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Original research article

To compare the severity of nephropathy with the duration of diabetes mellitus

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Abstract
Diabetic nephropathy (DN) is one of the most frequent and severe complications of diabetes mellitus (DM) and is associated with increased morbidity and mortality in diabetic patients. Thirty to 40 percent of patients with diabetes mellitus develop diabetic nephropathy. Diabetic nephropathy is diagnosed by persistent albuminuria on two or more occasions, separated at least by three months on early morning urine samples. Persistent albuminuria is greater than 300 mg over 24 hours or greater than200 micrograms per minute.
Aim: The study is undertaken to compare the severity of nephropathy with the duration of diabetes mellitus.
Result: In the present study, out of 150 patients, 68 (45.33%) had normal albuminuria, 46 (30.67%) had microalbuminuria and 36 (24%) had macroalbuminuria. In this study there is a rise in prevalence of hypertension and cardiovascular disease and retinopathy as proteinuria progresses from normal albuminuria to microalbuminuria to macroalbuminuria.
Conclusion: This study indicates that patients with microalbuminuria must be regarded as a high risk group not only because of the increased risk of progression to nephropathy but also because of the raised prevalence of retinopathy, hypertension and neuropathy.

Keywords: Microalbuminuria, Diabetes Mellitus, Diabetic Nephropathy.

Introduction

Diabetes mellitus is the most common endocrinal disorder affecting population in both developed and developing countries. Diabetic nephropathy (DN) is one of the most frequent and severe complications of diabetes mellitus (DM) and is associated with increased morbidity and mortality in diabetic patients [1]. Diabetic Kidney Disease (DKD) stands as the foremost cause of end-stage kidney disease. This condition is classified as a microvascular complication and can manifest in individuals with both DM Type 1 and DM Type 2. Thirty to 40 percent of patients with diabetes mellitus develop diabetic nephropathy [2]. Characterized by continuous albuminuria and a gradual decline in the glomerular filtration rate, DKD necessitates early intervention as there is compelling evidence suggesting that timely treatment can effectively delay or even prevent its progression.

Diabetic nephropathy is diagnosed by persistent albuminuria on two or more occasions, separated at least by three months on early morning urine samples. Persistent albuminuria is greater than 300 mg over 24 hours or greater than200 micrograms per minute. Moderately increased albuminuria is when the urine albumin excretion rate is between 30to 300 mg over 24 hours and is a marker of early DN [3].

Hyperglycemia, hypertension, obesity, smoking, race, men, dyslipidemia, age, and genetic factors are the main risk factors for the development and progression of DN [4].

DN develops after latency periods that may vary by several years in approximately one-third of patients with diabetes. It is still a matter of controversy whether individuals should be screened to find microalbuminuria or screened to predict DN, known as the personalized medicine approach, so as to allocate resources with more intensive therapy and early preventive measures only to the individuals most at risk [5]. Studies have shown a significant reduction in the risk of developing proteinuria and microalbuminuria with intensive diabetes control in T1DM [6].

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The American Diabetes Association recommends annual screening for microalbuminuria in patients of T2DM [7].

Aims and Objectives

The aim of the study is to compare the severity of nephropathy with the duration of diabetes mellitus. To recommend best renal function test to diagnose nephropathy at the earliest in the disease so that steps can be taken to delay the progression of disease.

Material and Methods

The study was carried out on 150 diabetic patients attending Medicine Department of Guru Nanak Dev Hospital, Amritsar. First 150 patients of diabetes irrespective of whether they were of insulin dependent diabetes mellitus (Type I) or non-insulin dependent diabetes mellitus (Type II) were included in the study irrespective of duration of diabetes mellitus, age and sex. Investigations were carried out in Deptt. Of Biochemistry and Deptt. of Physiology, Govt. Medical College, Amritsar. Patients with significant urinary tract infection, fever and congestive heart failure which can alter proteinuria significantly were excluded from study.

Detailed clinical history of all the patients including age, duration of diabetes, controlled or uncontrolled, treatment history or any other associated diseases like hypertension, ischaemic heart disease etc. was noted. A detailed clinical examination was carried out. Other complications of diabetes like neuropathy, retinopathy, arthropathy, were also recorded. Routine haematological and urinary investigations were done.

Results and Discussion

One hundred and fifty patients of diabetes mellitus (irrespective of type I and type II) admitted in Guru Nanak Dev Hospital attached to Govt. Medical College, Amritsar were studied to study the renal function tests in diabetes mellitus in this part of the country.

It was observed that out of 150 patients of diabetes, Type I diabetes mellitus (IDDM) was present in 8 patients (5.4%) and type II diabetes mellitus in 142 (94.0%). Thus it was observed that majority of patients were suffering from type II diabetes.

