Original Research Article **Biochemistry**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

RELATION BETWEEN SMOKING AND MICROALBUMINURIA

Dr. A. BHAGYALAKSHMI*[1], Dr. CH. ANITHA1,AND Dr. Md. DAWOOD SULEMAN

MD Asst. Professor Dept. of Biochemistry, Gandhi Medical College, Secunderabad.
MD Asst. Professor of Biochemistry, Gandhi Medical College, Secunderabad
MD Professor & HOD Biochemistry Secunderabad

ABSTRACT

Smoking increases the risk of renal disease and progresses to end stage renal disease. We therefore performed a population based study at Gandhi Medical College/Gandhi Hospital, Secunderabad in which we studied the relation between smoking and urinary albumin excretion. Smokers had a higher urinary albumin excretion (Albumin excretion 384 ± 12.8 mg / day: P<0.01) than those who do not smoke. In conclusion smoking is associated with albuminuria.

KEY WORDS: **Urinary albumin excretion, Microalbuminuria.**

Dr. A. BHAGYALAKSHMI
MD Asst. Professor Dept. of Biochemistry, Gandhi Medical College, Secunderabad.

***Corresponding author**

INTRODUCTION

It has become very clear that cigarette smoking is associated with excessive morbidity and mortality from a variety of diseases. Cardiovascular and lung diseases are more prominent but the adverse effects of smoking on renal function have gained more importance. The rapid reduction in risk for cardiac events after cessation of cigarette smoking implies that smoking (tobacco) may promote thrombosis or some other determinant of plaque stability as well as contribute to the evolution of the atherosclerotic lesions itself. Tobacco smokers have elevated fibrinogen levels, a variable associated with increased atherosclerosis and acute cardiovascular events[1]. Hyperglycemia may promote the nonenzymatic glycation of low density lipoprotein. Oxidatively modified, may signal many of the initial events in atherogenesis.[1] Absolute excess rates of disease mortality found in smokers compared to nonsmokers increasing with age.[2] Cigarette smokers are more likely than nonsmokers to develop large vessel atherosclerosis as well as small vessel disease. The risk of coronary artery in smokers is 2.8, kidney disease is 2.7 and bladder and other urinary organs is 3.3.[2]Less glycemic control, smoking, high blood pressure, elevated cholesterol level, obesity and lack of regular exercise are considered to be risk factors that accelerate the deleterious effects of diabetes.[3] Microalbuminuria is an important indicator of risk of developing overt diabetic neuropathy, although it is also found in other conditions. Risk factor for microalbuminuria include increased blood pressure, poor glycemic control and smoking.[4] Proteinuria is an abnormally high albumin of proteins in urine. Proteins pass through the glomeruli are negatively charged protein. Thus a size and charge barrier keeps protein molecules from entering the urine. But when the glomeruli are damaged proteins of various sizes pass through them and are excreted in urine.

Five types of proteinuria are distinguished by milligrams of protein during 24 hrs urine collection.

(1) Microalbuminuria 30-150 mg
(2) Mild 150-500 mg
(3) Moderate 500-1000 mg
(4) Heavy 1000-2000 mg
(5) Nephrotic range 2000-3500 mg[5]

Deletarions substances in cigarette smoke are nicotine, Carbon monoxide, nitrogen dioxide and Carbon soot. Nicotine increases heart rate and blood pressure. It may produce transient contraction of coronary artery. Cigarette smoke contains 5% Carbon monoxide which depletes oxygen in RBC and restricts oxygen availability to vital areas including heart.The glomeruli of kidney are not permeable to substances with molecular weight more than 69,000 and so plasma proteins are absent in normal urine. When glomeruli are damaged and diseased, they became more permeable and plasma proteins may appear in urine. The smaller molecules of albumin pass through damaged glomeruli more readily than the heavier globulins. So, when proteins appear in urine, the albumin fraction predominates. Albuminuria is always pathological.Microalbuminuria is identified when small quantities of albumin (50-300 mg/day) is seen in urine. It is an indicator of future renal failure.[6] Microalbuminuria is considered to be a predictor of cardiovascular disease both among diabetic and non diabetic subjects. Studies on microalbumin levels are helpful to prevent early onset of nephropathy.[7]

MATERIALS AND METHOD

50 controls, 50 moderate smokers (5-6 cigarettes / day for 4-5 yrs) and 50 heavy smokers (1->1 pkt / day for 5-8 yrs).

