ORIGINAL RESEARCH PAPER

Medical Science

Correlation of glycemic control & duration with microalbuminuria in patients with Type II diabetes mellitus: Results of a cross sectional study

KEY WORDS: Ganglion cyst, Carpal tunnel syndrome, dequervaintenosynovitis,Rheuma toid arthritis.

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ABSTRACT

BACKGROUND:Early detection and treatment of uncontrolled diabetes plays a significant role. So in this study we correlate FBS, PPBS and HbA1C with diabetic nephropathy using clinical and laboratory techniques.

METHODOLOGY:This cross Sectional analytic Study was carried out utilising the data on 100 Type 2 diabetes mellitus patients attended OPD/IPD at A Medical college hospital from October2014 to September 2016. In the study we used diabetic Dipstick test for microalbuminuria . FBS, PPBS, HbA1C and various routine investigations were done using standard procedures.

RESULTS: Of the 100 type 2 diabetics majority (60%) belonged to the age group of 56-60 years .The duration of diabetes ranged from 5 to >15 years and 40% belonged to group of 10-15 years of diabetes mellitus. In our study cohort 36% of participants had HBA1c of 8-10..Twenty nine had microalbuminuria with gender ratio (58% males: 42% females). There was statistically significant correlation between levels of FBS, PPBS and HbA1C with Microalbuminuria. A linear relationship was observed between microalbuminuria and duration of Diabetes .However, gender and BMI had no correlation in this study .

CONCLUSION: Thus we can conclude that ***poor glycaemic control as seen by FBS,PPBS and HBA1c can cause increased risk of development of microvascular complications of diabetes. Also early diagnosis and tight control of blood sugar levels can prevent or delay microvascular complications and it was also seen that BMI does not have a significant association with development of Microalbuminuria and thus may need further studies for evaluation***

INTRODUCTION

Diabetes mellitus is a syndrome with disordered metabolism and inappropriate hyper- glycaemia due to either a deficiency of insulin secretion or to a combination of insulin resistance and inadequate insulin secretion to compensate for the resistance.(1)

The importance of protecting the body from hyperglycemia cannot be overstated; the direct and indirect effects on the human vasculature are the major source of morbidity and mortality in both type 1 and type 2 diabetes. Generally, the injurious effects of hyperglycemia are separated into macrovascular complications (coronary artery disease, peripheral arterial disease, and stroke) and microvascular complications (diabetic nephropathy, neuropathy, and retinopathy). The number of people with Type 2 Diabetes mellitus is increasing rapidly and people with diabetes globally is projected to rise 592 million people in 2035(2).The disease burden due to diabetes is higher in low and middle income countries where four out of five people reside now. India, one of the largest countries in the Southeast Asian region, is expected to increase to 101 million by 2035(2)

Microvascular and Macrovascular complications manifesting as chronic complications of diabetes, largely account for diabetes related mortality and morbidity. Diabetic nephropathy is the leading cause of renal failure in the United States. It is defined by proteinuria > 500 mg in 24 hours in the setting of diabetes, but this is preceded by lower degrees of proteinuria, or "microalbuminuria."

Microalbuminuria is defined as albumin excretion of 30-299 mg/24 hours. Without intervention, diabetic patients with microalbuminuria typically progress to proteinuria and overt diabetic nephropathy. This progression occurs in both type 1 and type 2 diabetes.

As many as 7% of patients with type 2 diabetes may already have microalbuminuria at the time they are diagnosed with diabetes. In the European Diabetes Prospective Complications Study, the cumulative incidence of microalbuminuria in patients with type 1 diabetes was ~ 12% during a period of 7 years. In the UKPDS, the incidence of microalbuminuria was 2% per year in patients with type 2 diabetes, and the 10-year prevalence after diagnosis was 25%

The pathological changes to the kidney include increased glomerular basement membrane thickness, microaneurysm formation, mesangial nodule formation (Kimmelsteil-Wilson bodies), and other changes (3). Diabetic nephropathy is the leading cause of ESRD and a leading cause of DM related

morbidity and mortality(1)
The high rate of complications could be due to a variety of factors .

