

Original Research Article

A prospective evaluation of microvascular complications in diabetes mellitus patients at time of diagnosis

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ABSTRACT

Background: The microvascular complication is also showing increasing trend. This is because of lack of awareness and lack of regular screening programme. Early diagnosis and Intensive glycemic control has been the most effective approach to prevent the progress of microvascular complication.

Methods: Based on exclusion and inclusion criteria 100 patients were enrolled for this study. For diagnosis of diabetes mellitus, we used American Diabetes Association (ADA) guidelines was followed. Detail history of patient was taken related to microvascular complication and they underwent extensive medical examination for the assessment of microvascular complications.

Results: Mean age of patient with microangiopathy was 59.942 ± 7.18 years and without microangiopathy was 54.31 ± 13.15 years. Microangiopathy was common in patient whose HbA1c was more than 10.7. Out of 26 patient 20 patient having microangiopathy. Neuropathy was present in 31 patients and absent in 69 patients.

Conclusions: It was observed that a continuous linear association between HbA1c and microvascular complications. This is more common in patient in patient with higher HbA1c. Neuropathy is most common which is followed by nephropathy and retinopathy least among all.

Keywords: Diabetes mellitus, Newly diagnosed, Neuropathy, Retinopathy

INTRODUCTION

Diabetes mellitus is a group of metabolic disorder sharing the common underlying feature of chronic hyperglycaemia. The chronic hyperglycaemia and metabolic dysregulation is associated with secondary damage in multiple organ system like eye, kidney, blood vessels and nerve.¹ Diabetes is a major cause of heart attacks, stroke, blindness, kidney failure, and lower limb amputation. It has been reported that in 2016, an estimated 1.6 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012.^{2,3} The proportion of undiagnosed type 2 diabetes varies widely - a recent

review of data from seven countries found that between 24% and 62% of people with diabetes were undiagnosed and untreated.⁴ The pathogenesis of long term complications of diabetes depends upon multiple factor but persistent hyperglycaemia or glucotoxicity is the key factor. During initial undiagnosed and untreated phase the persistent hyperglycaemia is associated with various microvascular and macrovascular complications. The effect of microvascular complication used to be in the form of diabetic nephropathy, neuropathy and retinopathy.

Studies have reported that these complications are present in newly diagnosed patients. Spijkerman AM, Dekker

JM, Nijpels G et al have reported that the prevalence of microalbuminuria varies from 17.2% (95% CI 12.5-23.2) and 26.7% (17.1-39.0) in newly diagnosed diabetes mellitus patient prevalence of retinopathy varies from 7.6% (95% CI 4.6-12.4) to 1.9% (0.3-9.8) in newly diagnosed patients.⁵ Bansal D et al, has reported that higher prevalence of retinopathy, followed by neuropathy and nephropathy in newly diagnosed diabetes mellitus patient.⁶ In our country prevalence of undiagnosed and untreated cases are high in rural region. The microvascular complication is also showing increasing trend. This is because of lack of awareness and lack of regular screening programme. Early diagnosis and Intensive glycemic control has been the most effective approach to prevent the progress of microvascular complication. Present study has been designed to detect various microvascular complications in newly diagnosed diabetes mellitus patient.

METHODS

Present study is a prospective observational study conducted in the department of general medicine Konaseema institute of medical science Amalapuram from august 2018 to October 2019.

Newly diagnosed case of diabetes mellitus attending outpatient department of general medicine who has been diagnosed either during routine evaluation or has been admitted for some region but has been diagnosed as diabetic for first time were enrolled for this study as per exclusion and inclusion criteria.

Inclusion criteria

- Newly diagnosed case of diabetes mellitus.
- All age.
- Both sexes.

Exclusion criteria

- Preexisting renal and cardiovascular disorder,
- Any neurological disorder presented as neuropathy.
- Pregnancy.

Prevalence from previous study was taken in consideration and confidence interval 95%, with power of the study 80% and significance level of 5% the sample size was calculated to be 96. For calculation of sample size online sample size calculator was used.^{7,8}

This study is approved by institutional ethics committee. A written informed consent was obtained from all patients before enrolment of them in study.

