. It is not only determined by its renal excretion, but also by its production in muscular tissue, which is dependent on age, weight and sex. Therefore, when using serum creatinine level to estimate renal function, one needs to adjust for these factors, Knight and Jacopien, 2004. The aim of this study is to evaluate renal impairment biomarkers among healthy influenced by cigarette smoke.

MATERIALS AND METHOD

In this case-control study, ninety (90) subjects were enrolled, (60) them comprise smokers, and (30) represent healthy control groups (non-smokers) , All subjects were Healthy, they were referred to the Elriada Specialized Center in Khartoum state during the period from June to December 2016. (DM, Hypertension, Obesity and Alcoholism) were excluded from this study.

Samples Collection

(serum cystatin c, serum creatinine and urinary micro albuminuria), were measured in all study groups. (3) ml of venous blood sample withdrawn in disposable syringe and let to clot. The clotted blood was separated by centrifugation at (3000-4000 Rpm) for 10 minutes to obtain serum that was stored at (-20 c) till used, and random urine sample for quantitative Microalbuminuria was also obtained from all participants.

Estimation of Cystatin c, Creatinine and micro albuminuria

According to the procedure provided, serum cystatin c was measured by semi-automated analyzer Aggapa diagnostic (Mispa I2), as well as measurement of serum creatinine and urinary microalbuminurea was done by full automation (Mindray 380, China). This study was approved by the ethical committee of Alneelain University, College of Medical Laboratory Sciences, department of clinical chemistry.

Statistical Analysis

Data analysis was performed using SPSS version 21 software. Descriptive statistics on subject demographics were calculated, Mean, SD and Standard error of the mean, t-test and ANOVA were employed to compare mean concentration. Pearson's correlation was applied to correlate between study variables, p.value<0.05 was considered as significant.

RESULTS

This study included 90 participants, 60 were cigarette smokers and 30 nonsmokers as healthy control. The mean concentration of Cystatin C among cigarette smokers was (0.793±0.125) and in the control group was (0.619±0.103).Also the mean levels of MAU and serum creatinine in Cigarette smokers (18.33±3.41, 1.06±0.161) and means of control group (12.70±0.517, 0.810±0.058),p-value.

Table 2 shows the mean concentration of renal biomarkers (CystatinC, creatinine) and MAUamong heavy smoker groups. Fig 1 & 2 showed, correlation between serum CystatinC and MAU levels with age of cigarette smokers (.p-value 0.000, 0.000), r = 0.734**, 0.730**), respectively. Fig 3 & 4 show positive correlation between duration of smoking/cystatin c, MAU, p.values(0.000, 0.000), r=(0.773**, 0.790**), respectively.

DISCUSSION

In this case- control study, 90 healthy male volunteers were participated, 60 cigarette smokers, and 30 healthy represents a control group (nonsmokers). The mean age of smokers and healthy matched control group was not significantly different (38.38±11.74), (37.57±12.34) respectively. Smoking a cigarette, is a well-known risk factor for developing renal diseases.

Accordingly the results of the present study showed a significant increase in mean concentrations of Serum Creatinine, urinary microalbuminuria (MAU) and Cystatinc, (cys c), among cigarette smokers in comparison with nonsmoker with p.value (0.000,0.000,0.000), respectively (table 1). Many previous research studies showed similar findings in Creatinine level, Monzir *et al.,* 2015, Nobukazu Ishizaka, *et al.,* 2008 and Jean-micheli Halimi *et al.,* 2000.

Table 1. Mean concentrations of cystatin c, microalbuminuria and Creatinine among cigarette smokers and nonsmokers

Parameters	Smoker (Mean±SD)	Non-smoker (Mean±SD)	P-value
Cystatin C (mg/L)	0.793±0.125	0.619±0.103	0.000
Micro Albuminuria (mg/L)	18.33±3.41	12.70±0.517	0.000
Creatinine (mg/dL)	1.06±0.161	0.810±0.058	0.000

Table 2. Mean concentration of cystatin C, micro albuminuria and Creatinine among light and heavy smokers

Parameters	Light (Mean±SD)	Heavy (Mean±SD)	*P-value*
Cystatin C (mg/L)	0.715±0.12	0.848±0.10	0.000
Micro Albuminuria (mg/L)	16.71±2.51	19.49±3.51	0.001
Creatinine (mg/dL)	1.06±0.19	1.06±0.14	0.883

