

Original Article

Prevalence of Nephropathy and Its Risk Factors in Type-2 Diabetes: A Tertiary-Care Hospital Based Study

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ABSTRACT

Introduction: Diabetes mellitus is the most widespread affection of mankind. Diabetes is a syndrome characterized by chronic hyper-glycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action. The objective of the study was to determine the prevalence of nephropathy in type-2 diabetes in Northwest India and its correlation with various risk factors.

Methods: In the present study, total 11157 subjects (Male:Female 6661:4496), attending diabetic clinic were analyzed. The study sample resembles the population sample in anthropometric, age and socioeconomic factors. All patients were investigated for nephropathy.

Results: Among 11157 subjects, nephropathy was present in 3369 (30.2%). Multiple logistic regression analyses showed that duration of diabetes and serum triglyceride were strongly associated with regression coefficient (β) 3.916 and 2.428 respectively. Among variables serum triglyceride, BMI, systolic BP and duration of diabetes had strongest association with regression coefficient (β) 2.428, 1.402, 1.505, and 3.916 respectively.

Conclusion: The study highlights the high prevalence of nephropathy in type-2 diabetes in Northwest India. Controlling the risk factors we can prevent or delay the complications and progression

of diabetic nephropathy.

INTRODUCTION

Diabetes mellitus is one of the most wide spread chronic diseases of mankind. Diabetes is a syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action. Long term complications that affect retina, kidney and nervous system are termed as micro-vascular complications¹. The macro-vascular complications which include coronary artery disease, cerebrovascular disease and peripheral vascular disease also occur in higher frequency in diabetes.

The rising trend in the prevalence of type-2 diabetes has also been reported in a series of epidemiological studies^{2,3}. Recent WHO reports show that India already has the largest number of diabetic patients in the world. A major multicentre study was carried out on the complications of type-2 diabetes, in which India was also a participant⁴. This WHO study showed coronary heart disease prevalence rates in diabetics between 26% and 35% with higher rates in women and with much heterogeneity among other countries. Similar study carried out in south India showed high prevalence of vascular complications in type-2 diabetes⁵. The risk of peripheral vascular diseases (PVD) in diabetic patients was found 3-5 fold higher compared to that in non-diabetics⁶.

With this perspective, the present study was undertaken to define more clearly the risk factors influencing vascular complications in diabetic patients.

METHODS

A cross sectional study was conducted in patients attending or enrolled in a diabetic clinic attached to SP Medical College, Bikaner (North West India) for a period of two years. A total of 11565 type-2 diabetic patients registered at diabetic clinic were screened for diabetes and its complications. The present study was conducted on 11157 patients as 408 patients showed their unwillingness to give informed consent.

Each subject underwent detailed history and complete clinical examination. Details regarding age, sex, socioeconomic status, rural or urban, duration of diabetes and treatment history of diabetes were recorded for all the patients. Blood pressure was recorded in lying down, sitting and standing positions at intervals of five minutes and compared in both arms. Pregnant diabetic cases or gestational diabetics and type-1 diabetics were excluded from the study.

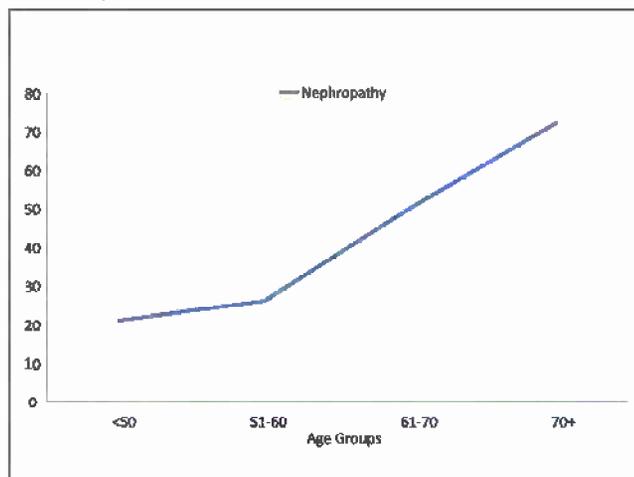


Figure 1: Age-related increase in diabetic nephropathy in the study population

Type-2 diabetes was differentiated from type-1 diabetes by age of onset, body habitus and evidence of ketoacidosis. Diabetes was diagnosed according to American Diabetes Association (ADA) revised criteria⁷.

Blood glucose level estimation was done by glucose oxidase method in venous blood. Lipid profile was measured colorimetrically. Glycosylated hemoglobin (HbA1C) was measured by ion-exchange chromatography. The selected patients were evaluated for presence of nephropathy by relevant investigations. Urine for microalbuminuria (30-300mg/24 hr) was tested by micral test for incipient nephropathy. Overt nephropathy was confirmed by estimation of level of blood urea, serum creatinine and macroalbuminuria.

Statistical analysis: Multiple logistic regression analysis with stepwise additions of variables was performed to assess their association with complications studied. Linear regression equation was used for calculation of age adjusted prevalence of nephropathy. All statistical analysis was performed using SPSS Version 10.0.