The present study correlates the level of Fasting blood sugar, Postprandial blood sugar and HbA1C with microvascular complications microalbuminuria and studying the role of duration of diabetes , body mass index and Gender with the above complications.

MATERIALS AND METHODS

STUDY DESIGN

This was a cross sectional Analytic Study and 100 Type 2 diabetes mellitus patients attending OPD/IPD at DR. B.R AMBEDKAR MEDICAL COLLEGE AND HOSPITAL from October 2014 to September 2016 were enrolled

INCLUSION CRITERIA

Duration of diabetes >5years
Onset of type 2 diabetes>35 years of age

EXCLUSION CRITERIA

Type 1 diabetes mellitus
Chronic alcoholics
Anaemia
Hereditary neuropathy
Patients with urinary tract infections
Vitamin B-12 deficiency

TECHNIQUE

Microalbuminuria detection was done by DipStick. Random spot urine samples of all the study subjects were collected and Patients with dipstick test for proteins result '1+' (30mg/dL or <0.5g/day), '2+' (100mg/dL or 0.5-1g/day), '3+' (300mg/dL or 1-2g/day) or above.[5,6]

Assessment and definition of various risk factors

The specific risk factors studied were gender, duration of diabetes and BMI.

BMI was calculated as weight in Kg / (height in mt)(2) and the normal BMI was taken as 18-22.9 .Overweight 23-24.9,Obesity>25 (adopted BMI cut off for Asian population)

HbA1C was measured by bidirectionally interfaced fully automated turbidimetry by Roche, FBS and PPBS by hexokinase mediated reaction.

RESULTS AND ANALYSIS

Out of 36 subjects with FBS of 80-130 ,53% are male 43% are females. Subjects with FBS In the range of 130-180 , are 29 in number out of which 62% are male and 38% are female. Out of total 35 subjects with FBS more than 180 , 66% are male and 34% are female.

52%of study subjects are having PPBS in the range of 180-300 out of which 62% are male and 38% are female. **30%** are in the range of less than 180 out of which 60% are male and 40%are females. **18%**are in the range of more than 300 mg% out of which 56% are male and 44% are female.

In our subjects with a duration of diabetes of 5-10 years none have microalbuminuria. Subjects with duration of diabetes of 10 -15 years 12 (30%) have microalbuminuria , while subjects with duration of diabetes more than 15 years 17 (50%) have microalbuminuria. (p-value of above table is <0.001) which is statistically significant.

In our subjects with normal BMI (18- 22.9) **10 (24%)** have microalbuminuria. Subjects with BMI 23-24.9 have **10 (52%)** microalbuminuria. Subjects with BMI of more than 25 ,**9 (19%)** have microalbuminuria(p-value is 0.070)., which **is not statistically significant**

In our study subjects **49%** are havingHBA1c less than 8 out of which 63% are male and 37% are females. **36%** of subjects are having HBA1c in the range of 8-10 out of which 56% are male and 44% are females.**15%** of subjects are having HBA1c more than 10 out of which 60% are male and 40% are females.

DISCUSSION

The microvascular complications of DM result from chronic hyperglycemia. Large randomized clinical trials of individuals with DM have conclusively demonstrated that a reduction in chronic hyperglycemia prevents or delays retinopathy, neuropathy and nephropathy.(3)

Study by Ezra et al(4) PPBS has a closer association with HbA1c than FBS. Hence, PPBS is better in predicting overall glycemic control in the absence of HbA1c. The plasma glucose measurements (fasting blood sugar-FBS and post pran-dial blood sugar-PPBS) provide a picture of short term glycemic control whereas the HbA1C reflects average glycemic control over the previous 2-3 months(3).

