

Microproteinuria in chronic cigarette smokers as a predictor of renal diseases: A case control study.

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Abstract

It was a case control study of 60 subjects. The aim of this study was to compare the microproteinuria and other kidney functions between tobacco smokers and non-smokers, determining whether smoking is associated with an increased risk for chronic renal failure (CRF) overall and by type of renal disease. 60 subjects, in two different groups (30 in each) were studied in SSG hospital, Vadodara. 30 subjects were participated as a study group (Group II), with chronic tobacco smoking habits. 30 healthy participants, who had never used tobacco, were studied as control group (Group I). The assessment consisted of urine analysis for microproteinuria, creatinine clearance test and blood analysis for urea and creatinine level. Blood pressure and BMI were also evaluated. Both the groups were compared using the unpaired Student's t-test for significance. Both the groups did not differ significantly in sex structure and body mass index, but the blood pressure values were significantly higher in group II (SBP=120.6±8.6 vs 140.6±6.6 and DBP=76.8±4 vs 86±4.4). Group II participants were characterized by higher microproteinurea (61.53±12.9mg% vs. 241±20.3mg%; p<.0001), though there were no significant changes in other kidney functions. The smokers were significantly younger, which may points to the earlier origin of microproteinuria in smokers (42.1 +/- 11.0 years). We concluded that chronic tobacco consumption causes kidney damage in various manner, produces microproteinuria as an early predictor of renal diseases.

Keywords: Microproteinuria, Serum creatinine, Blood Urea, Creatinine clearance

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Introduction

Tobacco chewing and smoking are the leading causes of cancer and death globally. It was recently suggested that smoking, in addition to its well-known cardiovascular consequences, could accelerate the progression of renal diseases.[1]Cigarette smoking is considered to be the most common identifiable cause of adult death in developed countries[2] and further increasing evidences suggest that chronic smoking is a risk factor for the progression of nephropathies[3]. Tobacco smoking has a similar influence on the progression of nephropathies in patients with type 2 diabetes mellitus [4] and polycystic kidney disease,[5] but studies regarding the effect of smoking on renal function in subjects without renal disease are scarce.

Further it is unknown whether chronic smoking affects renal function or represents a cause of renal damage in subjects without pre-existing renal diseases, so study of the renal effect of smoking in normal subjects could pro-

vide valuable information regarding the relationship between smoking and the progression of nephropathies. Microproteinuria is defined as, small quantity of protein (30-300 mg %) excreted in urine per day. It is an early indicator for the progressive kidney damage. This study was carried out in chronic cigarette smokers to evaluate the relation of nicotine to the renal functions like level of proteins in urine, serum creatinine level, blood urea level and creatinine clearance test.

Material and Method

This study was carried out in S.S.G. Hospital, Vadodara, during the period of 2007-2009, after ethical committee clearance. It was conducted in 60 subjects, in two different groups, each contain 30 participants. Subjects with tobacco smoking were included in experimental group (Group II) and further compared with control group (Group I). A face-to-face interview and a self-administered questionnaire provided information about

smoking habits and other lifestyle factors. Never smokers were defined as individuals who had never used tobacco. Those participants, who were taking 2 packets per week, since last 10 years or more, were included in group II. This questionnaire also included information about alcohol consumption, anthropometric measures, dietary habits, and education, medical history, use of analgesics, and occupations etc. A physician recorded clinical parameters including age, weight, and height, systolic and diastolic arterial pressure.

Inclusion criterias;

1. Age between 30-50 years for both groups.
2. Selection was irrespective to sex.
3. Group II, having smoking habit for more than 10 years.

Exclusion criterias;

1. Patients of any systemic or metabolic disease like diabetes mellitus and renal diseases.
2. Patients of vascular disease like renal artery stenosis
3. Alcoholic and those who were taking any medication
4. Pregnant female

Collection of sample:

Urine sample: For both groups 24 hr. urine sample was collected and store in the refrigerator at 4°C. Thymol was used as preservative for urine sample.

Blood sample

5 ml venous fasting blood sample was collected in a syringe under aseptic precautions. The sample was allowed to clot at room temperature and serum was separated for further analysis.

Biochemical investigations

Following methods were used for the biochemical investigations

- Urine protein – Colorimeter end point method (Pyrogallol reagent)[6]
- Serum creatinine – Jaffe’s method (without deproteinisation method) [7]
- Blood urea – Berthelot method[8]
- Creatinine clearance – by the standards procedure and calculation (UV/P)[9]

Data analysis

Statistical analysis involved quantitative variables summarized through mean± SD. Difference between means of the two groups was analyzed for significance, using student’s unpaired t- test. α error was set at 5% level ($p < 0.05$).

Observations & Results

This study was carried out in Department of Biochemistry, SSG hospital, Vadodara. Database was prepared in form of a master chart. Routine examination of group I showed that all of them were normotensive, but the group II subjects showed significantly higher blood pressure (SBP=120.6±8.6 vs. 140.6±6.6 and DBP=76.8±4 vs. 86±4.4). None of them were using any other medications. Clinical history was normal in recent six months. Biochemical investigations of both groups were compared and the observations were as follows.

