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Clinical Profile of Diabetic Nephropathy and Diabetic Retinopathy in a Tertiary Care Hospital

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Abstract

Background: Diabetic nephropathy is one of the leading causes of chronic renal failure in India contributing to over 30% of cases.In the last 50 years, blood urea and serum creatinine estimation have become the most commonly used serum markers of renal function. The aim is to assessment on Clinical Profile of Diabetic nephropathy and diabetic retinopathy in a tertiary care hospital. **Subjects and Methods:** Study was conducted in KIMS hubli on patients with type 2 diabetes mellitus and total of 137 patients were included in the study based on inclusion and exclusion criteria. Patients were divided in to two groups based on their UAC ratio, group A with normoalbuminuria patients and group b with microalbuminuria patients. Statistical analysis were conducted and results were drawn. **Results:** Mean age of subjects in Group A was 55.24 ± 5.9 years and in Group B was 54.77 ± 5.4 years. Male predominance was observed in the study among both the groups. Mean Hba1C in group A is 7.18 ±0.28 and in group B is 7.68 ±0.27. Mean duration from the onset of diabetes mellitus in group A is 5.68 ± 2.37 and in group B is 6.48 ± 1.95. Mean RBS on admission in group A was 183.67 ± 38.3 and in group B was 206.71 ± 38.6. In group A, 22 members were found to have diabetic retinopathy where as in group B 42 members were found to have diabetes mellitus. Mean Urine albumin in Group A was 13.30 ± 2.22 micro/ml and in Group B was 123.87 ± 46.67 micro/ml. There was significant difference in urine albumin between two groups. Mean Urine creatinine in Group A was 48.38 ± 6.64 mg/dl and in Group B was 101.44 ± 20.93 mg/dl. There was significant difference in Urine creatinine between two groups. **Conclusion:** It can be concluded that serum cystatin C is elevated much earlier than UACR rises and microalbuminuria appears and hence a better predictor of nephropathy among type 2 DM subjects.

Keywords: Diabetic Nephropathy, Micoalbuminuria, Retinopathy.

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Introduction

Type 2diabetes has become the most common metabolic disorder in India and is a growing problem with over 40 million diabetic subjects. The "Asian Indian phenotype" is associated with increased insulin resistance, greater abdominal adiposity despite lower body mass index, lower adiponectin and higher high sensitivity C - reactive protein levels and makes Asians more prone to diabetes. Among Indians, the onset of type 2 diabetes occurs at a younger age and hence, they are vulnerable to all the complications of diabetes due to longer duration of the disease.

Diabetic nephropathy is one of the leading causes of chronic renal failure in India contributing to over 30% of cases.[1] In the last 50 years, blood urea and serum creatinine estimation have become the most commonly used serum markers of renal function. Urea concentration in the blood can vary with diet, hepatic function and numerous disease states. Furthermore, the rate of appearance of serum creatinine in the blood stream is related to muscle mass and its blood concentrations are affected by diet, age, race and gender. As plasma concentrations increase, the tubular secretion of serum creatinine increases, leading to an overestimation of GFR. Serum creatinine is also insensitive for detecting small decreases in GFR because of the nonlinear relationship between plasma concentration and GFR.[2]

Microalbuminuria can detect early diabetic nephropathy. However, short-term hyperglycemia, exercise, urinary tract infections, marked hypertension, heart failure and acute febrile illness can also cause transient elevations in microalbuminuria. There is also a marked day-to-day variability in albumin excretion.[3] The care of patients with diabetes and end stage

renal disease contributes significantly to health care costs. In the past couple of decades, there have been notable advances in our knowledge regarding the early stages of diabetic kidney disease, including the advent of interventions that can significantly slow or even reverse the progression of disease. The limitations of currently available parameters in detecting renal dysfunction early have prompted a search for newer, more reliable markers of renal function.