Diabetic Nephropathy 29% of study subjects had microalbuminuria

The association between levels of FBS,PPBS and HbA1C with occurrence of microalbuminuria is statistically significant(p value<0.01). Microalbuminuria is increased in conditions with poor glycemic control. Thus we have studied that the microvascular complications of DM can be controlled with good glycemic control.

In the present study we used a urinary dipstick test for detecting microalbuminuria. It is a simple, reliable, rapid and convenient method for screening of microalbuminuria in diabetic patients(5,6).In a study conducted byWu HY,et al(7) the diagnostic performance of urine albumin concentration by Dipstick test is comparable to that of albumin creatinine ratio and suggested it as a screening tool for diabetic nephropathy, considering the rising incidence of diabetes mellitus and constrained health care resources in many countries.DCCT study 67 showed strong relationships between the risks of developing these complications and glycemic exposure over time. Confirming the DCCT data the UKPDS showed a continuous relationship between the risk of microvascular complications and glycemia. For every percentage point decrease in HbA1c there was a 35% reduction in the risk of microvascular complications.(3)

CORRELATION OF MICROALBUMINURIA RELATED COMPLICATIONS WITH VARIOUS RISK FACTORS

We have correlated Diabetic microalbuminuria with the duration of diabetes. The relation between diabetic microvascular complications and duration of diabetes was found to be statistically significant (p value<0.05).

Zhaolin Liu et al(8),Fasil A et al(9),Ramanatha RS(10) showed that after adjusting for age, the overall prevalence of diabetic complications significantly increased with disease duration ($p < 0.001$).Diabetic nephropathy ($p < 0.001$) is significantly associated with disease duration.

Hence, the risk of chronic complications increases as a function of the duration and degree of hyperglycemia. Since type 2 DM often has a long asymptomatic period of hyperglycemia, many individuals with type2 DM have complications at the time of diagnosis. The findings of DCCT, UKPDS and Kumamoto study strongly support. The idea that chronic hyperglycemia plays a causative role in the pathogenesis of diabetic microvascular complications(3).

We have correlated the microvascular complications of diabetes with risk factors like gender and BMI and found to be statistically non significant. Which is in contraindication with large sample size studies by Gary N Et al(11).Thus our study needs further evaluation into the same.

But in a cohort study conducted by TANAKA.S et al(12) in Japan , it was found that past obesity as well as current obesity were associated with increased risks of microvascular complications. Furthermore there may be other factors influencing diabetic microvascular complications and obesity which was not taken into consideration in the present study. It may be responsible for this disparity.

In the present study we used a Urinary dipstick test for microalbuminuria.

These tests were easy to perform,cost effective,bedside tests and have given results correlating incidence of microvascular complications with levels of FBS,PPBS, HbA1C and with duration of diabetes similar as previous studies(6,6,7,13)

CONCLUSION AND SUMMARY

Thus we can conclude that ***poor glycaemic control as seen by FBS, PPBS and HBA1c can cause increased risk of development of microvascular complications of diabetes. Also early diagnosis and tight control of blood sugar levels can prevent or delay microvascular complications and It was also seen that BMI does not have a significant association with development of Microalbuminuria and thus may need further studies for evaluation***

TABLE 1 Correlation of FBS with Microalbuminuria

	Male	Female	Total
80-130	19 (53%)	17 (43%)	36 (36%)
130-180	18 (62%)	11 (38%)	29 (29%)
>180	23 (66%)	12 (34%)	35 (35%)
Total	60	40	100

TABLE-2
Correlation of Duration of diabetes(in years) with Microalbuminuria

	Present	Absent	Total	P-Value
5-10	0	26 (100%)	26	<0.001
10-15	12 (30%)	28 (70%)	40	
>15	17 (50%)	17 (50%)	34	
Total	29	71	100	

TABLE 3
Corrrelation of BMI with Microalbuminuria

	Present	Absent	Total	P-Value
Normal	10 (24%)	39 (76%)	49	0.070
Overweight	10 (52%)	11 (48%)	21	
Obese	9 (19%)	21 (81%)	30	
Total	29	71	100	

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