In the present study, out of 150 patients of diabetes mellitus, 91 (60.66%) were male, 59 (39.34%) patients were female showing male predominance. 31.0% patients were in the age group of 60-69 years. Mean age was found to be 53.67±12.16 years [8].

In the present study, out of 150 patients, 68 (45.33%) had normal albuminuria i.e. proteinuria <30 mg/day, 46 (30.67%) had microalbuminuria i.e. proteinuria 30-300 mg/day and 36 (24%) had macroalbuminuria i.e. urinary protein >300 mg/day [9]. Varghese et al. [10] also found prevalence of microalbuminuria to be 36.3% in type II diabetic patients. In our study observation of microalbuminuria is comparable to observations of Molnar et al [11].

Out of 150 diabetic patients, 79 (52.67%) had hypertension, 50 (33.33) had neuropathy, 37 (23.9%) had IHD, 18 (12.00) had retinopathy and 2 (1.33%) had arthropathy. Thirty two patients had more than one complication.

Mean blood urea levels in the normoalbuminuric group (31.03±6.14) were significantly (p<0.05) lower than those in microalbuminuric group (39.31±10.25) and in macroalbuminuric group (48.14±21.11). Similarly serum creatinine levels in the normoalbuminuric group (1.08 ± 0.32) was significantly lower (p <0.05) than those in microalbuminuric (1.43±0.77) and macroalbuminuric group (1.51±0.73). This shows that as microvascular damage to kidneys progresses, the proteinuria increases and renal functions deteriorate thus increasing blood urea and serum creatinine. There was a significant difference in levels of fasting plasma glucose between normoalbuminuric (202.55±98.75) and microalbuminuric patients (265.78±112.29) (p<0.05) and between micro albuminuric and macroalbuminuric (218.75±83.10). It is also observed that proteinuria increased with worsening glucose tolerance and that fasting glucose was a stronger risk factor in young diabetic patients.

Similarly, serum cholesterol increased significantly (p<0.05) in macroalbuminuric patients as compared to normalbuminuric patients. This suggests that with worsening glycaemic control, proteinuria and serum cholesterol increase which further lead to renal failure and ischaemic heart disease.

As shown in our study proteinuria progressed from microalbuminuria to macroalbuminuria as duration of diabetes increased. The mean duration of diabetes in microalbuminuric group was 11.25±4.64 years and in macroalbuminuric group, it was 14.94 ±5.65. This increase in duration is significant (p<0.05). There was a significant increase in the duration of diabetes between normoalbuminuric (4.20±3.08) and microalbuminuric patients (11.25±4.64) (p<0.05) and between normalbuminuric and macroalbuminuric patients (4.94±5.65) (p<0.05) and duration of diabetes was significantly raised between micro albuminuric and macroalbuminuric (p<0.05).

In our study the normalbuminuric group, 25 (36.76%) patients had hypertension and 4 (5.88%) had ischaemic heart disease, 18 (26.4%) had neuropathy and 5 (7.35%) had retinopathy. In the microalbuminuric group, 29 (63.04%) had hypertension and 13 (28.26%) had ischaemic heart disease, 20

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(33.47%) had neuropathy and 7 (15.21%) had retinopathy and in the macroalbuminuric group, 25 (69.44%) had hypertension and 28 (77.77%) had ischaemic heart disease, 12 (33.33%) had neuropathy and 6 (16.66%) had retinopathy. Thus we see that there is a rise in prevalence of hypertension and cardiovascular disease and retinopathy as proteinuria progresses from normal albuminuria to microalbuminuria to macroalbuminuria.

This suggests that with time, as the degree of proteinuria increases in diabetes, the incidence of other complications shows a rising trend. This further makes it necessary to check progression of microvascular disease at an early stage by keeping good glycaemic control and other measures like antihypertensives and ACE inhibitors.

Conclusion

In this study, it was concluded that nephropathy begins with microalbuminuria and slowly over a period of 10-20 years progresses to macroalbuminuria. The proteinuria had a positive and significant correlation with duration of diabetes and glycaemic control. Blood pressure is also raised in proteinuric patients. Blood urea, serum creatinine also start increasing as nephropathy progresses. Serum cholesterol also correlated more or less with proteinuria.

This study indicates that patients with microalbuminuria must be regarded as a high risk group not only because of the increased risk of progression to nephropathy but also because of the raised prevalence of retinopathy, hypertension and neuropathy.

In view of the large number of diabetic patients at risk of developing diabetic renal disease, it is important to look for early signs of the disease. Microalbuminuria is one test which heralds further progression of microvascular damage of kidneys. Vigorous medical intervention at this stage can help in delaying the debilitating outcome of diabetic renal disease and hence can improve quality of life in diabetic patients over prolonged period.

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