India, with over 40 million diabetic subjects, is threatening to become the Diabetes Capital of the world. Based on current trends of the growing diabesity epidemic, it has been projected that by the year 2025 this number will increase to 69 million. The Asian Indian phenotype is associated with increased insulin resistance, greater abdominal adiposity despite lower body mass index, lower adiponectin levels and higher highly sensitive C-reactive protein which makes Indians more prone to diabetes. Among Indians, the onset of type 2 diabetes occurs at a younger age making them more vulnerable to all its complications owing to longer duration of disease. [1]

Being a multi-organ disease, diabetes causes macrovascular and microvascular complications that in turn contribute to the morbidity and mortality associated with it. Nearly 30% of chronic kidney disease in our country is due to diabetic nephropathy and it is thus the single most common cause of chronic renal failure in India. [3]

Diabetic nephropathy is a syndrome characterized by persistent albuminuria (>300 mg/24 hr.), a progressive decline in GFR, raised arterial blood pressure, and enhanced cardiovascular morbidity and mortality. [4] A clinical diagnosis of diabetic nephropathy can be made if, in addition to persistent albuminuria there is a co-existent of retinopathy in the absence of clinical or laboratory evidence of other kidney or renal tract disease.

Aims

Assesment on Clinical Profile of Diabetic nephropathy in a tertiary care hospital using renal function tests and microalbuminuria. and diabetic retinopathy using fundoscopy.

Subjects and Methods

This prospective observational study was done on Type 2 DM patients admitted from 2018 to 2020 in the Department of Medicine at Karnataka Institute of Medical Sciences, Hubballi. Institutional ethical committee approval was obtained prior to the start of the study. and written informed consent was taken from all the patients prior to the start of the study. A total of 137 subjects with Type 2 Diabetes Mellitus were included in the study The inclusion criteria for cases: All Type 2 Diabetes Mellitus cases aged above 18 years admitted to KIMS Hospital in Department of General Medicine. The exclusion criteria were patients who were already diagnosed with nephropathy, patients with either serum creatinine levels are elevated or macroalbuminuria present and patients who did not give consent for the study. Purposive sampling technique was adapted in the present to recruit the subjects. Patients fulfilling the inclusion criteria were included during the study duration. Data was collected by using a Pretested Structured questionnaire method. All patients were subjected to detailed history, clinical examination and below mentioned laboratory investigations were done as per standard procedures: Complete blood count (CBC), RBS, Glycosylated hemoglobin (HbA1c), Kidney function test (Urea, creatinine, uric acid), Urine routine for protein, Urine albumin, urine creatinine and urine albumin creatinine ratio (UACR) and Fundscopy. Further Patients were then divided in to two groups. Group A will be patients with normoalbuminuric that is UACR less than <=30mg/g and Group B with micro albuminuria i.e. UACR >30 mg/g. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. Microsoft Excel and Microsoft word were used to obtain various types of graphs and p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel and SPSS version 22**.**

Results

Mean age of subjects in Group A was 55.24 ± 5.9 years and in Group B was 54.77 ± 5.4 years. In the study 21.2% were in the age group <50 years, 56.2% were in the age group 51 to 60 years, 22.6% were in the age group >60 years. In Group A, 22.7% were in the age group <50 years, 52% were in the age group 51 to 60 years, 25.3% were in the age group >60 years. In Group B, 19.4% were in the age group <50 years, 61.3% were in the age group 51 to 60 years, 19.4% were in the age group >60 years. There was no significant difference in age distribution between two groups as shown in [Table 1]. In the study 41.6% were females and 58.4% were males. In Group A, 40% were females and 60% were males and in Group B, 43.5% were females and 56.5% were males. There was no significant difference in sex distribution between two groups as shown in [Table 2]. In the present study, the mean duration of diabetes mellitus in group A is 5.69±2.37 where as in group B it was 6.48±1.95. there was no significant difference between the two groups as shown in [Table 3]. The mean Hba1C value in group A was 7.18±0.28 in the present study where as in group B was 7.68±0.27. There was significant difference between the two groups. The mean RBS at the presentation to the hospital was 183.67 ±38.31 in group A whereas it was 206.71

Table 1: Age distribution of subjects and comparison between two groups

		Group					
		Group A		**Group B**		**Total**	
		Count	**%**	**Count**	**%**	**Count**	**%**
Age	<50 years	17	22.7%	12	19.4%	29	21.2%
	51 to 60 years	39	52.0%	38	61.3%	77	56.2%
	>60 years	19	25.3%	12	19.4%	31	22.6%
	Total	75	100.0%	62	100.0%	137	100.0%
	χ 2 =1.233, df =2, p =0.540						

± 38.6 in group B. There was significant difference between the two groups. In the present study, out of 75 patients in the group A, 22 patients showed features of diabetic retinopathy that is 29.33% of patients where as in group B 42 patients out of 62 that is 67.74% of the patients showed features of retinopathy. There was a significant difference between the two groups. It shows that, diabetic nephropathy most of the times it will be associated with diabetic retinopathy.

