

# Study to Know the prevalence of Microvascular Complications in Type 2 Diabetes Mellitus Patients

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## ABSTRACT

**Introduction:** The increased incidence of diabetes mellitus has imposed great burden on health all over the world. Type 2 Diabetes mellitus is insidious in onset and has many patterns of presentation which commonly militate against early detection and diagnosis. Thus most patients present late with the exacerbation of symptoms and complications, in the form of metabolic abnormalities and angiopathies. Microvascular complications include retinopathy, nephropathy, and neuropathy. Diabetic retinopathy and Nephropathy are the commonest causes of blindness and chronic renal failure worldwide respectively. Study aimed to check the prevalence and clinical profile of microvascular complications in type 2 Diabetes Mellitus patients.

**Material and methods:** The study was an observational cross-sectional study of 320 type 2 Diabetics Mellitus who matched the inclusion criteria, attending the Department of Medicine (outpatient/inpatient), Sukh–Sagar Medical College and Hospital, Jabalpur, (Madhya Pradesh) from May 2015 to April 2016. Cases were screened for vascular complications as per ADA criteria, data tabulated and analyzed. SPSS software package was used for Statistical analysis.

**Results:** The mean age of presentation was 54 years  $\pm$  12.30 with male:female ratio of 1.86:1.00. The prevalence of Diabetic Retinopathy, Nephropathy, Neuropathy was 30%, 47%, 23%, respectively.

**Conclusion:** There was a significant correlation between prevalence of diabetes and increased waist circumference and Body mass index. There was highest prevalence of Nephropathy followed by Retinopathy in central Indian population. The screening for complications in all cases of Diabetes Mellitus is highly recommended.

**Keywords:** Type 2 Diabetes Mellitus, Microvascular complications, Retinopathy, Nephropathy, Neuropathy

## INTRODUCTION

Diabetes Mellitus happens to be the commonest of all metabolic diseases worldwide. Type 2DM is the commonest form of diabetes constituting 87% of the disease burden. The global prevalence of diabetes is estimated to increase from 4.1 % in 1995 to 5.6% by the year 2025.<sup>1</sup> Recent estimates suggest that the incidence of diabetes is rising globally, particularly in developing countries (eg: India). The number of people with diabetes in India currently is around 66.8 million and is expected to rise to 101.2 million by 2030. An estimated 80-85% of the global population with diabetes lives in developing countries.<sup>2</sup> The onset of T2DM is often insidious and silent. The asymptomatic phase of hyperglycemia accounts for the relatively high prevalence of complications at initial presentation.<sup>3</sup> Diabetes is a systemic disorder characterized by metabolic abnormalities and angiopathies.<sup>4-7</sup> Microvascular complications include Retinopathy, Nephropathy, and Neuropathy. Diabetic Retinopathy can be defined as damage to microvascular

system in the retina due to prolonged hyperglycaemia. Diabetic retinopathy is primarily classified into non proliferative and proliferative diabetic Retinopathies.<sup>8</sup> Neuropathy is considered the most common micro-vascular complication of the T2 DM.<sup>9,10</sup> It can be classified as peripheral, autonomic, proximal and focal. Diabetic polyneuropathy also called distal peripheral neuropathy affects the peripheral nervous system and is by far the most common type of neuropathy seen in T2DM.<sup>11</sup> Diabetic polyneuropathy (DPN) is the major risk factor for amputation and hence a significant cause of morbidity.<sup>12</sup> Diabetic Nephropathy is the leading cause of chronic renal failure worldwide and is responsible for renal failure in about 33% of patients who undergo dialysis. Microalbuminuria indicates an increased risk of progression to Nephropathy as well as an elevated risk of cardiovascular events in Diabetic patients.<sup>13</sup>

Study was aimed to check the prevalence and clinical profile of microvascular complications in type 2 Diabetes Mellitus patients.

## MATERIAL AND METHODS

320 cases of Type 2 DM attending the Department of Medicine, Sukh Sagar Medical College and Hospital, Jabalpur between May 2015 to April 2016 contributed a sample of this study, by the random sampling and after taking informed consent. Subjects were put to detailed clinical workup, Laboratory diagnosis of Diabetes Mellitus was confirmed by criteria laid by the American Diabetes Association (ADA).<sup>3</sup> Peripheral Neuropathy was regarded as the bilateral loss of ankle jerks or gross sensory deficit in both feet as per standard criteria. Blood glucose was estimated by the ortho-toluidine, while glycosylated hemoglobin by the modified chemical method of Flickinger and Winterhalter. Lipid profile and serum creatinine were determined in all the patients. Ethical clearance was obtained from the ethical clearance board of the college.

## Exclusion Criteria

- 1) Type 1 Diabetes Mellitus
- 2) Any other severe illness (eg. Hypertension)
- 3) Refusal to be a part of the study
- 4) Pregnancy

A thorough neurological assessment of samples was done. Presence of sensory neuropathy was defined by symptoms of tingling and numbness over the extremities (bilaterally

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symmetrical) with or without impaired touch, vibration sense or joint position sense. Presence of motor neuropathy was noted. Autonomic dysfunction in the form of resting tachycardia, orthostatic hypotension, gastroparesis/ diarrhea or abnormal sweating was noted. Ten gram monofilament was used to note any reduced sensation due to neuropathy. Dilated pupil funduscopy was carried out in all patients by an ophthalmologist and retinopathy was defined and graded.

Presence of microalbumin in two urine samples within a period of six months taken as criteria for detecting Diabetic Nephropathy. Blood glucose, glycosylated hemoglobin, Lipid profile and serum creatinine were determined in all patients.

