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Original article:

Study of microvascular complications in type 2 Diabetes Mellitus

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Abstract

Introduction: Diabetes mellitus (DM) has routinely been described as a metabolic disorder characterized by hyperglycaemia that develops as a consequence of defects in insulin secretion, insulin action, or both. Type 2 diabetes encompasses individuals who have insulin resistance (IR) and usually relative (rather than absolute) insulin deficiency.

Materials and methods The present cross sectional study was conducted on randomly selected newly diagnosed type 2 diabetes mellitus cases coming to the Department of Medicine, Padmashree Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune. The period of data collection was spread over one and half year months from October 2017 to March 2019. After collection of data, the data entry forms were checked for their completeness and missing and incomprehensible data was rechecked from the respective participant profile.

Results: In our study, cases according to type of Microvascular Complications. It was observed that 6 (13.6) cases had Chronic Kidney disease, 14 (31.8) cases had Microalbuminuria, 9 (20.5) cases had Retinopathy, 7 (15.9) cases had Peripheral neuropathy, 4 (9.1) cases had Autonomic neuropathy and 4 (9.1) cases had Erectile dysfunction.

Conclusion: In the present study, prevalence of microvascular complications was found 44% among which 13.6% cases had Chronic Kidney disease, 31.8% cases had Microalbuminuria, 20.5% cases had Retinopathy, 15.9% cases had Peripheral neuropathy, 9.1% cases had Autonomic neuropathy and Erectile dysfunction each.

Introduction:

Diabetes mellitus (DM) has routinely been described as a metabolic disorder characterized by hyperglycaemia that develops as a consequence of defects in insulin secretion, insulin action, or both. Type 2 diabetes encompasses individuals who have insulin resistance (IR) and usually relative (rather than absolute) insulin deficiency. [1] The pathologic hallmark of DM involves the vasculature leading to both microvascular and macrovascular complications. [2] Chronicity of hyperglycaemia is associated with longterm damage and failure of various organ systems mainly affecting the eyes, nerves, kidneys, and the heart. [1]

According to diabetes atlas (7 edition), the global prevalence of diabetes is estimated at 415 million (8.8%), which is predicted to rise to 642 million in next 25 years. In India, there are about 69.2 million people with diabetes and are expected to cross 123.5 million by 2040.

Materials and methods

The present cross sectional study was conducted on randomly selected newly diagnosed type 2 diabetes mellitus cases coming to the Department of Medicine, Padmashree Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune.

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The period of data collection was spread over one and half year months from October 2017 to March 2019. After collection of data, the data entry forms were checked for their completeness and missing and incomprehensible data was rechecked from the respective participant profile. Data entry was done in MS Excel data sheet. This procedure was conducted over the period of 2 months. The data cleaning and the retrieval of the missing data were done over a period of one month. The collected data was analyzed over a three-month period and the report writing was completed by end of Oct 2019.

100 randomly selected newly diagnosed type 2 diabetes mellitus who attend Medicine department were included in the study. Patients were included in the study after taking their voluntary informed consent.

Inclusion criteria

- Type 2 diabetes mellitus patients
- Male or female of
- Age > 40 years irrespective of disease duration

Exclusion criteria

- Type 1 diabetes mellitus patients
- Gestational diabetes mellitus patient

A predesigned semi-structured questionnaire was prepared based on the review of literature on microvascular complications in type 2 diabetes mellitus cases. The questionnaire included the information regarding age, gender, height, weight, BMI, WHR, duration of diabetes and duration of hypertension. It also included information regarding fasting blood sugar, 2 hour post prandial blood sugar, HbA1c level, HDL, LDL, triglyceride and cholesterol level. The data collection sheet included information on microvascular complications and type of microvascular complication.

Results:

In our study , Mean age of the patients was 54.32 year (standard deviation 7.12 years). Age of the patients ranged from minimum 42 year to maximum 70 year.

Table 1 : Distribution of cases according to microvascular complications

Microvascular Complications	Frequency	Percent
Present	44	44.0
Absent	56	56.0
Total	100	100.0

The above table shows distribution of cases according to microvascular complications. It was observed that 44 (44.0) cases had microvascular complications while 56 (56.0) cases did not have microvascular complications.

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Table 2 : Distribution of cases according to type of Microvascular Complications

Microvascular Complications	Frequency	Percent
CKD	6	13.6
Microalbuminuria	14	31.8
Retinopathy	9	20.5
Peripheral neuropathy	7	15.9
Autonomic neuropathy	4	9.1
Erectile dysfunction	4	9.1
Total	44	100.0

The above table shows distribution of cases according to type of Microvascular Complications. It was observed that 6 (13.6) cases had Chronic Kidney disease, 14 (31.8) cases had Microalbuminuria, 9 (20.5) cases had Retinopathy, 7 (15.9) cases had Peripheral neuropathy, 4 (9.1) cases had Autonomic neuropathy and 4 (9.1) cases had Erectile dysfunction.