RESULTS

Total number of type-2 diabetic patients was 11157. Results showed presence of nephropathy in 3369 (30.2%) patients. Figure 1 shows relationship regarding age of patients with nephropathy.

Table 1: Results of multiple logistic regression analysis showing association of various risk factors with diabetic nephropathy

Diabetic Nephropathy			
Variable	Odds Ratio	95% CI	Regression coefficient β
Age	2.1699	1.936-2.432	3.113
Duration of Diabetes	2.3639	2.122-2.633	3.916
Systolic BP	7.0408	6.460-7.674	1.505
Diastolic BP	6.1807	5.754-6.639	0.554
Fasting glucose	0.8286	0.724-0.948	2.485
HbA1C	2.7888	2.366-3.287	0.560
BMI	3.8824	3.623-4.160	1.402
Total cholesterol	5.2104	4.855-5.591	0.618
HDL cholesterol	0.1881	0.168-0.211	0.865
Triglycerides	2.2293	1.991-2.497	2.428
LDL cholesterol	2.0049	1.754-2.304	2.270
VLDL cholesterol	2.3679	2.212-2.535	0.975

Total patients studied were divided in various groups

according to age i.e. below 50, 51-60, 61-70, >70 years. Table 1 shows the association of age, duration of diabetes, systolic and diastolic blood pressure (BP), fasting blood sugar, HbA1c, body mass index (BMI), serum cholesterol, serum HDL cholesterol, serum triglyceride, serum LDL cholesterol and serum VLDL cholesterol with nephropathy and among these factors duration of diabetes and serum triglyceride were strongly associated with regression coefficient (β) 3.916 and 2.428 respectively ($p < 0.001$). Among variables serum triglyceride, BMI, systolic BP and duration of diabetes had strongest association with regression coefficient (β) 2.428, 1.402, 1.505, and 3.916 respectively.

DISCUSSION

In the present study, evidence of nephropathy was observed in 3369 (30.2%) patients (including both microalbuminuria and overt nephropathy). Klein et al in their study found that frequency of microalbuminuria was 29.2% in those taking insulin and 22.0% in those not taking insulin⁸. A lower prevalence of proteinuria (19.7%) was found in the study conducted by Ramchandran et al in south Indian diabetes subjects⁵. Gupta et al reported prevalence of microalbuminuria in 26%⁹. Schonitz from Denmark reported 27.4% prevalence, while in the WHO multicentric study of vascular disease in diabetics, a wide geographical variation was reported in prevalence of nephropathy. It ranged from 2.4% (Hong Kong), 23% (Delhi) to 37% (Oklahoma, USA)⁴. This observed geographical and population variation in prevalence of diabetic nephropathy could be due to real ethnic variation in the susceptibility to diabetic nephropathy i.e. genetic, or due to poor control of diabetes, hypertension or other socioeconomic and cultural or environmental factors. Simultaneously, quality and quantity of protein may also play an important role in evolution of diabetic nephropathy.

On applying regression analysis for diabetic nephropathy, we found significant association of age, systolic and diastolic BP, HbA1c, BMI, serum cholesterol and serum triglyceride.

Thirty percent of patients with BMI 25-29.9 kg/m²

developed nephropathy. These findings are consistent with a study in England which reported that Indians are at increased risk of diabetes and its complications, at a relatively lower BMI, probably due to an excess total body fat composition and because they are centrally obese. Nephropathy increased significantly with increase in HbA1c¹⁰. This is consistent with UKPDS study¹¹ that showed that microvascular complications were benefited by better control of blood sugar levels. Also, in accordance with the fact that diabetic nephropathy and blood pressure have a strong correlation,^{12,13,14}. Studies have reported that the incidence of nephropathy increased significantly with increasing dyslipidemia^{15,16,17}.

Significant associations of duration of diabetes and nephropathy was also observed by Mohan et al and Verghese et al^{18,19}. The findings of our study show that the incidence of nephropathy increased significantly with rise in BP. Systolic BP was associated with high prevalence of diabetic nephropathy; however, diastolic BP had no significant contribution to nephropathy^{18,19}. Ramchandran et al had also observed the positive association of hypertension with diabetic nephropathy. Poor glycemic control indicated by raised glycosylated hemoglobin was significantly associated with increased incidences of diabetic nephropathy⁵. Gupta et al (1991) from New Delhi found that glycosylated hemoglobin was significantly higher in microalbuminuric NIDDM patients¹⁷.

Endeavour should be made to control hyperglycemia and hypertension tightly by appropriate therapeutic measures so that the occurrence and worsening of the complications could be mitigated. As this was a cross-sectional study, it is not possible to determine whether elevated or decreased levels of variables showing associations with complications actually preceded the development of the complications. Thus, the clinical and laboratory variables which have associations with complications in this study may only be interpreted as potential risk factors. Secondly, it is a clinic based study; hence, there is a possibility of referral bias affecting the results.

CONCLUSION

There is high prevalence of nephropathy in type 2 diabetes in our population. It is mainly because of duration of diabetes, hypertension and diabetic dyslipidemia. It is likely that controlling these risk factors can prevent or delay the complications and progression of diabetic nephropathy.

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