## STATISTICAL ANALYSIS

SPSS software package was used for the analysis. Statistical significance was defined as a p value <0.05 Student's *t*-test and Chi-square test was used to calculate the significance between the variables.

## RESULTS

In this study, 208 (65%) were males and 112 (35%) were females. The mean age was 54 years  $\pm$  12.30. The maximum incidence of diabetics was seen between 54-66 years. Table-1 shows various metabolic parameters in the study population. The patients presenting with diabetic complications of retinopathy, nephropathy and neuropathy were 30%, 47%, and 23% respectively. Fundus examination revealed that 28 cases had non-proliferative diabetic retinopathy and two cases had proliferative retinopathy and it was statistically significant

( $p < 0.05$ ). Microalbuminuria and Macroalbuminuria were seen in 40% and 7% cases respectively. Table-2 shows correlation of HbA1C with diabetic complications. The high incidence of complications especially Microvascular occur in patients having  $>7$  HbA1C. Microvascular complications Retinopathy, Nephropathy and Neuropathy were 30.0%, 47.0% and 23.0%, respectively. Table-3 shows p values of the vascular complications.

## DISCUSSION

This study has been done over a period of 12 months in cases of T2DM attending the outpatient and inpatient Department of Medicine, Sukh- Sagar Medical College and Hospital Jabalpur. Chronic complications are responsible for most of morbidities and mortalities associated with diabetes and these usually occurred after many years of uncorrected elevated blood sugars level. Since patients with type 2 diabetes mellitus may have elevated blood sugars level for several years prior to diagnosis, these patients may have high chances of complications specially Microvascular at the time of diagnosis. The overall prevalence of Diabetic Retinopathy was 30%, only 3.125% of patients had proliferative retinal changes that is similar to 2.6% and 2.8% reported by Abera Ejigu<sup>14</sup> and Mengistu.<sup>15</sup> A study was done in India on prevalence of microvascular and macrovascular complications in T2DM patients. Noted the prevalence of Diabetic retinopathy (23.7%), among which 3.7% was proliferative.<sup>16</sup> Diabetic kidney disease is a dangerous complication of Type 2- Diabetes mellitus. Earlier, studies has founded that Diabetic nephropathy is present in about 15-17%

Parameters	Diabetics	Diabetic Retinopathy	Diabetic Nephropathy	Diabetic Neuropathy
Age	54. $\pm$ 12.3	56	58	56
BMI	27. $\pm$ 12.2	27.4	28	28.1
Waist circumference	89.14 $\pm$ 9.40	90	90.6	92.2
FBS	206 $\pm$ 71.6	224	209	223
PPBS	300 $\pm$ 98	340	352	346
HbA1C	8.60 $\pm$ 2	9.1	9.6	9.5

**Table-1:** Mean and Standard Deviation of the Metabolic Parameters of Diabetic patients

HbA1C (%)	Number	Diabetic retinopathy	Diabetic nephropathy	Diabetic neuropathy
<7	10	03	04	03
7 -8	116	43	48	25
8-9	55	13	26	16
>9	140	59	37	44

**Table-2:** HbA1C in Correlation with Diabetic Micro vascular Complications

Micro vascular Complications	Number	Percentage (%)	P value
Diabetic retinopathy	96	30	0.02
Diabetic nephropathy	150	47	0.004
Diabetic neuropathy	74	23	0.42

Significant  $p < 0.05$ .

**Table-3:** Prevalence of Micro vascular Complications of Diabetes Mellitus

Micro vascular Complications	Drivsholm et al <sup>14</sup>		Weerasuriya et al <sup>15</sup>	Hoorn study <sup>16</sup>	Our study
	Male	Female			
Diabetic retinopathy	5.4	4	15.2	1.9	30
Diabetic nephropathy	48.1	37.4	29	26.7	47
Diabetic neuropathy	19.1	19.1	25.2	48.3	23

**Table-4:** Comparison of Prevalence of Micro vascular Complications with Other Studies

of patients of newly diagnosed type 2 Diabetics.<sup>17</sup> Thus our study shows that 47% patients having Diabetic nephropathy. this difference is due to inclusion of all T2DM patients (new and old) in this study. Most patients with nephropathy were diabetic for more than 8 years. On considering BMI, most of the patients with BMI 25-30 developed nephropathy. These findings suggested that Indians are at increased risk of T2DM and its complication, at a relatively lower BMI, because Asians-Indians pheno-type.<sup>18</sup> The prevalence of neuropathy in Indians was 23%, which was more when compared to that in Hong Kong (13%).<sup>19</sup> Asian patients had more evidence of macro and micro vascular disease at diagnosis of diabetes, compared to European patients. eg.- Drivsholm et al<sup>14</sup> and Weerasuriya et al.<sup>15</sup> Table-4 shows prevalence of complications of T2DM in the various studies.

## CONCLUSION

Large proportion of T2DM patients presented with various microvascular complications because of insidious and silent onset of T2DM and hence this disease acts as a silent killer. There is high prevalence of Nephropathy (47%) and Retinopathy (30%) in cases of T2DM which is statistically significant. The prevalence of Neuropathy is 23% which is statistically also not insignificant. HbA1C levels predict the prevalence of complications and there is moderate correlation between HbA1C and blood glucose levels. Thus the screening for the complications of Diabetic patients is very useful in the preventive management of disease. Screening with simple tests such as Fundoscopy and urine Microalbuminuria at diagnosis for all cases of diabetes, is essential to identify the complications at an early reversible stage.

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