Table 3 : Comparison of cases according to age and microvascular complications

Age group (in years)	Microvascular complications		Total (%)
	Present	Absent	
41-50	7 (15.9)	25 (44.6)	32 (32.0)
51-60	24 (54.5)	23 (41.1)	47 (47.0)
61-70	13 (29.5)	8 (14.3)	21 (21.0)
Total	44 (100.0)	56 (100.0)	100 (100.0)

P value 0.006

The above table shows the comparison of cases according to age and microvascular complications. It was seen that among microvascular complications present group, 7 (15.9) cases were between 41-50 years, 24 (54.5) cases were between 51-60 years and 13 (29.5) cases were between 61-70 years of age while among microvascular complications absent group, 25 (44.6) cases were between 41-50 years, 23 (41.1) cases were between 51-60 years and 8 (14.3) cases were between 61-70 years of age.

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Table 4 : Comparison of cases according to gender and microvascular complications

Gender	Microvascular complications		Total (%)
	Present	Absent	
Male	26 (59.1)	36 (64.3)	62 (62.0)
Female	18 (40.9)	20 (35.7)	38 (38.0)
Total	44 (100.0)	56 (100.0)	100 (100.0)

P value 0.59

The above table shows the comparison of cases according to gender and microvascular complications. It was seen that among microvascular complications present group, 26 (59.1) cases were male and 18 (40.9) cases were female while among microvascular complications absent group, 36 (64.3) cases were male and 20 (35.7) cases were female.

Table 5 : Correlation of type of Microvascular Complications with mean HbA1c level

Microvascular Complications	Mean ± SD	Mean ± SD
CKD	6	10.3 ± 2.13
Microalbuminuria	14	9.6 ± 1.76
Retinopathy	9	9.4 ± 1.51
Peripheral neuropathy	7	9.8 ± 2.14
Autonomic neuropathy	4	9.1 ± 0.86
Erectile dysfunction	4	9.8 ± 1.64

It was observed that mean HbA1c in Chronic Kidney Disease cases was 10.3 ± 2.13 g/dl, in Microalbuminuria cases was 9.6 ± 1.76 g/dl, in Retinopathy cases was 9.4 ± 1.51 g/dl, in Peripheral neuropathy cases was 9.8 ± 2.14 g/dl, in Autonomic neuropathy cases was 9.1 ± 0.86 g/dl and in Erectile dysfunction cases was 9.8 ± 1.64 g/dl.

Discussion:

Type 2 diabetes is associated with disabling and potentially life-threatening microvascular and macrovascular complications.[3] As many as 80% of patients with type 2 diabetes develop cardiovascular complications, which account for approximately 65% of deaths in this group. [4] The contribution of microvascular complications to type 2 diabetes morbidity is also substantial. Large prospective studies have demonstrated that intensive glycemic control decreases the incidence and delays the progression of microvascular complications in patients with type 2 diabetes. [5] The benefits of intensive glycemic control in reducing the incidence of macrovascular complications are less clear; however, previous studies have demonstrated that better glycemic control may modestly reduce the long-term risk of

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some macrovascular events. Furthermore, recent cardiovascular outcome trials and a large observational study have suggested that some glucose-lowering agents may substantially improve cardiovascular outcomes in patients with type 2 diabetes. [6]

In the present study, 44 (44.0) cases had microvascular complications while 56 (56.0) cases did not have microvascular complications. It was observed that 6 (13.6) cases had Chronic Kidney disease, 14 (31.8) cases had Microalbuminuria, 9 (20.5) cases had Retinopathy, 7 (15.9) cases had Peripheral neuropathy, 4 (9.1) cases had Autonomic neuropathy and 4 (9.1) cases had Erectile dysfunction.

In my study, prevalence of retionopathy was 20.5%. Our results are consistent with Ramchandran et al [112] where they found that out of 3010 type-2 diabetics, retinopathy was present in 714 i.e. 23.7%, at a diabetes centre in Chennai. Knuiman et a[7] reported prevalence of retinopathy 28% in Perth, Western Australia. On the contrary, Rema et al [8] found that the prevalence of retinopathy was 34.1% in type-2 diabetes. It may be because of referral bias as this centre offers retinal services. In the study done by Agrawal et al.,[9] retinopathy was present in 3621 patients i.e. 32.5%. On applying multiple regression analysis for diabetic retinopathy, a positive association was observed for age of patients, duration of diabetes, blood pressure, fasting blood sugar and HbA1C.

In our study, prevalence of diabetic nephropathy was 20.5%. In the study done by Agrawal et al., [9], evidence of nephropathy was observed in 3369 patients i.e. 30.2% (including both microalbuminuria and overt nephropathy). Klein et al. [10]in their study found that frequency of microalbuminuria was 29.2% in those taking insulin and 22.0% in those not taking insulin. A lower prevalence of proteinuria (19.7%) was found in the study conducted by Ramchandran et al.[11] in south Indian diabetes subjects. Gupta et al. [12] reported prevalence of microalbuminuria in 26%. 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). [13]

It has been 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 / 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 B.P., HbA1C, BMI, serum cholesterol and serum triglyceride. Significant associations of duration of diabetes and nephropathy was also observed in other studies.

Conclusion:

In the present study, prevalence of microvascular complications was found 44% among which 13.6% cases had Chronic Kidney disease, 31.8% cases had Microalbuminuria, 20.5% cases had Retinopathy, 15.9% cases had Peripheral neuropathy, 9.1% cases had Autonomic neuropathy and Erectile dysfunction each.

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