PREVALENCE OF PROTEINURIA AND NEPHROPATHY IN TYPE I DIABETES MELLITUS

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Abstract: **Background & objectives:** Diabetes Mellitus is one of the oldest metabolic disorders causing long term complications involving various systems, though diabetic renal disease remains one of the major complications observed with long standing diabetes[1.] The Insulin dependent diabetes mellitus (IDDM) patients who develop nephropathy are exposed to the excess mortality of 80-100 times that of age and sex matched background population[2.] Diabetic nephropathy, the leading cause of morbidity and mortality in adults with type 1 diabetes mellitus may have its roots since childhood. The detection of microalbuminuria in patients with Type 1 Diabetes (T1DM) may provide an early opportunity to study the natural history and plan earlier interventions[3.] This study examined the impact of duration of diabetes, demography (age, gender) and metabolic factors on the frequency of proteinuria among type 1 diabetic patients admitted in Guru Nanak Dev Hospital attached to Govt. Medical College, Amritsar. All the patients of type 1 diabetes mellitus (T1DM) were included in the study irrespective of the duration of disease, age and sex. **Methods:** It is a crossectional study in which 56 patients suffering from the disease admitted in hospital were examined clinically after taking a detailed history and investigated for the parameters like fasting and postprandial blood glucose (FBS, PP), body mass index (BMI), blood urea and serum creatinine, serum proteins, serum cholesterol, urine protein and blood pressure. **Results & interpretation:** The data collected was analysed by chi square test to determine the statistical significance and the percentages of the parameters were calculated by SPSS (version 18.0). Maximum number of patients(40.3%) were in the age group of 30-39 years followed by 32.2% in the age group of 40-49 years with mean age 38.7 years. 44.6 % patients were having duration of diabetes 6-10 years and 25.1% had duration of 11-15 years, 7.1% had duration between 1-5 years and 23.2 % were less than one year. The mean duration was 7.8 years. The numbers of associated complications were high, 23.2% cases were having hypertension, 30.3% had neuropathy and 3.57 % had associated ischaemic heart disease. 39.27% patients showed abnormal proteinuria. 16.07% had mild proteinuria and 23.2.44 % had nephropathy. **Conclusion:** The prevalence of mild proteinuria started increasing with increasing duration and was maximum after 10 years duration ($p < 0.001$) as compared to those having less than 5 years and 5-10 years. In our study, number of males having mild proteinuria and nephropathy was more than females. However the results were not statistically significant. Thus it was concluded that proteinuria occurred in 9 out of 56 diabetic patients investigated for the same and the risk of nephropathy increases with duration of disease.

Key words: Nephropathy, proteinuria , type 1 diabetes mellitus (T1DM) .

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Introduction:

Diabetic nephropathy(DN) is a clinical syndrome characterised by persistent albuminuria associated with relentless decline in the glomerular filteration rate and raised arterial blood pressure. It is presently the leading attributable cause of chronic kidney disease (CKD)[4.] In its typical course, patients thereafter develop microalbuminuria , the excretion of albumin in the range of 30 -300 mg/dl. Normal persons excrete less than 30mg/dl. When proteinuria is greater than 550 mg/dl this degree of leakage is termed as macroproteinuria[5.] Subsequently with progressive proteinuria , GFR tends to fall in a linear fashion , terminating with end stage renal failure (ESRF) after about 10 years. In general, patients with nephropathy have a duration of diabetes significantly longer than those without this complication . Characteristically, it takes 10-20 years of known diabetes before the clinical manifestation of nephropathy appears. In addition to the tremendous health care costs of these diabetic patients with end stage renal disease, the incalculable costs of suffering and loss of human productivity demands early diagnosis and alleviation of the debilitating outcome of diabetic renal disease.

Microalbuminuria(MA) being an early predictor of DN provides a prospect for its detection in manageable condition and reduce the morbidity and mortality rate due to the same[6].

Material and Methods:

This crossectional study was conducted on 56 diabetic patients admitted in Guru Nanak Dev Hospital attached to Govt. Medical College.

The data collected was analyzed by chi square test to determine the statistical significance and the percentages of the parameters were calculated by SPSS (version 18.0).

Inclusion criteria:

All the patients of type 1 diabetes mellitus were included in the study irrespective of the duration of disease, age and sex. Confirmation of diagnosis was made from patient folders before being recruited into the study.

