Original Article

Diabetic Retinopathy in Diabetic Patients with Diabetic Nephropathy

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Objective: The aim of this study was to discover the stages of diabetic retinopathy in patients with diabetic nephropathy.

Study design: Descriptive cross sectional study.

Place and Duration: It was conducted in medical teaching institute Lady Reading Hospital Peshawar. Duration of study was from October 2015 to 0ctober 2016.

Material and Methods: 208 participants with type 1 and 2 diabetes having diabetic nephropathy were included in the study. Patients either requiring or not requiring hemodialysis, were also included. The data was analyzed with statistical package for the social sciences (SPSS) 16.0. Frequency of different variables was calculated in percentage.

Results: Non-proliferative diabetic retinopathy (NPDR) were found in 102 cases (49%) while proliferative diabetic retinopathy (PDR) was in 79 cases (38%) and normal fundi were found in 27 patients (13%). Among 69 patients who required hemodialysis, 65.2% were having PDR, 31.88% having NPDR and 2.89% normal fundi. Among 139 patients who were stable 34 had PDR (24.46%). NPDR was seen in 80 (57.55%) and normal fundi were observed in 25 (17.98%) patients. Among 184 hypertensive patients 41.84% had PDR, 54.34% had NPDR and 3.80% had normal fundi. Out of 24 normotensive patients 8.33% had PDR, 8.33% had NPDR and 83.33% had normal fundi. In 32 type 1 diabetic patients, 62.50% had PDR, 25% had NPDR and 12.5% had normal fundi. Out of 176 type 2 diabetic patients 33.52% had PDR, 53.40% NPDR and 13.06% normal fundi.

Conclusion: Most of the diabetic patients who had nephropathy had diabetic retinopathy.

Key words: Diabetic Nephropathy; Diabetic Retinopathy; Hemodialysis; Non proliferative Diabetic Retinopathy; Proliferative Diabetic Retinopathy.

Diabetes is a group of chronic diseases, that occurs when the body does not produce any or enough insulin. In modern health system, there is a variety of lifestyle and pharmaceutical interventions used for preventing and controlling diabetes[1]. The development of chronic complications of diabetes are closely related to glycemic control. Micro and macro vascular pathological complications can involve various organs and tissues resulting in significant morbidity and mortality[2]. As the number of people with diabetes are increasing the development of microvascular complications like retinopathy, nephropathy and neuropathy are also rising[3].

Diabetic nephropathy and retinopathy are the two most serious complications of diabetes mellitus leading to blindness. As the patient advances to end stage renal disease and blindness, the socioeconomic and medical cost burden increases on patient as well

as health care system[4].

There is a close relationship between diabetic retinopathy and nephropathy. Microangiopathy is the underlying disorder with a histopathological co-relation with each other[5]. Changes in the microcirculation result in the increase of blood viscosity and platelet aggregation leading to retinal capillary wall thickening. Microangiopathy leads to hyper-permeability and ischemia of retinal vessels[6]. The most important cause of end stage renal disease is diabetic nephropathy[2].

Diabetic retinopathy is a diagnostic and screening tool for diabetic nephropathy in type 2 diabetic patients with renal disease. Proliferative diabetic retinopathy may be a highly specific indicator for diabetic nephropathy[7]. The annual incidence of proliferative diabetic retinopathy is 10-15% in early nephropathy compared to only 1% in patients without nephropathy. Long-term improvement of metabolic control by using insulin infusion pumps and antihypertensive especially ACE inhibitors seems to stop the further progression of early nephropathy and significantly improves the clinical outcome[8]. The aim of this study was to find out the diabetic retinopathy and its stages in patients with diabetes having diabetic nephropathy.

MATERIAL AND METHODS

The study was carried out in Lady Reading hospital in the department of nephrology with the collaboration of Ophthalmology department from October 2015 to 0ctober 2016. It was descriptive cross sectional study and comprised of 208 participants with diabetes having diabetic nephropathy. Male and female patients of all age groups were included in the study. Both type 1 and type 2 diabetics were included. These patients were further stratified as those that required hemodialysis and those who were stable, patients who were hypertensive and patients who were normotensive. All type 2 diabetics who had nephropathy were included irrespective of time duration. While diabetic nephropathy patients who had type 1 diabetes of less than 5 years duration were excluded.