Exclusion Criteria

Diabetes Mellitus and Hypertension. The persons who were smoking for 4 yrs and more were selected. All the persons were taken from Gandhi Hospital, Secunderabad.50 persons from controls and both the groups of smokers were examined for blood pressure and blood samples (Randam Sample) were collected for blood sugar and creatinine estimation. Urine samples were analysed for microalbuminuria by pyrogallol red method. Blood sugar and creatinine were analysed by autoanalyser method.[8,9]

Method

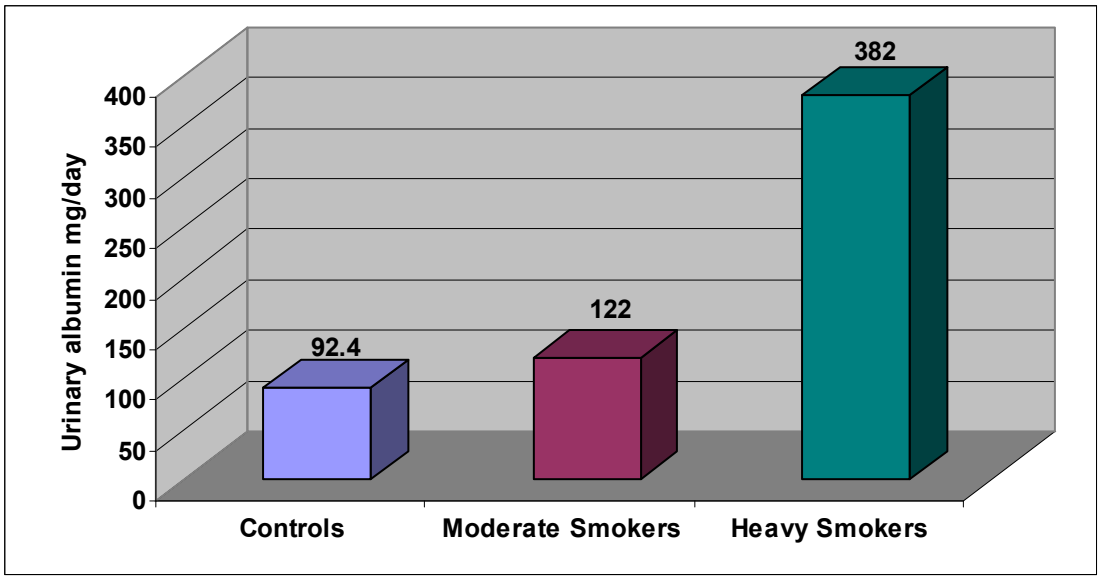
Proteins are involved in the maintenance of the normal distribution of water between blood and the tissues and consist mainly of the albumin and globulin fractions. The measurement of low levels of urinary proteins is important in the detection of renal diseases. Albuminuria is estimated by pyrogallol red method.

Principle

Proteins in an acidic medium combines with pyragallo Red and Molybate to form a blue, purple coloured complex. Intensity of the colour formed is directly proportional to the amount of protein present in the sample.

RESULTS

Subject	Randam Blood glucose mg/dL	Microalbuminuria mg / 24 hrs	Sr. Creatinine mg /dL
Controls (50)	82.4 ± 12.4	92.4 ± 11.6	1.0 ± 0.1
Moderate Smokers (50)	96.9 ± 18.8	122 ± 12.4	1.0 ± 0.08
Heavy Smokers (50)	108.8 ± 22.4	382 ± 12.7	1.1 ± 0.2



The results obtained from 50 moderates smokers and 50 heavy smokers and 50 persons who do not smoke. The blood samples were analysed on autoanalyser.The mean value for plasma glucose were 96.9 and 108.8 mg/dl Sr. Creatinine 1.0 ± 0.08 mg/dl. Microalbuminuria i.e. in urine the albumin concentration was more than the normal limits (>300 mg/dl 382 ± 12.7 mg/dl). In controls Sr. Creatinine, Blood glucose and albuminuria are normal.