Exclusion criteria:

1. Patients with any febrile illness.
2. Patients with urinary tract infection.
3. Those having signs of diabetic ketoacidosis (DKA) and those with preexistent renal disease were excluded from the study.

The study design was approved by the Ethical Committee of the Institute. Informed consent was taken from all the subjects.

Detailed clinical history of all the patients was recorded including age, duration of diabetes, course of illness , associated hypertension and other complaints. All of them had a clinical examination with measurement of blood pressure. The biochemical parameters including Fasting and postprandial blood glucose (FBS), blood urea and serum creatinine, serum proteins, serum cholesterol, urine protein were recorded. Urine samples were collected for 24 hours from 8.00 AM to 8.00 AM next day. All the samples were mixed and measured and albumin estimation in 24 hrs was done by Esbach's method[7].

Result:

56 patients of type 1 diabetes were studied to know the prevalence of proteinuria in diabetes mellitus in this part of the country. Out of 56 subjects , 34(60.8%) were males and 22 (39.2%) were females. (Table 1) Thus males outnumbered the females

As shown in table 2,Out of 56 IDDM patients, 5 (8.9%) were in the age group of 10-19 years, 5 (8.9%) in the age group of 20-29 years, 28 (50%) patients were in age group 30-39 years, 18 (32.2%) patients in the age group of 40-49 years. It was seen that maximum patients were in the age group of 30-39 years. The mean age was found to be 38.7 years.

It was observed (table - 3) that the maximum number of patients 25/56 i.e. 44.6% were having duration of diabetes 6-10 years followed by 14 patients i.e.25.1% having duration of 11-15 years. Only 13 (23.2%) were having duration less than 1 year and 4 (7.1%) patients were having duration of 1-5 years . The mean duration was found to be 7.8 years. Table no 3 also shows that out of 56 patients 9 (16.07%) had mild proteinuria (150-500mg/day) and 13 had proteinuria above 500mg/d. A total of 22 (39.27 %) patients had abnormal proteinuria. The distribution of mild proteinuria with duration of diabetes revealed that only 1 patient (11.1%) had diabetes of less than 5 years , 2 (22.22%) had 5-10 years and 6 (66.66%) patients had diabetes of more than 10 years of duration . The prevalence of mild proteinuria was statistically significant in patients with duration of diabetes between 5-10 years as compared to patients with duration less than 5 years (p value <0.05). Similarly prevalence of mild proteinuria in patients with diabetes of more than 10 years duration was statistically very significant ($p<0.001$) than the other 2 groups. Out of 13 patients having overt nephropathy (proteinuria > 500mg/d) only 1 (7.69%) patient had duration of diabetes less than 5 years, 3 (23.07%) had duration between 5-10 years, 9 (69.24%) had duration more than 10 years. Thus the prevalence of nephropathy was found to be significantly higher inpatients with duration between 5-10 years than patients with less than 5 years of diabetes (p value < 0.01). Similarly , the prevalence of nephropathy in patients wit duration of more than 10 years was statistically very significant (p value < 0.001) as compared to other two groups. (table 3)

It was found (table - 4) that 17 (30.3 %) patients were having neuropathy ,13 (23.2%) were having hypertension, while 2(3.57 %) patients were having associated ischaemic heart disease. Total number of complications was found to be 32 in the study group.

It was observed (table no 5) that out of 34 male patients with type 1 diabetes, 14 (41.17%) have

abnormal proteinuria while out of 22 female patients, 8 (36.66%) were having abnormal proteinuria. However the difference was not statistically significant (p value > 0.05)

Table no 5 also shows that out of 34 male patients with T1DM, 8(23.51 %)were having nephropathy and out of 22 female patients,5 (22.7%) had nephropathy. The difference between the two groups was not significant. (p value >0.05)

Table:1

Distribution of sex in patients with Type 1 DM

Sex	No. Of patients	Percentage
Male	34	60.8
Female	22	39.2
Total	56	100

Table- 2 : Age distribution amongst the patients

Age group in yrs	Total no. Of patients	% of total
10-19	5	8.9
20-29	5	8.9
30-39	28	50.0
40-49	18	32.2
Total	56	100.0

Table -3: Duration of diabetes and distribution of proteinuria and nephropathy with it

Duration in years	Total no. Of patients	% of total	No. of patients with proteinuria(n=9)	%age	No. of patients with nephropathy(n=13)	%age
<1	13	23.2	0	0	0	0
1-5	4	7.1	1	11.11	1	7.69
6-10	25	44.6	2	22.22	3	23.07
11-15	14	25.1	6	66.66	9	69.24
Total	56	100.0	9	100.00	13	100.00

Table - 4: Associated complications observed in the patients

Complication	No. Of patients (n=56)
Hypertension	13 (23.2%)
Neuropathy	17 (30.3 %)
Ischaemic heart disease	2 (3.57 %)
Total	32

Table - 5: Sex distribution in relation to abnormal proteinuria and nephropathy.

