ORIGINAL RESEARCH PAPER

Medicine

CROSS SECTIONAL, OBSERVATIONAL STUDY TO KNOW THE PREVALENCE OF MICROALBUMINURIA AND MACROALBUMINURIA, HYPERTENSION AND DYSLIPIDEMIA AND PREVALENCE OF CAROTID PLAQUES IN TYPE 2 DIABETES PATIENTS IN A TERTIARY CARE HOSPITAL KOLKATA, WEST BENGAL.

Md Hamid Ali — Associate Professor, Department of Medicine, Murshidabad Medical College.

Ourangajeb* — RMO/SR, Department of Medicine Murshidabad Medical College. *Corresponding Author

ABSTRACT

Type 2 diabetes is often associated with various coexisting comorbidities like-hypertension and dyslipidemia. They are very much associated with ASCVD. Effects of diabetes are more predicting. If we can control multiple risk factors besides Diabetes, we will be able to tackle the ASCVD more efficiently & effectively. The other risk factors for ASCVD like Hypertension, Dyslipidemia, and obesity are prevalent in our country. There is a combination of 5 risk factors collectively named as syndrome X including Hypertension (BP >130/85 mm Hg), insulin resistant DM, hypertriglyceridemia, decreased HDL cholesterol and increased Waist hip ratio. Syndrome X predispose to atherosclerotic changes in the carotids. High blood pressure is reported in over two-thirds of patients with type 2 diabetes, and its development coincides with the development of hyperglycaemia . Dyslipidemia is frequent among patients with type 2 DM (T2DM) (prevalence > 75%) and is mainly a mixed dyslipidemia [increase in triglycerides (TGs), low high-density lipoprotein cholesterol (HDL-C), and small-dense (atherogenic), low-density lipoprotein cholesterol (LDL-C) particles](2) . It was also reported that microalbuminuria or macroalbuminuria increased the mortality rate by 60 – 80% –(3) . Albuminuria can be measured by urinary Albumin-to Creatinine ratio (ACR) in a random spot urine collection–(4) . The carotid IMT is significantly higher in diabetic patients than that in non-diabetic patients(5) , and the increased IMT can predict future events of silent brain infarction and coronary heart disease in the patients with T2DM(6). Our objective is to find out the prevalence of microalbuminuria and macroalbuminuria, hypertension, dyslipidemia, Diabetic kidney disease (serum Cr>1.5) and presence of plaque in carotid arteries in type 2 diabetes patients in our country. Another objective was to find out the distribution of glycemic parameters (FBS, PPBS, HbA1c) and BMI among study groups.

MATERIALS AND METHODS

1. **Study Design:** Cross sectional, Single Centre, hospital based prospective and observational study.

2. **Place Of Study:** Nilratan Sircar Medical College, Kolkata.

3. **Period Of Study:** January 2018 to June 2019.

4. **Study Population:**
Patients attending OPD and IPD of General Medicine Department, Nilratan Sircar Medical College, Kolkata and fulfill inclusion & exclusion criteria of the study.

5. **Sample Size:** 50.

6. **Sample Selection:** Randomized

7. **Inclusion Criteria:**
1. Diagnose case of type 2 diabetes mellitus
2. Age above 18 years
3. Both sexes

8. **Exclusion Criteria:**

Type 1 diabetes mellitus	Secondary diabetes	Gestational diabetes	Connective tissue disorders or vasculitis	Overt renal failure
Valvular heart disease or atrial fibrillation	Ischemic heart disease with medications	Patients with ischemic stroke. infection	Urinary tract infection	Congestive cardiac failure

Method Of Data Collection:

Interview & History taking	Physical examination	Laboratory examination,	Record analysis.

Parameters To Be Studies:

CLINICAL: 1. Presenting clinical features of type 2 diabetes mellitus as polyuria, polydipsia. 2. Complications of type 2 diabetes mellitus as nephropathy, neuropathy or retinopathy and. 3. Duration of diabetes.

GENEREL & SYSTEMIC EXAMINATION:

LABORATORY INVESTIGATIONS:-

1. The following laboratory parameters were carried out:

Complete haemogram	Fasting Blood Glucose	PPBS	HBA1C	Spot urine ACR	Serum electrolytes – Sodium , potassium, chloride etc.
Blood urea & creatinine	Urine RE/ME	Lipid profile:.	ECG in all leads	Echocardiography in selected cases	Brain imaging in suspected cases of CVA.

2. Specific Investigation:
Urinary albumin Creatinine ratio(ACR) was calculated by dividing the urinary albumin concentration in micrograms by the urinary creatinine concentration in milligrams. Normal UACR is generally defined <30 mg/g Cr, and increased urinary albumin excretion is defined as >30 mg/g Cr. However, UACR is a continuous measurement, and differences within the normal and abnormal ranges are associated with renal and cardiovascular outcomes.