Written consent was taken from all patients, bio data was entered on prescribed proforma. Variables were entered in SPSS 16.0. Variables were name, age, sex, duration and type of diabetes, blood pressure, urea creatinine, fundoscopy findings, dialysis received or not was recorded. Fundoscopy findings broadly categorized as non-proliferative diabetic retinopathy, proliferative and normal fundi.

RESULTS

Total number of patients was 208. Age ranged from 20 years to 83 years. Mean age was 53.40 years with Standard deviation of ± 12.26. Male were 113 (54.3%) while females were 95 (45.7%). Type 1 diabetics were 32 (15.4%) while type 2 diabetics were 176 (84.6%). Total number of hypertensives were 184 (88.5%) while normotensives were 24 (11.5%). Non-proliferative diabetic retinopathy (NPDR) was found in 102 cases (49%) while proliferative diabetic retinopathy (PDR) was seen in 79 cases (38%) and normal fundi were found in 27 patients (13%). Hemodialysis was done in 69 patients (33.2%) while 139 patients (66.8%) were stable not requiring renal replacement therapy. Among the patients that required hemodialysis, 45 (65.21%) had proliferative diabetic retinopathy, 22 (31.88%) were having non-proliferative diabetic retinopathy and 2 (2.89%) had normal fundi. Those who were stable and not required dialysis were 139 in number having PDR in 34 (24.46%) patients, NPDR in 80 (57.55%) and normal fundi in 25 (17.98%). 184 patients were found hypertensive. Among these hypertensive patients, 41.84% were having PDR, 54.34% were having NPDR, and 3.80% had normal fundi. Out of 24 normotensive Patients, 8.33% had PDR and the same percentage of patients had NPDR

Table 1: Demographics.

Total Number of Patients	208
Age	20-83 years
Mean age	53.40 years
Standard deviation	± 12.26
Male	113 (54.3%)
Female	95 (45.7%)
Type1	32 (15.4%)
Typ2	176 (84.6%).
Hypertension	184 (88.5%)
Normotensive	24 (11.5%).
NPDR	102 (49%)
PDR	79 (38%)
Normal fundi	27 (13%)
Dialysis	69 (33.2%)
Stable patients	139 (66.8%)

Table 2: Percentages of patients with different stages of diabetic retinopathy in people with diabetes having diabetic nephropathy, further stratified in hypertensive and normotensive, type I and type II diabetics and those who require hemodialysis and stable (does not require hemodialysis.

	Hemodylasis n =(69)	Stable n = (139)	Hypertensive n = (184)	Normotensive n = (24)	Type 1 n = (32)	Type 2 n = (176)
PDR	45 (65.21%)	34 (24.46%)	77 (41.84%)	2 (8.33%)	20 (62.50)	59 (33.52%)
NPDR	22 (31.88%)	80 (57.55%)	100 (54.34%)	2 (8.33%)	8 (25%)	94 (53.40%)
Normal Fundus	2 (2.89%)	25 (17.98%)	7 (3.80%)	20 (83.33%)	4 (12.50%)	23 (13.06%)

while 83.33% had normal fundi. Out of 32 type 1 diabetic patients, 62.50% patients had PDR, 25% had NPDR and 12.5% had normal fundi. Out of 176 patients of type 2 diabetes, 33.52% patients had PDR, 53.40% patients had NPDR and 13.06% had normal fundi.

DISCUSSION

The three microvascular complications of diabetes are diabetic retinopathy, diabetic nephropathy and diabetic neuropathy[9]. Some recent studies have shown that diabetic retinopathy is a risk factor for diabetic nephropathy and especially the proliferative stage of diabetic retinopathy may be a very high specific indicator of the diabetic nephropathy[10,11,12] but not an exclusion criterion for non-diabetic renal disease[13].