Based on exclusion and inclusion criteria 100 patients were enrolled for this study. For diagnosis of diabetes mellitus, American Diabetes Association (ADA) guidelines was followed. (FPG ≥ 126 mg/dL (7.0 mmol/L). 2-h PG ≥ 200 mg/dL (11.1 mmol/L) during

OGTT.HbA1C $\geq 6.5\%$ (48 mmol/mol). In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dL (11.1 mmol/L). Detail history of patient was taken related to microvascular complication and they underwent extensive medical examination for the assessment of microvascular complications. For peripheral neuropathy history of burning sensation, loss of sensation as observed by patient, numbness and tingling was recorded. History of erectile dysfunction, urinary retention and impaired sweating was taken for autonomic dysfunction. A detailed clinical examination for neuropathy was done. For assessment of peripheral neuropathy we used S W monofilament for sensitivity testing, percussion hammer for deep tendon reflex and tuning fork (128 hz) for perception of vibration. Autonomic neuropathy was evaluated under two heading sympathetic and parasympathetic. For evaluation of sympathetic evaluated for erectile dysfunction, diabetic diarrhoea, urinary incontinence and change in blood pressure with change in posture. For evaluation of parasympathetic abnormality, we examined effect of deep breathing and valasva maneuver on heart rate. For nephropathy history of oliguria, polyuria, facial puffiness and pedal oedema was taken. Nephropathy was diagnosed by estimating 24 hours urine protein excretion of more than 500 mg/day. For diagnosis of retinopathy, funduscopy examination of all patients was done by ophthalmologist. Regular blood parameters like fasting plasma glucose, post prandial plasma glucose was measured by glucose oxidise peroxidise method. Glycosylated haemoglobin was measured by spectrophotometry.

Statistical analysis

Data was collected on Microsoft excel sheet and analysis was done by using mean, proportion chi square test and unpaired t-test was used, p-value less than 0.05 was taken significant.

RESULTS

Total 100 newly diagnosed diabetes mellitus patients were enrolled for this study based on exclusion and inclusion criteria.

Table 1 shows out of 100 patients who has been newly diagnosed diabetes mellitus, in 42 patients any one type of microangiopathy was found. Mean age of patient with microangiopathy was 59.942 ± 7.18 years and without microangiopathy was 54.31 ± 13.15 years this finding was statistically significant because p value was 0.0159. Regarding sex distribution of patient out 42 patients with microangiopathy 28 were male and 14 were female similarly out of 58 patients 38 were male and 20 were female. The p value was 0.90 that mean this is not significant. Body mass index was 26.996 ± 1.191 kg/m² in patients with microangiopathy and 23.685 ± 0.815 kg/m² in newly diagnosed diabetes mellitus patient without microangiopathy. This finding was highly significant

statistically as p value was 0.00001. The mean of fasting plasma glucose 170.85±9.70 mg/dl in patients with microangiopathy and 149.457±11.30 mg/dl in patient without microangiopathy. The p value was 0.00001 which is significant statistically. Similarly, the mean of post prandial plasma glucose was 266.5±12.66 mg/dl in newly diagnosed DM patient with microangiopathy. Post

prandial plasma glucose was 215.6±9.00 mg/dl in DM patient without microangiopathy. The p value was 0.00001 which is significant statistically. Glycosylated haemoglobin was 9.76±1.17 % newly diagnosed DM patient with microangiopathy and 7.168±0.439 % in patient without microangiopathy. The p value was 0.00001 which is significant statistically.

Table 1: Demography and biochemical parameter of patients.

Variables	Microangiopathy	Without microangiopathy	p value
Number	42	58	
Age(yrs.)(mean±SD)	59.942±7.18	54.31±13.15	0.0159
Sex	Male	38	0.90 chi-square statistic is 0.0143
	Female	20	
BMI (kg/m ²)	26.996±1.191	23.685±0.815	0.00001
FPG (mg/dl)	170.85±9.70	149.457±11.30	0.00001
PPPG (mg/dl)	266.5±12.66	215.6±9.00	0.00001
HbA1C (%)	9.76±1.17	7.168±0.439	<0.00001

As per Table 2, regarding frequency and type of complication in diabetes mellitus the neuropathy was present in 31 patients and absent in 69 patients. In newly diagnosed diabetes mellitus patients nephropathy was present in 22 patients and absent in 78 patients. Retinopathy was present in 18 newly diagnosed diabetes mellitus patient and absent in 82 patients. The p value was 0.09 which is more than 0.05 so is not significant statistically.

