



**Full Length Research Article**

**THE EFFECT OF SMOKING CIGARETTE ON KIDNEY FUNCTIONS AMONG SUNDAES PEOPLES**

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**ABSTRACT**

There are numerous harmful substances found in tobacco and tobacco smoke. Nicotine is one of these substances that may be acquired through active and passive smoking. In man nicotine is commonly consumed via smoking cigarettes. Therefore, the aim of this study is to elucidate whether smoking has effects on kidney functions in Sudanese young students. Eighty subjects were included in this study, 40 none smoking males as the control group (healthy males) and the other 40 as smoker group, whom smoking more than 12 cigarette /day. Renal function tests were done for all participants; for investigates creatinine, urea and uric acid.

**Results:** The results revealed that the levels of creatinine and urea were found significantly higher ( $P < 0.05$ ), and the level of uric acid were found significantly decreased ( $P < 0.05$ ) in smoker group when compared with the control group.

**Conclusions:** The study concluded that, Smokers are at greater risk for kidney disease, which indicated by serum creatinine, urea, and uric acid.

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**INTRODUCTION**

The kidneys play a major role in the control of the consistency of the internal environment. The blood passing through the kidneys is first filtrated (glomerular filtration) so that all the constituents, except blood cells and plasma proteins, go into the microtubular systems. In the kidneys the useful substances are quickly reabsorbed but unwanted substances escape filtration and are actively excreted in urine (El Sayed *et al.*, 2013). However, renal function tests are important to identify renal dysfunction, to diagnose renal disease, to monitor disease progress, and to monitor response to treatment. In medicine (nephrology) renal function is an indication of the state of the kidney and its physiological role in the body. Most doctors use the concentration of creatinine, urea, to determine renal function. These measures are adequate to determine whether a patient is suffering from kidney disease. Smoking cigarette causes deterioration of renal function, which was first demonstrated in patients with kidney diseases, including

diabetic nephropathy, hypertensive nephrosclerosis, polycystic kidney, and glomerulonephritis in the last decade of the last century, with subsequent evidence accumulating even in the general population from communities (Noborisaka *et al.*, 2007). Recently, it has become apparent that smoking cigarette is associated with excessive morbidity and mortality in various diseases prominently cardiovascular and lung diseases. Kidney is also an important target organ of smoking induced damage. There are numerous harmful substances found in tobacco and tobacco smoke. Nicotine is one of these substances that may be acquired through active and passive smoking (Halimi *et al.*, 1998). Therefore, this study is aim to investigate the effects of smoking cigarettes on serum creatinine, urea, and uric acid. Participants eighty of younger universities students were included in this study.

**MATERIALS AND METHODS**

A total of eighty Sudanese male who came from different parts of the Sudan to Khartoum state were included in this study. They were divided into two groups, forty non-smoker were used as control, forty smoker. The control & smokers group

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members were within the age range of 20 – 29 years. The criteria of the selection of subjects (either smoking or non-smoking) was that no one should have any medical complication such as hypertension, ischemic heart disease, stroke, diabetes or any other disorder. Hence, all male subjects included in the present study are the normal healthy subjects.

The smokers in this study were those smoking 10-15 cigarettes/ day with an average of 12.5 cigarettes/ day; and duration of the smoking habit was 3-5 years. Blood samples were collected from the controls and the smokers from the cephalic vein, using sterile syringes and, then the blood was allowed to clot at room temperature, serum was then separated in sterile containers and kept at -20°C until analyzed for creatinine, urea, and uric acid. The data was collected and analyzed statistically using student t test.

## RESULTS

### Biochemical profiles

The result of the geographical area distribution was shown in Table (1).

**Table 1. Distribution of the study population according to the geographical area in the Sudan**

Location (%)	Population No	Percentage
North	18	22
South	6	8
Center	39	49
West	13	16
East	4	5
Total	80	100

**Table 2. Age, Creatinine, urea, and uric acid in both groups control and smoker**

Parameters	Control group	Smoker
Age / year	20 – 29	20 - 29
Serum creatinine mg/dl	0.81 ± 0.09	1.12 ± 0.12 *
Serum urea mg/dl	25.13 ± 5.45	30.63 ± 3.69 *
Serum uric acid mg/dl	4.04 ± 0.48	3.89 ± 0.52 *

Values are means ± SD, n= 40, \* =  $P \leq 0.05$ .