Sex	Total no of patients	Patients with proteinuria(n=78)	Percentage	Patients with nephropathy	Percentage
Male	34	14	41.17	8	23.5
Female	22	8	36.66	5	22.7
Total	56	22		13	

Discussion:

Our study examined the impact of duration of diabetes, demography, age& gender and associated complications on the frequency of proteinuria and further development of nephropathy among type 1 diabetic patients

Sex: We noticed that there was slight male preponderance in the distribution of the disease. It could be due to more male dominated society and concern only about their health which leads to less reporting of female patients to the hospitals for the same disease. Similar results were noticed by Vijay et al and Ballard et al[6,8].

Age: Mean age of the patients in our study was 38.7 years and maximum patients were in the age group of 30-39 years. Similar incidence were noted by Vijay et al(1994)[6].They found the mean age of 54$\pm$10.5 years in their study.

Duration of diabetes: The mean duration was found to be 7.8 years .The mean duration in the present study is less than the earlier study by Vijay et al (1994), who found it to be 12.5$\pm$7 years[6]. This difference may be due to different design and size of the study.

Associated complications: The total number of complications was found to be 32. The high percentage of hypertension and neuropathy in IDDM patients in the present study is consistent with the study of Agardh et al who found that IDDM patients having poor metabolic control have high levels of systolic and diastolic pressure[9]. Rossing et al , Gall et al also found elevated blood pressure to be an independent risk factor for

development and progression of proteinuria in DM[10,11.]

Proteinuria: A total of 22 (39.27%) patients showed abnormal proteinuria. 9 (16.07%) had proteinuria in the range of 150-500mg/day. This finding is consistent with the findings of Anderson et al who found abnormal proteinuria in 21% patients,[6] Klein et al (1995) in 28% patients while 13 (23.2%) patients inour study had proteinuria in the nephropathy range (>500mg/day) similar to the results of study done by Faber et al[12] and Vijay et al [6].

Proteinuria in relation to duration of diabetes: The prevalence of proteinuria in patients with more than 10 year diabetes was statistically highly significant as compared to other two groups ($p<0.001$).

The prevalence of nephropathy with relation to duration of diabetes: The prevalence of nephropathy in patients with 5-10 years of diabetes was statistically significant as compared to patients with less than 5 years of diabetes ($p <0.01$), while the prevalence of nephropathy in patients with more than 10 years of diabetes was statistically highly significant as compared to other two groups ($p<0.001$).Stratton et al, Peterson JC and Ramirez also confirmed the duration of diabetes as an important factor in the development of proteinuria[13,14,15.]

Thus it was seen that the prevalence of proteinuria (both mild as well as overt) starts increasing with the duration of diabetes and rises dramatically after 10 years of duration of diabetes ($p< 0.001$)[16,17,18,19.]

Sex distribution in relation to proteinuria and nephropathy: It was noted that men had increased incidence of proteinuria and nephropathy with increased duration. However the difference in genders was not statistically significant ($p >0.05$). Result of our study is consistent with the study done by Johnsen et al[20.]

Conclusion:

Our study examined the impact of duration of diabetes, demography (age, gender) and metabolic factors on the frequency of proteinuria and nephropathy among type 1 diabetic patients admitted in Guru Nanak Dev Hospital attached to Govt. Medical College, Amritsar. It was concluded that all these factors like age, sex, duration of disease and associated complications individually contribute to kidney damage ultimately resulting in hyperfilteration and consequently proteinuria, which is a cardinal sign of overt nephropathy. The difference in the incidence related to gender was not statistically and practically significant .Increasing duration of the disease, increasing age and associated complications increase the prevalence of proteinuria. Strategies to mitigate the occurrence of nephropathy should be targeted at early diagnosis of diabetes and suitable control of the disease as well as associated complications.

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