Regarding relation between glycosylated haemoglobin and frequency of microangiopathy in newly diagnosed diabetes mellitus patients, it has been observed that in patients having HbA1c below 8.5%, 8 patients have microangiopathy and 32 patients were without

microangiopathy. Total 34 patients have glycosylated haemoglobin from 8.6% to 10.6 % out of them 14 were presented with microangiopathy. Microangiopathy was common in patient whose HbA1c was more than 10.7. Out of 26 patient 20 patient having microangiopathy. This relation is significant statistically as p value was 0.00028 (Table 3).

Table 2: Frequency of type of microvascular complication in diabetes patients.

Variables	Present	Absent	p value
Neuropathy	31	69	0.0988 chi-square statistic is 4.6284
Nephropathy	22	78	
Retinopathy	18	82	

Table 3: Relation between glycosylated haemoglobin and microvascular complication.

HbA1c	Microangiopathy	Without microangiopathy	p value
6.5 to 8.5	8	32	0.000028 chi-square statistic is 20.9742
8.6 to 10.6	14	20	
More than 10.7	20	6	

DISCUSSION

Persistent hyperglycemia during initial undiagnosed and untreated phase of diabetes mellitus is responsible for microvascular complication of diabetes mellitus. Present study has been designed to detect various microvascular complications in newly diagnosed diabetes mellitus patient and 100 patients are enrolled as per selection criteria. It has been observed that 42 patients have at least

one of the various microvascular complications. This finding is supported by Spijkerman AM et al, and Michael J. Fowler et al.^{5,10} There was significant difference between mean ages of patient with microangiopathy and without microangiopathy. The mean age of patient without microangiopathy was higher (59.942±7.18 yrs vs 54.31±13.15 yrs). This finding is supported by the work of Bansal D et al, and Azura M. S et al.^{6,11} In present study there was male predominance

but relation between sex and microangiopathy was not significant. This finding corroborates with the finding of Raina, Akhter et al.¹² It was observed that BMI of patient with microangiopathy was significantly higher than patients without microangiopathy, which is supported by the work of Azura MS et al, and Raina, Akhter et al.^{11,12} In present study we have observed that fasting and post prandial plasma glucose was significantly higher in patient with microangiopathy. This finding is supported by the work of Omar MA, Motala AA et al, and Rema M, Ponnaiya M, Mohan Vet al.^{13,14} This association between plasma glucose and microangiopathy was statistically significant. Which is further supported by the work of Prakash B, Yadav LK et al.¹⁵

Sabanayagam et al, has concluded that continuous linear association between HbA1c and microvascular complications, and Sohaib A. Virk, Kim et al, has reported that HbA1c independently contribute to increased oxidative stress which support our finding.^{16,17} Mean of glycosylated haemoglobin was 9.76 ± 1.17 % in microangiopathy group and it was more common in patient whose glycosylated haemoglobin was more than 10.6% which corroborate with these finding. we have found a significant association in the current analysis between HbA1c level and microvascular.

Neuropathy is most common which is followed by nephropathy and retinopathy least among all. This is supported by the work of Kosiborod M, Gomes MB et al.^{18,19} Bui HDT, Jing X, has reported that neuropathy is most common complication, but retinopathy comes second. But Agrawal RP et al, has concluded retinopathy and nephropathy were the commonest complications of diabetes which does not support our study.²⁰

CONCLUSION

To conclude microangiopathy is frequently found in newly diagnosed diabetes mellitus patient. Patients with microangiopathy have higher mean age its association with sex was not significant. Body mass index and plasma glucose was high in patient with microangiopathy then without microangiopathy. We have observed that a continuous linear association between HbA1c and microvascular complications. This is more common in patient in patient with higher HbA1c. We have observed that neuropathy is most common which is followed by nephropathy and retinopathy least among all.

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