**Original Research Article**

# A study of clinical profile and complications in patients with type 2 diabetes mellitus in a tertiary care centre

**Oshin Mantro, Jagadeesan Mohanan\*, Mahendra Kumar K., Kannan R., Gowri Shankar A., Damodharan J., Magesh Kumar S.**

Department of General Medicine, Saveetha Medical College Hospital, Chennai, Tamil Nadu, India

**\*Correspondence:**
Dr. Jagadeesan Mohanan,
E-mail: drjagadeesan@gmail.com

**ABSTRACT**

**Background:** Diabetes is the most common non-communicable disease known today. This study was conducted to assess the clinical profile and complications in patients with type 2 diabetes mellitus.

**Methods:** A prospective study was carried out between April 2017 to April 2018 in patients attending a tertiary care hospital in Chennai. Patients with type 2 diabetes of age 25-80 years, minimum of 5 years duration were enrolled.

**Results:** Out of 66 patients, 23(34.8%) were males whereas 43 (65.2%) were females. Mean age in this study population was 55.36 years with a standard deviation of 11.362. In present study, the mean fasting blood sugar level was 196.12±77.180, mean postprandial blood sugar level was 303.26±115.385 and the mean HbA1C levels was 10.95±2.369. 77.3% were on oral hypoglycaemic agents, 13.6% on insulin and 9.1% on combined therapy with oral hypoglycemic agents and insulin. The complications associated with diabetes found in present study were microvascular complications which include peripheral neuropathy 41(62.1%), retinopathy 31(46.96%), nephropathy 28 (42.42%). Peripheral neuropathy was found to be most commonly associated. Macrovascular complications include cardiovascular disease in 12.12% (n=8) and cerebrovascular disease in 4.54% (n=3). Autonomic neuropathy was found in 69.69% (n=46).

**Conclusions:** The complications of DM are commonly seen in patients with poor glycaemic control. Among microvascular complications, peripheral neuropathy was most commonly seen. Autonomic neuropathy usually goes unnoticed and asymptomatic in most of the individuals. Increasing levels of HbA1c was found to be significantly correlated with neuropathy.

**Keywords:** Autonomic neuropathy, Diabetes mellitus (DM), Macrovascular, Microvascular, Nephropathy, Neuropathy, Retinopathy

## INTRODUCTION

With the current population of 19.4 million diabetics, and close to 60 million by the year 2025, India would rank first in its share of the worldwide burden of diabetes.[1,2] Diabetes mellitus (DM) is currently taking its place of the most threat to human health within the 21st century.[1,2] The chronic complications of diabetes are broadly divided into microvascular and macrovascular, with the former having much higher prevalence than latter.[3] Microvascular complications include neuropathy, nephropathy and retinopathy. Whereas macrovascular complications consist of cardiovascular disease, stroke, peripheral artery disease. Long-term poor glycemic control can only increase the risk of developing advanced

diabetic neuropathy, although long-term follow-up studies are lacking.[4,5]

Autonomic nervous system dysfunction is one of the significant complications and is generally associated with poor prognosis. [6,7] Cardiac autonomic neuropathy is the most commonly over looked complication of diabetes.[8] Some manifestations of autonomic neuropathy may proceed the diagnosis of diabetes by several years.[9] Early detection and good glycemic control will help in decreasing mortality among the population.

## METHODS

This prospective study was conducted after getting approval from the institutional ethical committee and informed consent from the patients.

### Inclusion criteria

Patients aged more than 25 and less than 80 years of either sex with a known case of type 2 diabetes of duration more than 5 years attending tertiary care centre.

### Exclusion criteria

- Alcoholics
- Type 1 diabetes
- Chronic diseases like CCF, COPD, CKD
- Chronic liver disease
- Pregnancy
- Patients with underlying cardiomyopathies
- Arrhythmias
- Thyroid Disorder
- Hansen's Disease
- Amputation
- ECG changes- conduction defect
- Patients on drugs known to affect the autonomic nervous system including chemotherapeutic agents.

Study population was based on the existing literature, (by allowing alpha error of 5%, beta error of 20% (power 80%)) for a relative precision of 20% at 5% significant level the estimated sample size to be studied was calculated to be 66 patients.

### Statistical analysis

After completion of the study statistical analysis was done using SPSS software version 22.