DISCUSSION

Microalbuminuria is the first clinical detectable sign of involvement of kidney. Microalbuminuria is considered to be an early stage of nephropathy.[7] Increase in heart rate and blood pressure among nondiabetics cigarette smoking have been reported which may increase glamemlar filtration rate and renal plasma flow. Alternatively because smoking is associated with high amounts of carboxy haemoglobin and decrease oxygen delivery to tissue. Albuminuria may be caused by hypoxia in the renal microcirculation.[11]Mather et al reported a statistical significance between the presence of microalbuminuria and serum triglycerides.[12]Svenson et al showed that high blood pressure increased the risk of developing signs of nephropathy.[13]Huraib et al reported correlation between the prevalence of microalbuminuria and hypertension.[14]Another mechanism based on pathophysiological effect of smoking induced renal damage is insulin resistance. Several investigations have described smoking to be causally related to insulin resistance in nondiabetic subjects.[15] Sympathetic activation (influencing BP and renal hemodynamics) and chronic effects, particularly endothelial cell dysfunction (diminished nitric oxide availability), diminished endothelial cell dependent vasudilation and intimal cell hyperplasia.[16] Smoking causes alterations of intra renal hemodynamics, particularly a decrease in renal plasma flow as a result of renal vasoconstriction.[16]Smoking→Sympathoadrenal activation→Increase in circulation catecholamines→β1-adrenergic stimulation→Increase in renin production→Angiotensin II. This is smoking induced activation of the renin angiotensin system as one major pathomechanism of smoking induced renal damage.[16]The nicotine induced increase in BP and heart rate via sympathetic activation and vasopressin release appears to be a major mechanism contributing to the adverse renal effects of smoking. Nicotine directly stimulates catecholamine release from peripheral sympathetic nerve endings and the adrenal medulla. Increased sympathetic activity accelerates progression of renal failure independent of BP effects.[17] Smoking also seems to alter the diurnal rhythm of BP. Hansen et al[18] reported that the night/day ration of systolic and diastolic BP in healthy smokers was lower than in nonsmokers.In our study moderate smokers i.e. 5-6 cigarettes per day for 4-5 years had microalbuminuria 122±12.4mg/day and heavy smokers i.e. more than 1 packet per day had microalbuminuria i.e. albumin excretion 382±12.7mg/day. Comparatively with controls i.e. non smokers who had microalbuminuria levels 92.4±11.6 mg/day. Our study shows nondiabetic, normotensive smokers had higher mean urinary albumin level which is directly related to the amount of smoking (> 1 packet per day) among smokers. Also more smokers had microalbuminuria i.e. albumin excretion 382±12.7 mg/day (P<0.01) than those who donot smoke.

CONCLUSION

Present study conclude that in heavy smokers (i.e. 1 or more pkt / day for 5-8 yrs lead to albuminuria i.e. more than 300 mg/dl in nondiabetic and nonhypertensive subjects. The creatinine in serum shows absolutely normal range i.e.1.0 $\pm$ 0.1mg/dl with these levels we conclude that the kidney function is normal but microalbumin shows ($P<0.01$) significantly higher values, from this observation we conclude that a small amount of albumin is excreted in urine which may lead to future abnormalities in renal functions. In conclusion cigarette smokers may be associated with albuminuria and abnormal renal function in nondiabetic and nonhypertensive people in future. Society should put more efforts to help people quit smoking.Psychological support and counseling therapies are of major importance to further improve the smoking cessation success rate, which is still disappointingly limited.Screening for microalbuminuria in smokers should be done and counselling regarding smoking cessation.