The results of creatinine, urea, and uric acid in control and smoker group were shown in Table (2). The results revealed that the level of creatinine and urea in smoker were found significantly higher ( $p < 0.05$ ) than the control. Also, the study revealed significant decrease ( $p < 0.05$ ) uric acid in smoker when compared to the non-smoker group.

## DISCUSSION

This study shows the effect of cigarette smoking on renal function, as indicated by serum creatinine, urea, and uric acid. It shows that there were an elevated values of serum creatinine, and urea in smoker people at ( $p < 0.05$ ) in comparison with the control subjects as shown in (Table 2), these findings are agreement with the results of other studies (El Sayed *et al.*, 2013; Yuka *et al.*, 2012). Moreover, these might be due to that the cigarette smoking increases renovascular resistance that lead to a significant fall in glomerular filtration rate (GFR), filtration fraction and renal

plasma blood (Ritz *et al.*, 1998). The decrease in GFR will lead to a decrease in distal tubular flow rate which leads to increase of urea reabsorption (JoAnn and Robert., 2011). Several mechanisms may be operative in inducing renal vasoconstriction and vascular damage. Nicotine increases plasma levels of vasoconstrictors including catecholamines, arginine, vasopressin and endothelin-1 (Ritz *et al.*, 1998; Gambaro *et al.*, 1998). Cigarette smoke damages endothelial cells, and nicotine induces smooth muscle cell proliferation (Pittilo *et al.*, 1990). Other study attributed the renovascular resistance to activation of the sympathetic nervous system (Black *et al.*, 1983). Previous study indicated that Lead (Pb) - linked glomerular dysfunction was observed in smokers possibly due to more recent exposure to high levels of Lead, as reflected by 30-50 percent higher serum cadmium (Cd) and Pb levels in smokers than nonsmokers. Smoking of 20 cigarettes per day results in inhalation of approximately 3.6 - 6.0 Lg of Cd, which is a cumulative nephrotoxicant<sup>(10)</sup>.

The nephrotoxicity of Cd results in changes in proximal tubular function, characterized by an increased excretion of beta 2-microglobulin and giving rise to the classical tubular proteinuria and in a glomerular dysfunction evidenced by an increased excretion of high molecular weight proteins and increased levels of beta 2-microglobulin and creatinine in plasma, and giving rise to a glomerular type proteinuria (Roszczenko *et al.*, 2004). In this study, level of uric acid in smokers is significantly lower than the nonsmoker group ( $P < 0.05$ ). This finding is in agreement with other studies that showed low serum uric acid in regular smokers and reduction of antioxidants including uric acid in smokers (Goraca and Skibska., 2005), this indicating the oxidative stress was increased in every cigarette smoked. Other studies, proved that even nonsmokers exposed to cigarette smoke have a significantly lower plasma antioxidant status than unexposed nonsmokers (Dietrich *et al.*, 2003).

In the mean time, the level of uric acid was raised in circulating antioxidant defenses and allows restoration of endothelium-dependent vasodilation (Goraca and Skibska., 2005). Therefore, high serum uric acid concentrations might be protective in situations characterized by increased cardiovascular risk and oxidative stress as smoking (Waring *et al.*, 2006), however, the low level of serum uric acid induced more susceptibility to oxidative damage and accounts for the excessive free radical production (Reilly., 1993). Therefore, the possibility that uric acid confers protection against the development of atherosclerosis, in view of its antioxidant properties, has been recognized (Reilly., 1993). Moreover, other studies that proved that reduction of antioxidants including uric acid in smokers (Tomita *et al.*, 2008) is due to both chronic exposures to cigarette smoke that is a significant source of oxidative stress and low intake of dietary antioxidants (Alberg., 2002). From these results we can suggest cigarettes substances can causes severe effects in PH in renal tubules and lead to change in glomerular filtration rate.

## Conclusion

In this study an attempt has been made to detect the biochemical changes reflecting renal function during smoking.

The kidney function is affected adversely in smoker group, indicated by the elevation of serum creatinine, urea, and a reduction of serum uric acid. The elevation of creatinine and urea almost attributed to significant fall in glomerular filtration rate (GFR), and a reduction of serum uric acid was attributed to reduce endogenous production as a result of exposure to cigarette smoke that is a significant source of oxidative stress.

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