Discussion

Diabetes is an emerging health problem in developed as well as developing countries. India has the highest prevalence of diabetes in the world. It has gained much popularity due to its various microvascular and macrovascular complications. As diabetes is an independent risk factor for cardiovascular and cerebrovascular disease, the early detection of diabetes and its complications is of utmost importance.[5,6]

Once of the most important microvascular complications of diabetes are diabetic nephropathy. Diabetic nephropathy is the leading cause of chronic kidney disease (CKD) in patients starting renal replacement therapy and is associated with hypertension and a high risk of cardiovascular morbidity and mortality. The presence of microalbuminuria is a known complication in patients of diabetes. It is an early sign that before glomerular filtration rate (GFR) deteriorates. In Type 2 diabetes, the incidence of microalbuminuria is around 2.0% per year and the prevalence at 10 years after diagnosis is around 25%. Although a reliable investigation, collection of urine over 24 h and other factors (i.e., Short-term hyperglycaemia, exercise, urinary tract infections, marked hypertension, heart failure, and acute febrile illness) influencing its presence makes testing for microalbuminuria a very tedious job 137 patients with Type 2 diabetes either attending the OPD or admitted to hospital were included in our study.[7,8] A detailed history with special importance to a number of years of diabetes and other comorbidities were taken. A complete clinical examination and Group A consisted of Type 2 DM subjects with Normal albumin levels and Group B consisted of 62 subjects with micro albuminuria.

In the present study Mean age of subjects in Group A was 55.24 ± 5.9 years and in Group B was 54.77 ± 5.4 years. In Group A, 22.7% were in the age group <50 years, 52% were in the age group 51 to 60 years, 25.3% were in the age group >60 years. In Group B, 19.4% were in the age group <50 years, 61.3% were in the age group 51 to 60 years, 19.4% were in the age group >60 years. There was no significant difference in age distribution between two groups. Similar observations were made by Yun Kyung Jeon et al.[9] and Varun Shetty et al.[10] were in majority of subjects were in the age range of above 55 years in both the groups.

In the present the study, there were 45 male patients and 30 female patients in the group A and in group B there were 35 male patients and 27 female patients were there. It was similar to other studies like Varun Shetty et al,[10]where there was male preponderance in the study.

In Varun Shetty et al, there were 15 male patients and 5 female patients in group A and 12 male patients and 8 female patients in the group B. Al-Wakeel et al,[11] showed that the peak incidence of diabetic nephropathy was present between 50 and 70 years if age. The mean age of the onset of diabetes is early, and the majority have diabetes in their forties. Studies conducted by Ericksson et al,[12] Pan et al,[13] Williams et al,[14] and Kanaya et al,[15] show that males are more prone to develop diabetes than females.

In the present study, the mean Hba1C values in group A was 7.18±0.28 in group A and 7.68±0.27 in group B as shown in [Table 6]. Similar findings were seen in studies conducted by Sheuly et al,[16]where the mean value was 7.53±1.72 in group A and 7.90 ± 1.69 in group B. also in Joen et al,[9] the mean Hba1c value in group A was 7.3± 1.5 and group B was 7.8± 1.9. In study conducted by Geetha.et al,[17] group A had mean Hba1c value of 8.63 ± 6.70 and in group B 9.25 ± 2.72. Hence can be concluded that patients with micro albuminuria had more uncontrolled sugar levels when compared with patients with normoalbuminuria.