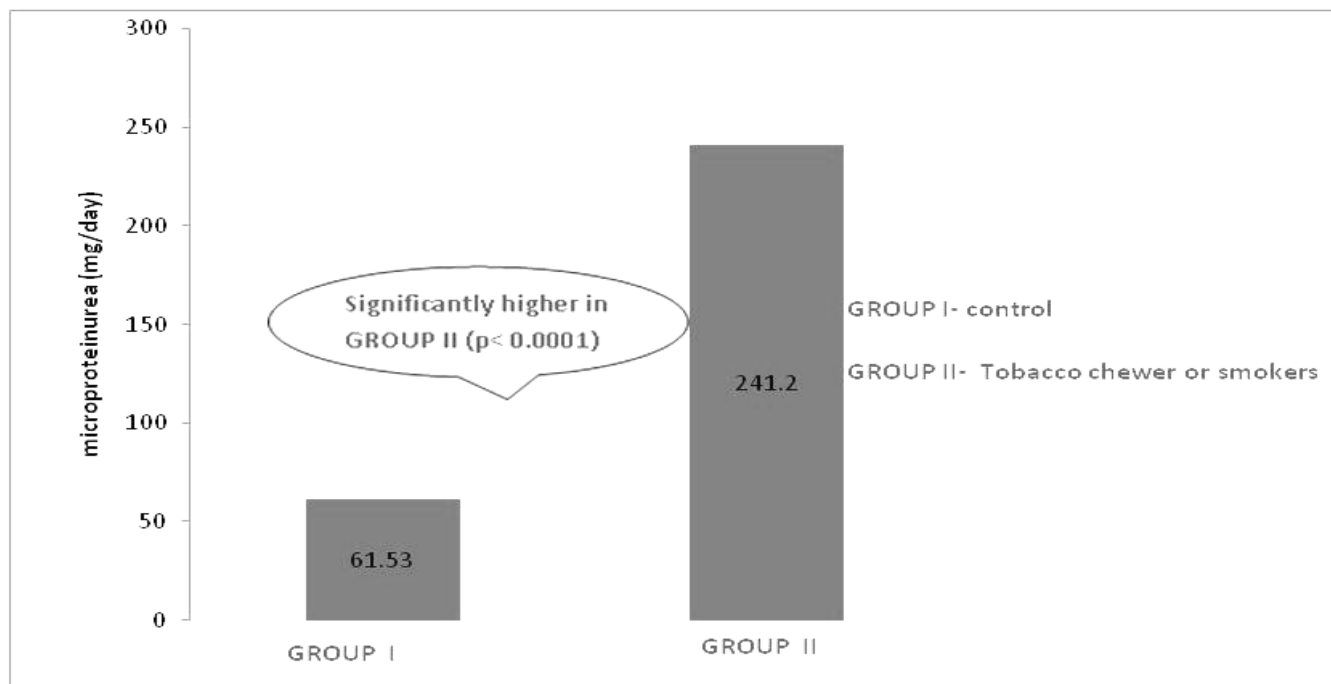
As per table1, microproteinuria is significantly higher (61.53±12.9mg% vs. 241±20.3mg%; $p < 0.0001$) in group II, those who were, tobacco smokers as compare to non-smokers (graph 1). Other renal functions like serum creatinine level, blood urea, creatinine clearance test were altered but within clinical limit.

Table 1. Comparison of biochemical parameters between Group- I and Group-II

PARAMETERS	Group-I N=30 (MEAN±SD)	Group-II N=30 (MEAN±SD)	P' Value
Microproteinuria (mg%)	61.53± 12.94	241± 20.26	<0.0001*
Serum.Creatinine (mg%)	0.78± 0.11	0.82± 0.08	0.0942
Blood Urea (mg %)	23.47± 3.43	24.87±3.64	0.0636
Creatinineclearance (mg/dl)	94.30± 5.68	89.8±3.2	0.04

* Significant, mg- milligram, SD-Standard deviation, dl- deciliter (per 100 ml)

GRAPH 1: COMPARISON OF MICROPROTEINURIA IN GROUP I AND GROUP II



Discussion

This study evaluated the effect of chronic cigarette smoking on renal functioning. Observations suggested that tobacco users were hypertensive as compared to control. Smoking increases the risk of hypertension by some 2 to 3 times, due to increase in sympathetic tone [10], the latter may interfere with the action of some hypertensive agents.[11]

Microproteinuria may be due to various pathophysiological mechanisms in smokers and tobacco chewers. Nicotine increases mesangial cell proliferation via activation of nicotinic receptors [12]. Nicotine increases synthesis of fibronectin, which is a critical matrix component involved in the progression of chronic kidney diseases [13]. Smoking induces a transient decrease in renal plasma flow and glomerular filtration rate.[14,15] These small repeated episodes of transient renal hypoperfusion may damage some glomeruli which may result in hyperfiltration, together with capillary albumin leakage. [16, 17]

Studies reported that cigarette smoke contains glycotoxins, forming advanced glycation end products, which may enhance vascular permeability causing albuminuria.[18,19,20] Interestingly, it was demonstrated that cigarette smoking (or nicotine) could cause plasma endothelin levels to rise.[21]

Cigarette smoking contains carbon monoxide which has an affinity towards hemoglobin and forms carboxy hemoglobin. Due to the low oxygen-carrying capacity of hemoglobin, ischemia produced in renal glomeruli and basement

membrane.[22] This minor damage is likely to cause microproteinuria. Studies have demonstrated that stable compounds present in cigarette smoke produce endothelial dysfunction[22] by increasing the vascular production of reactive oxygen species (ROS).[23]

Conclusion

There is 99.9% significant ($p < 0.0001$) higher microproteinuria in chronic smokers compared to the control group. It is an early indicator of renal diseases. There were no significant changes in other renal function parameters like serum creatinine level, blood urea and creatinine clearance test etc in both groups. It remains within the normal range. Chronic smokers have a chance to develop renal impairment in long-time addiction to tobacco smoking.

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