



"EXPLORING THE LANDSCAPE OF MICROVASCULAR COMPLICATIONS IN TYPE 2 DIABETES: A COMPREHENSIVE PREVALENCE STUDY"

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ABSTRACT **Introduction:** The global rise in diabetes mellitus has placed a significant burden on healthcare systems. Type 2 Diabetes mellitus often develops stealthily and presents with various patterns, making early detection and diagnosis challenging. Consequently, many patients seek medical attention only when their symptoms worsen, leading to complications such as metabolic abnormalities and angiopathies. Among these complications, microvascular issues like retinopathy, nephropathy, and neuropathy are prevalent. Diabetic retinopathy and nephropathy stand as the leading causes of blindness and chronic renal failure worldwide, respectively. This study seeks to investigate the prevalence and clinical characteristics of microvascular complications in patients with type 2 Diabetes Mellitus. **Method and Material:** This research conducted at Sukh-Sagar Medical College and Hospital in Jabalpur, Madhya Pradesh, from May 2015 to April 2016, involved 400 type 2 Diabetes Mellitus patients meeting specific inclusion criteria. The study followed an observational cross-sectional design, assessing vascular complications based on ADA criteria and utilizing SPSS software for statistical analysis. **Results:** The results indicated that the average age of presentation was 54 years with a male-to-female ratio of 1.86:1. The prevalence rates for Diabetic Retinopathy, Nephropathy, and Neuropathy were 30%, 47%, and 23%, respectively. **Conclusion:** Notably, a significant correlation was observed between diabetes prevalence and increased waist circumference and Body Mass Index (BMI). The study also highlighted the highest prevalence of Nephropathy, followed by Retinopathy, in the central Indian population. These findings underscore the importance of screening for complications in all Diabetes Mellitus cases.

KEYWORDS : Type 2 Diabetes Mellitus, Microvascular complications, Retinopathy, Nephropathy, Neuropathy.

INTRODUCTION:

Diabetes Mellitus is the most prevalent metabolic disease worldwide, with Type 2 Diabetes Mellitus (Type 2DM) accounting for 87% of cases. It is projected that the global prevalence of diabetes will rise from 4.1% in 1995 to approximately 5.6% by 2025. Recent data indicates a notable increase in diabetes incidence, particularly in developing nations such as India. Presently, there are approximately 66.8 million individuals living with diabetes in India. The study aimed to assess the prevalence and clinical characteristics of microvascular complications in individuals with Type 2 Diabetes Mellitus (T2DM), a condition expected to affect around 101.2 million people by 2030. Notably, approximately 80-85% of those with diabetes reside in developing nations. T2DM often develops without noticeable symptoms, leading to a higher likelihood of complications during the initial diagnosis due to asymptomatic hyperglycaemia. Diabetes is a systemic disorder marked by metabolic abnormalities and angiopathies. These microvascular complications encompass Retinopathy, Nephropathy, and Neuropathy. Specifically, Diabetic Retinopathy is defined as damage to the retinal microvascular system resulting from prolonged hyperglycaemia and can be categorized as non-proliferative or proliferative. Neuropathy, the most common microvascular complication of T2DM, can be classified as peripheral, autonomic, proximal, or focal. Diabetic polyneuropathy, also known as distal peripheral neuropathy, predominantly affects the peripheral nervous system and is the most prevalent form of neuropathy observed in T2DM. Notably, Diabetic Polyneuropathy (DPN) is a significant risk factor for amputation and a major contributor to morbidity. Moreover, Diabetic Nephropathy is the primary cause of chronic renal failure worldwide, responsible for approximately 33% of patients requiring dialysis. The presence of micro albuminuria signals an elevated risk of progressing to Nephropathy and an increased risk of cardiovascular events in diabetic individuals. The study's primary objective was to investigate how these microvascular complications manifest and their prevalence among patients with Type 2 Diabetes Mellitus.

METHODS & MATERIAL:

In this study, we included a sample of 400 Type 2 Diabetes Mellitus (DM) cases from the Department of Medicine at Sukh Sagar Medical College and Hospital in Jabalpur, spanning from May 2015 to April 2016, using random sampling and after obtaining informed consent. We conducted a detailed clinical examination, confirming the

diagnosis of Diabetes Mellitus based on the criteria established by the American Diabetes Association (ADA). Peripheral Neuropathy was defined as the bilateral loss of ankle jerks or significant sensory deficits in both feet, following standard criteria. Blood glucose levels were measured using ortho-toluidine, and glycosylated haemoglobin was assessed using the modified chemical method of Flickinger and Winterhalter. Additionally, we analysed the lipid profile and serum creatinine levels for all patients. Ethical clearance for this study was obtained from the college's ethical clearance board.

Exclusion criteria for the study were as follows:

- 1) Type 1 Diabetes Mellitus
- 2) Any other severe illnesses, such as hypertension
- 3) Refusal to participate in the study
- 4) Pregnancy

We performed a comprehensive neurological assessment of the study participants, defining the presence of sensory neuropathy based on bilateral symptoms of tingling and numbness in the extremities. Patients were assessed for symmetrical sensory symptoms, with or without impaired touch, vibration sense, or joint position sense. Motor neuropathy was also observed. Autonomic dysfunction, such as resting tachycardia, orthostatic hypotension, gastro paresis/diarrhoea, or abnormal sweating, was documented. Neuropathy-related reduced sensation was evaluated using a ten-gram monofilament. An ophthalmologist conducted dilated pupil fundoscopy for all patients to detect and grade retinopathy. Diabetic Nephropathy was identified using the presence of micro albumin in two urine samples within a six-month period as a criterion. Additionally, blood glucose, glycosylated haemoglobin, lipid profile, and serum creatinine levels were measured for all patients.