Basic demographic details were collected from patients with type 2 diabetes between age 25-80. Fasting and post prandial glucose levels, HbA1c levels, blood urea, serum creatinine, urine analysis and electrocardiogram were done for the study group. Physical examination and investigations required for diagnosing the microvascular complications and macrovascular complications was done. Heart rate variability was done to find out autonomic neuropathy. *Heart rate response to Valsalva manoeuvre (valsalva ratio)*

The subjects were asked to blow into a mouth piece attached to an aneroid manometer at a constant pressure of 40mm Hg and to hold it for 15 seconds.

The ratio of the longest RR interval shortly after the manoeuvre (within 20 beats) to the shortest RR interval during the manoeuvre was then measured.

The mean of three successive readings were taken.

### Heart rate response to immediate standing (30:15 ratios)

The subject was asked to lie quietly on a couch and then asked to stand up unaided as quickly as possible.

The ratio of the longest RR interval around the 30th beat after standing up to the shortest RR interval around the 15th beat was calculated. Observed on cardiac monitor.

## RESULTS

Out of 66 patients, 23(34.8%) were males and rest 43(65.2%) were females (Figure 1).
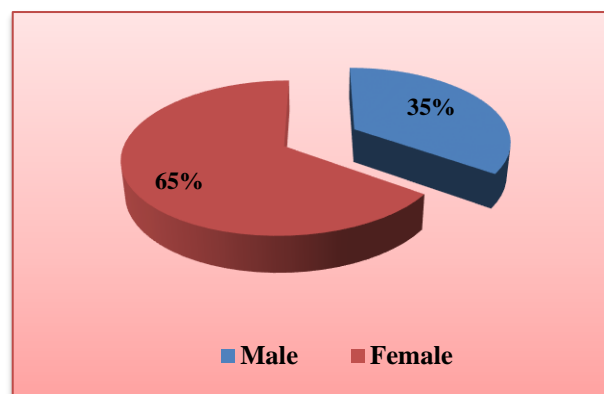


**Figure 1: Sex distribution in the study population with T2DM.**

The mean age was found to be 55.36%. In this population mean duration of diabetes was found to be 9.06 years±4.121 i.e. maximum population were having diabetes of duration 5-10 years.

The mean fasting blood glucose was 196.12±4.121, mean post prandial blood glucose was 303.26±115.383 and HbA1c was 10.9511±2.36924.

The mean total cholesterol was 155.55(mg/dl)±51.376, mean HDL 41.05(mg/dl)±6.988, mean LDL 84.50(mg/dl)±24.219, mean triglycerides was 131.46(mg/dl)± 62.300 (Table 1).

In present study 77.3% preferred oral hypoglycemic agents,13.6% insulin therapy and 9.1% preferred combined therapy with oral hypoglycemic agents and insulin (Figure 2).

**Table 1: Descriptive statistics of study population.**

|  | Mean | Std. deviation |
|---|---|---|
| Age (years) | 55.36 | 11.362 |
| Duration of T2DM (years) | 9.06 | 4.121 |
| FBS (mg/dl) | 196.12 | 77.180 |
| PPBS (mg/dl) | 303.26 | 115.385 |
| HbA1c | 10.9511 | 2.36924 |
| HDL (mg/dl) | 41.05 | 6.988 |
| TG (mg/dl) | 131.46 | 62.300 |
| LDL (mg/dl) | 84.50 | 24.219 |

The study showed that patients were more compliant for oral hypoglycemic drugs as compared to insulin.
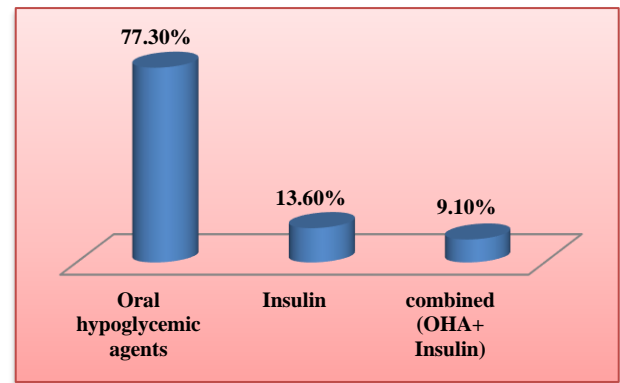