REFERENCES

1. Kasper, Braunwald, Fauci, Hauser, Longo, Jawesar, Harrison's Principles of Internal Medicine, Mc Graw Hill companies Pathogenesis of atherosclerosis, Disorders of the cardiovascular system 16th Edition, Volume II; 2005.p.1427, 1439.
2. Kasper, Braunwald, Fauci, Hauser, Lango, Jawersar, Harrison's Principles of Internal Medicine, Mc Graw Hill Companies Disease manifestations of cigarette smoking 16th Ed, Vol. II; 2005. p.2574.
3. Buch Archana, Choudary Sangeeta, Chandanwale Shirish S, Kumar Harsh, Dy Patil Medical College, IJPBS/Volume 5/issue 2015 Jan-March/33-41.
4. Turner AN, Savill J, Stewart LH, Camming A, Davidson's Principles and Practical Medicine, Churchil Livingstone an imprint of Harcourt Publishers Limited; 19th Edition: Long term complications of diabetes; p.674.
5. Hitesh Shah-Dept. of Biochemistry, Pramaleh Swamy Medical College, Srikrishna Hospital and H.M Patel centre for Medical care and education, Karamsad, ANAND, Gujrat, India-Incidence of Microalbuminuria in Tobacco Chewers. InJ Clin Bio, 2005, 20(2) 189-191.
6. SreeKumari S. Vasudevan Textbook of Biochemistry for Medical Students Kidney function tests Jaypee Brothers, Medical Publishers (P) Ltd; 3rd Edition; p.439.
7. Jyothirmayi B, SRM Medical College, Hospital, Research Centre: Study of Microalbuminuria in Type 2 DM with less than and more than five years of duration; IJPBS 2014 April; 5(2):(B)634-639.
8. Trinder.P.Ann. Clin. Biochem determination of glucose in blood using glucose oxidase with an alternative oxygen acceptor, 1969 6(24)
9. Bawers.L.D. Wong E.T. Kinetic serum creatinine assays II A critical evaluation and review Clin. Chem 1980, 26; 555-561.
10. Walanabe N, Kamei S : Ohkubo A. et al (1986). Urinary protein as measured with a pyrogallol red-molybdate complex, manually and in a Hitachi 726 automated analyzer, Clin Chem-32:1551-4.
11. Redchill.A-Fianco, Cerecedo A-Hensen, A. Stensdotter, M.Pernow.J. and Lundberg, Jm(1989) cigarette smoking induced elevation of plasma neuropeptide and levels in human. Clin. Physiology: 9; 243-248.
12. Mather HM, Chaturvedi N, Kehely AM. Comparison of prevalence and risk factors for microalbuminuria in South Asians and Europeans with type 2 diabetes mellitus. Diabetes Med1998; 15:672-7.
13. Svensson M, Sundkvist G, Arnqvist HJ, Bjork E, Blohme G, Bolinder J, et al. Signs of Nephropathy may occur early in young adults with diabetes despite modern diabetes management results from the nationwide population based diabetes incidence. Study in Sweden (DISS). Diabetes Care2003; 26:2903-9.
14. Huriab S, Abu-Aishah, Sulaiman RA, Askar et al., The pattern of diabetic Nephropathy among Saudi patients with NIDDM. Ann Saudi Med1995; 15:1.
15. Gupta RK, Gupta R, Mawiya M. Impacts of smoking on microalbuminuria and urinary albumin creatinine ratio in nondiabetic normotensive smokers. InJ Nephrol, 2014 Mar/Apr 24(2) 1992-96.
16. Stephan R. Orth Division of nephrology and hypertension, University Hospital Berne (Inselspital), Berne, Switzerland; Smoking and the Kidney; J Am Soc Nephrol, 2002 13: 1663-1672.
17. Amann K, Rump LC, Simoaviciene A, Oberhauser V, Wessels S, Orth SR, et al. Effects of low dose sympathetic inhibition on glomerulosclerosis and albuminuria in subtotally nephrectomized rats. J Am Soc Nephrol. 2000 11: 1469-1478.
18. Hansen KW, Pedersen MM, Christiansen JS, Mogensen CE: Night blood pressure and cigarette smoking: disparate association in healthy subjects and diabetic patients. Blood press. 1994; Nov;3(6): 381-388.