OBSERVATION AND ANALYSIS:

Age Distribution: 10 cases out of 50 cases in the study are below the age of forty years. (Table-1) comprising 20.0 % of total cases, 25 cases are between 40-60 years comprising 50.0 % of total cases, 15 cases are 60yrs or more comprising 30.0 % of total cases.(Table-2))

Sex Distribution: 22 cases out of fifty cases in the study are Female Comprising 44.0 % of total cases, 28 cases are male comprising 56.0 % of total cases(Table 3)

Fasting Blood Sugar: out of 50 cases, 26 cases are in the range OF 100-126 of FBS, comprising of 52 % of cases, 24 cases are >126, comprising 48 % of FBS (Table 4.)

PPBS distribution: out of 50 cases, 27 cases are in the range of 140-200 of PPBS, comprising of 54 % of cases, 15 cases are >200, comprising 30 % of PPBS (TABLE 5.)

HbA1c: 43 cases out of fifty cases in the study are HbA1c (>6..5) Comprising 86.0 % of total cases, 7 cases are HbA1c

(≤ 6.5) comprising 14.0 % of total cases (TABLE 6.)

Total Cholesterol-(TC) - Out of 50 cases, 24 cases are abnormal of TC, comprising of 48 % of cases, 26 cases are normal, comprising 52 % of TC. (Table-7)

TG- triglyceride- Out of 50 cases, 31 cases are abnormal of TG , comprising of 62 % of cases, 19 cases are normal , comprising 38 % of TG (Table-8)

LDL-Cholesterol- Out of 50 cases, 21 cases are abnormal, comprising of 42 % of cases, 29 cases are normal, comprising 58 % of LDL-C (Table-9)

HDL-C- Out of 50 cases, 40 cases are abnormal, comprising of 80 % of cases, 10 cases are normal, comprising 20 % of HDL-C. (Table-10)

Urine ACR- Out of 50 cases, 24 cases are abnormal of Urine ACR, comprising of 48 % of cases, 26 cases are normal, comprising 52 % of Urine ACR (table-11)

Hypertension-30 cases out of fifty cases in the study are no Hypertension Comprising 60.0 % of total cases, 20 cases are Hypertension present comprising 40.0 % of total cases(table-13)

PRESENCE OF CAROTID PLAQUE: 30 cases out of fifty cases in the study are no Presence of plaque Comprising 60.0 % of total cases, 20 cases are Presence of plaque (yes) comprising 30.0 % of total cases (table-14).

CIMT- out of 50 cases, 11 cases are increased of CIMT, comprising of 22 % of cases, 39 cases are normal, comprising 78 % of CIMT (table-15)

SERUM CREATININE: 4 cases out of fifty cases in the study are no Serum creatinine (>1.5) Comprising 8.0 % of total cases, 46 cases are Serum creatinine (NORMAL) comprising 92.0 % of total case -**Table 16.**

BMI distribution-Out of 50 cases, 12 cases are in the range of <22.9 of BMI, comprising 24 % of cases, 20 cases are 23-27.5 , comprising 40 % of BMI and >27.3 BMI is 36 %. Table-17

CIMT * AGE: Out of 50 cases 10 cases bellow the age of 40 years, among them none has increased CIMT, 19 cases between 40-60 years among them 6 cases and 10 cases above 60 years , of them 5 have increased CIMT respectably.

CIMT * DURATION OF DM: From the Pie diagram 18, it is observed that there is maximum increased CIMT for 8 cases comprising of 16 % for > 10 years of duration of DM.

DISCUSSION:
A study by **Gupta et al**(7) found tobacco use, obesity, high blood pressure, high low-density lipoprotein (LDL) cholesterol, low high-density lipoprotein (HDL) cholesterol, and diabetes to correlate with vascular events. Study, showed 92.5% prevalence of high CIMT in T2DM patients with ischemic stroke, 80% prevalence in T2DM patients without any stroke and 20% prevalence in non-diabetics. These prevalence rates vary as per the accompanying risk factors. As per the ultrasonography measurements, it was observed that among patients with increased CIMT (>0.8 mm), male: female ratio was 3.75:1, suggesting that males are more vulnerable to have increased CIMT. As the age and BMI progresses, the risk of having increased CIMT goes up. In all age groups, males scored over females in having increased CIMT. Smokers had statistically significant higher prevalence of having increased CIMT. Hypertensive patients had significantly higher chances of getting increased CIMT than nonhypertensives. But though the subjects with duration of T2DM >10 years had a higher prevalence of increased CIMT, it was statistically not significant in comparison to subjects with duration of T2DM <10 years. As the age and BMI progresses, the risk of having increased CIMT goes up. In all age groups, males scored over females in having increased CIMT. Smokers had statistically significant higher prevalence of having increased CIMT. Any increase in BMI above normal weight levels is associated with an increased risk of being diagnosed as having complications of diabetes mellitus. For men, the increased risk of these complications occurred at higher BMI levels than in women. Ocular complications occurred at higher BMI levels than other complication types in both men and women(8).