Statistics:

The analysis was conducted using the SPSS software package, and statistical significance was determined with a significance level set at $p < 0.05$. The significance between variables was assessed using both Student's t-test and the Chi-square test.

RESULT'S:

In this study, there were 260 (65%) male participants and 140 (35%) female participants. The average age was 54 years with a standard deviation of 12.30. The highest incidence of diabetes was observed in

the age range of 54-66 years. Table-1 presents various metabolic parameters within the study group. Among the patients, 30% had diabetic retinopathy, 47% had nephropathy, and 23% had neuropathy as complications. Fundus examinations showed that 28 cases had non-proliferative diabetic retinopathy, and two cases had proliferative retinopathy, which was statistically significant ($p < 0.05$). Micro albuminuria was found in 40% of cases, while macro albuminuria was present in 7%. Table-2 displays the correlation between HbA1C levels and Prevalence of diabetic complications, indicating a higher incidence of complications, especially microvascular complications, in patients with HbA1C levels > 7 .

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

Parameters	Patients	Diabetic Nephropathy	Diabetic Retinopathy	Diabetes Neuropathy
Age	54.0 ± 12.3	57	56	56
Waist circumference	89.14± 9.40	90.6	27.4	28.1
BMI	27.0 ± 12.2	28	90	92.1
FBS	206± 71.6	209	223	222
PPBS	300± 98	351	342	345
Hba1c	8.6 ± 2	9.6	9.1	9.5

Table :-2 Correlation of Hba1c to Microvascular complications of Diabetic patients and it's prevalence

Hba1c	Number	Diabetic Nephropathy	Diabetic Retinopathy	Diabetes Neuropathy
<7	25	10	6	9
7-8	126	67	35	24
8-9	71	22	22	27
>9	178	89	57	32
Total number	400	188	120	92
Percentage %	100	47	30	23
P value	Significant P < 0.05	0.004	0.02	0.42

Table:-3 Comparison of Prevalence Of Micro vascular Complications Of Diabetes Mellitus with Other Studies

Microvascular complications	Weerasuriya et al.15	Hoorn study16	Drivsholm et al.14	Our study
Diabetic Nephropathy	29	26.7	43	47
Diabetic Retinopathy	15.2	1.9	4.6	30
Diabetic Neuropathy	25.2	48.3	19.1	23

DISCUSSION :

In the discussion, this study spanned 12 months and focused on cases of Type 2 Diabetes Mellitus at the outpatient and inpatient departments of Medicine at Sukh-Sagar Medical College and Hospital in Jabalpur. Chronic complications are a major cause of morbidity and mortality in diabetes, typically developing after years of elevated blood sugar levels. Patients with Type 2 diabetes often experience prolonged periods of elevated blood sugar before diagnosis, increasing their risk of complications, especially microvascular ones, at the time of diagnosis. The overall prevalence of diabetic retinopathy was 30%, with only 3.125% of patients having proliferative retinal changes, which is comparable to the findings of Abera Ejigu and Mengistu. Another study conducted in India examined the prevalence of microvascular and macrovascular complications in Type 2 diabetes patients, reporting a diabetic retinopathy prevalence of 23.7%, including 3.7% with proliferative changes. Diabetic kidney disease is a significant complication of Type 2 Diabetes Mellitus, with earlier studies indicating its presence in about 15-17% of cases. In our study, we found that 47% of newly diagnosed type 2 diabetic patients had diabetic nephropathy. This difference in prevalence is attributed to the inclusion of both new and old type 2 diabetic patients in our research. Notably, most patients with nephropathy had been diabetic for over 8 years. When considering BMI, it was observed that a significant number of patients with a BMI in the range of 25-30 developed nephropathy. These findings suggest that Indians are at a higher risk of developing type 2 diabetes and its complications, even at a relatively lower BMI, possibly due to the Asian-Indian phenotype.

Indians was 23%, which is higher than the prevalence observed in Hong Kong (13%). Additionally, Asian patients exhibited more evidence of macro and microvascular diseases at the time of diabetes diagnosis compared to European patients. This aligns with findings from other studies such as those conducted by Drivsholm et al.14 and Weerasuriya et al.15. For a comprehensive overview of the prevalence of complications of type 2 diabetes mellitus, please refer to Table 3 in our study.

CONCLUSION :

Type 2 Diabetes Mellitus (T2DM) often manifests with subtle and asymptomatic signs, earning its reputation as a "silent killer." T2DM patients frequently experience microvascular complications, notably Nephropathy (47%), Retinopathy (30%), and Neuropathy (23%). These complications carry significant statistical relevance and are influenced by HbA1C levels, which moderately correlate with blood glucose levels. Early screening through straightforward methods such as Fundoscopy and urine Microalbuminuria tests at the time of diagnosis plays a pivotal role in detecting complications at an early, potentially reversible stage. This proactive approach is imperative for effectively managing the disease and enhancing the well-being of individuals with T2DM.

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In our study, we also found that the prevalence of neuropathy among