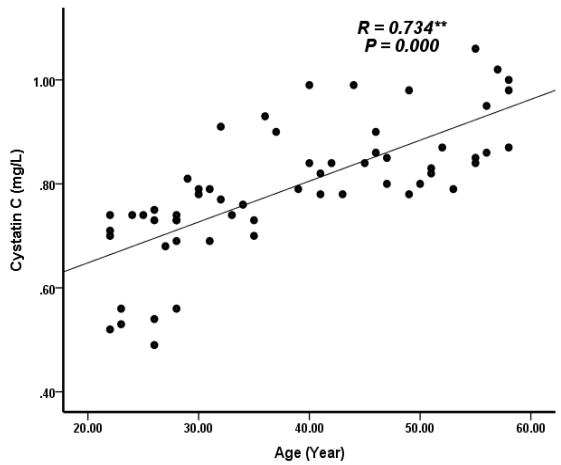

Fig 1. Correlation between cystatin C and age.

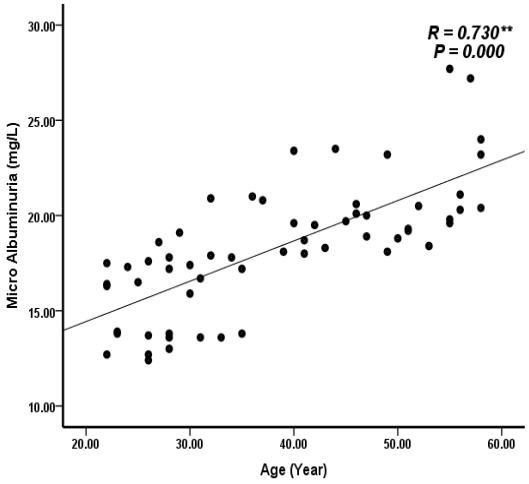

Fig 2. Correlation between micro albuminuria and age

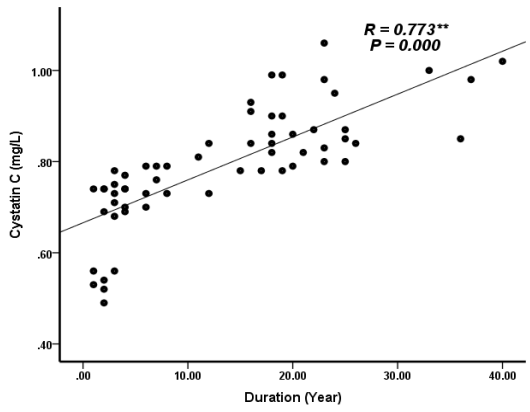

Fig 3. Correlation between cystatin C and duration of smoking.

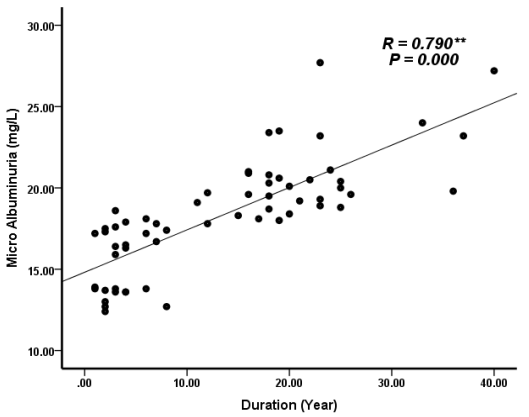

Fig 4. Correlation between micro albuminuria and duration of smoking.

Urinary Microalbuminuria was also has been reported in some circumstance showing significantly difference, Sara *et al.,* 2000. There was a previous consistent results concerning our findings in serum cystatin C, (Yamada y *et al.,* 2015. Currently cigarette smoking was found to be associated with an increased risk of albuminuria, in our study, the mean concentration of urinary (MAU) was significantly increased among heavy smoker subjects in comparison with light smoker, p-value(0.001), whereas (cys c) in the same groups revealed p.values (0.000). Consistently with our result findings in Urinary Microalbuminuria (Hyung-Jin Yoon *et al.,* 2009, had reported significantly increased. In contrast, the mean concentration of creatinine was not significantly difference, p-value (0.883).

Our result findings of correlation was found positive between serum (cys c and age (p-value 0.000,r = 0.734**,), furthermore between urinary (MAU) and age was also positively correlated (p-value 0.000, r = 0.730**,), meanwhile correlations between cys c versus duration of smoking revealed a positive correlation (p-value 0.000,r= 0.773**,), also positive correlation was obtained between urinary (MAU) and duration of smoking (p-value 0.000,r = 0.790**,). Consistent with our findings, recently, Gupta *et al.,* 2014 reported Microalbuminuria was directly related to the amount of smoking (pack-years). In contrast to these, Abdallah *et al.,* 2016 reported insignificance increase in (MAU) level according to (duration per years).

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