**Figure 2: Treatment for T2DM in the study group.**

The complications due to diabetes were divided into microvascular and macrovascular (Table 2).
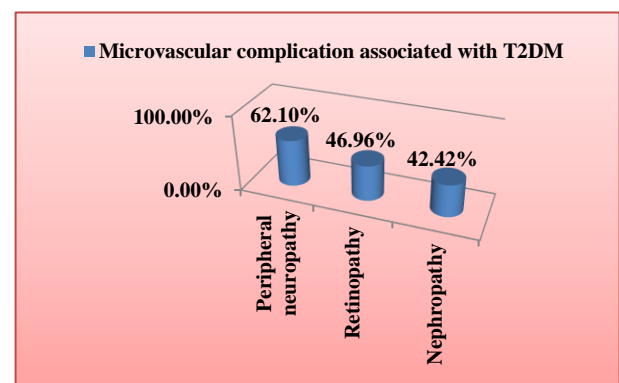
**Table 2: Complications associated with T2DM.**

| Complication associated with T2DM | Total no. of patients developing complication | No. of patients affected | |
|---|---|---|---|
| Microvascular | 66 | Peripheral neuropathy | 62.10% (n=41) |
|  |  | Retinopathy | 46.96% (n=31) |
|  |  | Nephropathy | 42.42% (n=28) |
| Macrovascular | 11 | Cardiovascular disease (CVD) | 12.12% (n=8) |
|  |  | Cerebraovascular disease (CVD) | 4.54% (n=3) |
| Autonomic neuropathy | 46 | Cardiac autonomic neuropathy (CAN) | 69.69% (n=46) |

Most common complication seen in the study group was development of peripheral neuropathy i.e. 62.1%,46.96% had retinopathy and 42.42 % had nephropathy (Figure 3). Present study showed that the prevalence of retinopathy significantly increased in patients with HbA1c of 7.6%. All microangiopathies were found in patients with poor glycemic control or high HbA1c levels.

HbA1c >7.6% with neuropathy was found in 65.57% (n=40) patients where as HbA1c of <7.6 with neuropathy was found in only 1.51% (n=1) patient which was statistically significant.HbA1c >7.6% with nephropathy was found in 39.39% (n=26) patients where as HbA1c of <7.6 with nephropathy was found in only 3.03% (n=2) patients.HbA1c >7.6% with retinopathy was found in 45.45% (n=30) patients where as HbA1c of <7.6 with retinopathy was found in only 1.51%(n=1) patients (Figure 4).

Present study showed a positive correlation between increasing HBA1c and incidence of neuropathy but there was no significant correlation found between HbA1c and retinopathy or nephropathy. In present study 12.12%

(n=8) developed cardiovascular disease and 4.54% (n=3) developed cerebrovascular disease.
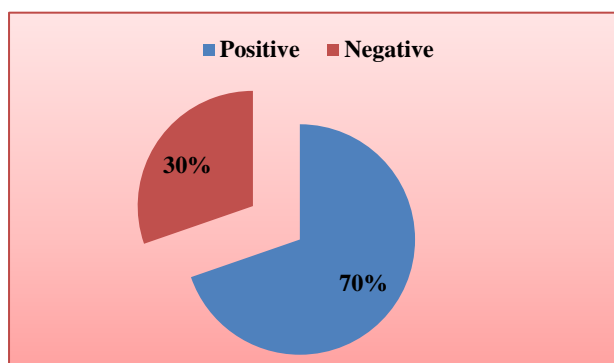


**Figure 3: Microvascular complications associated with T2DM.**

Over all microvascular complications were more common as compared to macrovascular complications or autonomic complications. Most common risk factors

associated with these complications as seen in present study were age, uncontrolled diabetes, dyslipidemia (increased LDL). 69.69% (n=46) showed the evidence of cardiac autonomic neuropathy where as 30.30% (n=20) were normal (Figure 5) were found to be statistically significant.
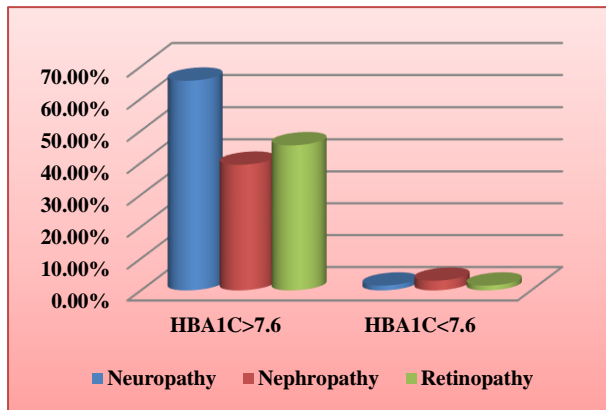


**Figure 4: HbA1c correlation with microvascular complications in the study group.**



**Figure 5: Evidence of autonomic neuropathy in the study group.**

Over all complications were studied in the study group, it was found that microvascular complications (100%) were more common to develop in diabetic patients. Next was autonomic neuropathy (69.69%) which often go unnoticed, asymptomatic and under diagnosed. Lastly 16.66% developed macrovascular complications.