Therefore, diabetic retinopathy may be useful in diagnosing and screening for the diabetic nephropathy. In this study we have examined people with diabetes having nephropathies. We also found whether these patients had diabetic retinopathies or not and the stages of retinopathies in terms of normal fundi, having no retinopathy and non-proliferative retinopathy and proliferative retinopathy. We also studied these stages in the diabetic retinopathy patients who were hypertensive and normotensive patients, and also in those patients who required dialysis and in those who did not require dialysis and were stable. Finally we examined these diabetic retinopathy stages in diabetic nephropathy patients in type 1 and type 2 diabetic patients. We found that most of the diabetic patients having nephropathies also had retinopathies either in non-proliferative or in proliferative stages and only few had normal fundi. The same findings were shown in the Trial to Reduce Cardiovascular Events with Aranesp Therapy (TREAT) study, which stated that DR was common in diabetic patients having nephropathy[14]. Those patients who required dialysis had proliferative diabetic retinopathies and only a small number of patients had normal fundi. While those who were stable had mainly non proliferative diabetic retinopathy, (however these had more patients having normal fundi than in those who required dialysis). Our study findings are similar to a recent study by Lee et al[15] who showed a direct association between DR and CKD and the presence of CKD and DR was associated with a more rapid reduction in renal function and greater mortality in this group of patients who might benefit from more aggressive treatment. Those who are hypertensive have more NPDR and PDR while negligible amount of patients have normal fundi. Those who are normotensive have high number of patients having normal fundi than NPDR and PDR. In higher number of people with type 1 diabetes and nephropathy have PDR than NPDR and little number of patients have normal fundi. In higher number of people with type 2 diabetes and nephropathy has NPDR than PDR and little number of patients have normal fundi. These results are also comparable to previous study, which established a higher incidence of NPDR than PDR in cases of type 2 diabetes[10].

So from the above discussion, it is now obvious that diabetic patients having nephropathy have high likelihood that these patients would have diabetic retinopathy. Therefore, diabetic patients who present to nephrologist or physician first should also be referred to ophthalmologist to have his or her eyes checkup so that they should be promptly and timely treated. When these patients present to ophthalmologist for the first time, they should be referred to physician or nephrologist. It is also found in this study that the severe the renal disease higher will be the stage of the diabetic retinopathy and vice versa.

Type 1 diabetes and hypertension are also associated with higher stage of diabetic retinopathy. It is uncertain from this study that hypertension along with nephropathy is responsible for this higher number of patients in PDR, or is this the hypertension

alone which poses a high risk for retinopathy progression. Another study is required to find out this relationship. However other studies have shown that hypertension leads to progression of kidney disease and retinopathy and pharmacologic lowering of blood pressure was shown to slow progression of kidney failure and reduce the risk of progression of diabetic retinopathy and vision loss[16,17].

Another drawback of this study is that it is also possible that the nephropathy of some of these patients may not be due to diabetes and it may be a co-incidence that these patients would have non-diabetic nephropathy and having diabetes especially in those patients who have normal fundi. So, those patients having normal fundi and having nephropathy should be further investigated to find out some other cause of nephropathy. However, previous meta-analyses demonstrated that DR could differentiate DN from NDRD with a pooled sensitivity of 0.65 and a pooled specificity of 0.75[18]. When diabetic retinopathy coexists with albuminuria, the likelihood of diabetic nephropathy is very high [19] and lack of retinopathy suggests a non-diabetic etiology for persistent albuminuria in diabetic patients[20].

CONCLUSION

This study concluded that diabetic patients having nephropathy also have diabetic retinopathy. Most of the diabetic patients with nephropathy who require hemodialysis have proliferative diabetic retinopathy and those who do not require dialysis have non-proliferative diabetic retinopathy. Most of Type 1 diabetic Patients with nephropathy have proliferative diabetic retinopathy, most of the Type 2 diabetic patients with nephropathy have non-proliferative diabetic retinopathy and most of the hypertensive diabetic patients with nephropathy have proliferative diabetic retinopathy.

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