In the present study, the mean duration since the onset of diabetes mellitus in group A is 5.69 ±2.37 and in group B is 6.48± 1.95, which is almost comparable with M sigdel et

Table 2: Sex distribution of subjects and comparison between two groups

		Group					
		Group A		Group B		Total	
		Count	%	Count	%	Count	%
Sex	Female	30	40.0%	27	43.5%	57	41.6%
	Male	45	60.0%	35	56.5%	80	58.4%
	Total	75	100.0%	62	100.0%	137	100.0%
	χ 2 =0.176, df =1, p =0.675						

Table 3: Distribution of duration of diabetes mellitus between the groups

Duration of years	Group A (number of patients)	Group B (Number of patients)	p value
<5 years	39	12	
5-10Years	29	47	
>10 years	7	3	
Mean ±SD	5.69±2.37	6.48±1.95	0.04

Table 4: Variation in Hba1C and RBS values in both the groups

Parameter	Group A	Group B	P value
Hba1c (mean ± SD)	7.18(±0.28)	7.68(±0.27)	<0.01
RBS (mean± SD)	183.67(±38.31)	206.71(±38.6)	<0.01

Table 5: showing number of patients having retinopathy in both the groups

Retinopathy	Group A	Group B	Total	Chi square
Yes	22 (29.33%)	42 (67.74%)	46.72%	
No	53 (70.67%)	20 (32.26%)	53.28%	
Total	75 (100%)	62 (100%)	137 (100%)	< 0.01%

al,[18] study where the mean duration since onset of diabetes mellitus is 3.40± 0.57 years in group A and 5.01 ± 0.58 in group B as shown in [Table 7].

In a study conducted by N K Chowta et al,[19] the mean duration of diabetes mellitus in group A was 3.21 ± 2.01 where as 10.66 ± 5.02 in group B. Hence it can be derived that as in increase in the duration of disease, the chances of developing micro albuminuria and hence so nephropathy is greater.

In the presence study, there was significant difference between two groups in association with diabetic nephropathy. In group A, there were 22 patients who had diabetic nephropathy findings on fundoscopy out of 75 patients where as in group B 42 patients had diabetic retinopathy out of 62 patients as shown in [Table 8].

Similarly in Eugene Sobngwi et al,[20] study there was significant difference between the two groups with more retinopathy patients in group B, where 21 patients had retinopathy out of 34 patients compared to 3 patients out of 30 patients in group A. so it can be said that diabetic retinopathy can be found associated with diabetic nephropathy and can be used as an important risk factor for the development of nephropathy.

Various other studies have also shown that presence of microalbuminuria is an early indicator of diabetic nephropathy. de Zeeuw et al,[21] while working on the RENAAL study showed that albuminuria is the most critical baseline predicator for end-stage renal disease. Chiarelli et al. showed that microalbuminuria is and an early sign that appears before GFR (derived using creatinine-based Cockcroft-Gault equation) deteriorates. Mogensen et al,[22] and Keane et al,[23] also showed that proteinuria was the strongest and most consistent marker for diabetic nephropathy. Date from the UKPDS demonstrated that approximately 25% of patients with Type 2 diabetes develop microalbuminuria or worse, diabetic nephropathy by 10 years. It is estimated that almost 50% of patients who develop microalbuminuria do so within 19 years from diagnosis of diabetes. From any stage of diabetic

Table 6: mean Hba1C values between groups

		Group				P value
		Group A		Group B		
		Mean	SD	Mean	SD	
Hba1c	Present study	7.18	0.28	7.68	0.27	<0.01
	Sheuly et al,[16]	7.53	1.72	7.90	1.69	0.04
	Kyung Jeon et al,[9]	7.3	1.5	7.8	1.9	0.015
	Geetha et al,[17]	8.63	6.70	9.25	2.72	0.61

nephropathy, the rate of deterioration to the next stage is 2-3% per year.

Conclusion

It can be concluded that as the duration of presence of diabetes mellitus increases, the risk of developing nephropathy also increases. From the study, it can be concluded that patients having diabetic nephropathy are also more commonly will be associated with diabetic retinopathy.

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Table 7: Duration of Diabetes mellitus

		Group				P value
		Group A		Group B		
		Mean	SD	Mean	SD	
Duration	Present study	5.69	2.37	6.48	1.95	0.04
	Geetha et al,[17]	10.36	6.81	12.59	8.25	0.14
	M Sigdel et al,[18]	3.40	0.57	5.01	0.58	<0.05
	N K Chowta et al,[19]	3.21	2.01	10.66	5.02	<0.001

Table 8: Presence of diabetic retinopathy:

		Group				p value
		Group A		Group B		
		Yes	No	Yes	no	
Diabetic retinopathy	Present study	22	53	42	20	<0.01
	Eugene Sob-ngwi et al,[20]	3	27	21	13	< 0.05

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