## DISCUSSION

Out of 66 patients, 23 (34.8%) were males and rest 43(65.2%) were females (Figure 1).[10] The mean age was found to be 55.36%. Similar results are obtained done by Purty A et al and Vishwanathan M et al, in Puducherry institute.[10] In this population mean duration of diabetes was found to be 9.06 years±4.121 i.e. maximum population were having diabetes of duration 5-10 years.

The mean fasting blood glucose was 196.12±4.121, mean post prandial blood glucose was 303.26±115.383 and HbA1c was 10.9511±2.36924. The mean total cholesterol was 155.55(mg/dl)±51.376, mean HDL 41.05(mg/dl)±6.988, mean LDL 84.50 (mg/dl)±24.219, mean triglycerides was 131.46(mg/dl)±62.300 (Table 1).

In present study 77.3% preferred oral hypoglycemic agents, 13.6% insulin therapy and 9.1% preferred combined therapy with oral hypoglycemic agents and insulin (Figure 2). The study showed that patients were more compliant for oral hypoglycemic drugs as compared to insulin.

The complications due to diabetes were divided into microvascular and macrovascular (Table 2). Most common complication seen in the study group was development of peripheral neuropathy i.e. 62.1%, 46.96% had retinopathy and 42.42% had nephropathy.[11] (Figure 3). Birajdar SV et al, reported peripheral neuropathy in 58% patients, retinopathy in 56% patients and nephropathy in 8% patients.[11]

Present study showed that the prevalence of retinopathy significantly increased in patients with HbA1c of 7.6% Rui Zhang et al, found that the prevalence of retinopathy increases significantly in the tenth deciles of FPG and HbA1c, with optimal cut off of 7.03mmol/L and 6.4% respectively in Chinese population.[12]

All microangiopathies were found in patients with poor glycemic control or high HbA1c levels.

HbA1c >7.6% with neuropathy was found in 65.57% (n=40) patients where as HbA1c of <7.6 with neuropathy was found in only 1.51% (n=1) patient which was statistically significant.HbA1c >7.6% with nephropathy was found in 39.39% (n=26) patients where as HbA1c of <7.6 with nephropathy was found in only 3.03% (n=2) patients.HbA1c >7.6% with retinopathy was found in 45.45% (n=30) patients where as HbA1c of <7.6 with retinopathy was found in only 1.51% (n=1) patients (Figure 4). Present study showed a positive correlation between increasing HbA1c and incidence of neuropathy but there was no significant correlation found between HbA1c and retinopathy or nephropathy Penno G et al, showed a significant correlation of HbA1c with nephropathy but do not show any significant with retinopathy. [13] In present study 12.12% (n=8) developed cardiovascular disease and 4.54% (n=3) developed cerebrovascular disease.

Over all microvascular complications were more common as compared to macrovascular complications or autonomic complications. Most common risk factors associated with these complications as seen in present study were age, uncontrolled diabetes, dyslipidemia (increased LDL). 69.69% (n=46) showed the evidence of cardiac autonomic neuropathy where as 30.30% (n=20) were normal (figure 5) were found to be statistically significant.[14,15] Ewing et al, reported the incidence of abnormal 30:15 ratio to be 60%.

Over all complications were studied in the study group, it was found that microvascular complications (100%) were more common to develop in diabetic patients. Next was autonomic (69.69%) which often go un-noticed, asymptomatic and under diagnosed. Lastly 16.66% developed macrovascular complications.

## CONCLUSION

Among the complications, microvascular complications were more predominant in present study which was seen in almost 100% followed by autonomic and macrovascular complications. Increasing HbA1c levels was found to have a positive correlation in the development of neuropathy in patients with diabetes in present study. Autonomic neuropathy usually goes asymptomatic, unnoticed and under diagnosed. Hence it is important to anticipate and to find the autonomic complications. Monitoring and bringing down the HbA1c levels are the most vital step in reducing the complications of diabetes. Early detection and good glycemic control will help in decreasing mortality among the population.

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