Hypertensive patients had significantly higher chances of getting increased CIMT than nonhypertensives. But though the subjects with duration of T2DM >10 years had a higher prevalence of increased CIMT, it was statistically not significant in comparison to subjects with duration of T2DM <10 years.

The three glycemic parameters (FPG, PPPG, and HbA1C) and the lipid parameters like total cholesterol, LDL cholesterol, and triglyceride were all significantly higher in patients with increased CIMT. Though HDL cholesterol had a negative association with the occurrence of increased CIMT, it was not significant. Diercks et al. similarly showed that urine albumin excretion was strongly related to subclinical atherosclerosis in the presence of increased CIMT in patients with T2DM (9). **The Framingham study** and **Multiple Risk Factor Intervention Trial (MRFIT)** showed a 2–3 fold elevation in the risk of clinically evident atherosclerotic disease in patients with T2DM(10). The risk factors predispose to increased IMT and correlate well with lack of coronary artery disease, whereas an increasing CIMT above normal level (> 0.8 mm) is associated with increasingly severe coronary artery disease, an increased risk of myocardial infarction and also stroke.

CONCLUSION-
Most common age group of diabetes was 40- 60yrs (50%). Male predominance of diabetes was seen 56% v/s 44%. Regarding glycemic parameters FBS>126, PPBS>200, HbA1c>6.5% were associated with 48%, 30%, 86% respectively. Hypertension was coexisting with diabetes in 40% cases. In our study diabetes patients are mostly having abnormalities of hypertriglyceridemia, then low HDL, then total cholesterol, then LDL cholesterol. Which tally with Indian lean diabetics-abdominal obesity. 27.3% cases having high BMI >27.3. Not very significant patients were having significant kidney disease (8%). Atherosclerotic plaque (30%) was not very common in our study. CIMT increased only in 22% v/s 78%. Risk of carotid atherosclerosis increased with age and duration of diabetes >10 years.

Limitation of the study- **STUDY DESIGN:** A longitudinal study with baseline and follow up in type 2 diabetic patients would have been more suited to determine the relationship between the occurrence of atherosclerosis and Syndrome X. **SELECTION BIAS:** The study being a hospital-based study, there is always a chance of selection bias **SAMPLE SIZE:** A larger number of study populations would have made this study more accurate and leaded further weightage to the results. 50 patients were too small to come into a conclusion. **REFERRAL BIAS:** Referral bias may have influenced the study result in this study.

Conflict Of Interest-There is no conflict of interest.

Table 1. American Diabetic Association Classification of albuminuria

Spot Collection	Timed Collection	24-hr Collection	Category
Less than 30 mcg/mg creatinine	Less than 20 mcg/min	Less than 30 mg	Normal
30-300 mcg/mg creatinine	20-200 mcg/min	30-300 mg	Microalbuminuria

More than 300 mcg/mg creatinine	More than 200 mcg/min	More than 300 mg	Clinical albuminuria

Table 2. Age Distribution

AGE (IN YEARS)	FREQUENCY	PERCENT
<40 YEARS	10	20.0
40-60 YEARS	25	50.0
>60 YEARS	15	30.0

Table 3. Sex distribution

SEX	FREQUENCY	PERCENT
FEMALE	22	44.0
MALE	28	56.0

Table 4.-FBS distribution

FBS	FREQUENCY	PERCENTAGE
<100	0	0.0
100-126	26	52.0
>126	24	48.0

TABLE 5. PPBS distribution

PPBS	FREQUENCY	PERCENTAGE
<140	8	16.0
140-200	27	54.0
>200	15	30.0

TABLE 6. HbA1c distribution

HbA1c	FREQUENCY	PERCENT
> 6.5	43	86.0
≤ 6.5	7	14.0

TABLE 7. TC distribution

TC	FREQUENCY	PERCENTAGE
ABNORMAL (>200 mg/dl)	24	48.0
DESIRABLE (<200 mg/dl)	26	52.0

TABLE 8. TG

TG	FREQUENCY	PERCENTAGE
ABNORMAL (> 150 mg/dl)	31	62.0
DESIRABLE (<150 mg/dl)	19	38.0

Table 9-LDL-Distribution-

LDL-C	FREQUENCY	PERCENTAGE
ABNORMAL (>100 mg/dl)	21	42.0
DESIRABL (< 100 mg/dl)	29	58.0

TABLE 10. HDL-C DISTRIBUTION

HDL-C	FREQUENCY	PERCENTAGE
ABNORMAL (<50 mg/dl)	40	80.0
DESIRABLE (> 50 mg/dl)	10	20.0

TABLE 11. URINE ACR DISTRIBUTION

Urine ACR	FREQUENCY	PERCENTAGE
ABNORMAL (> 30 mcg/mg Creatinine)	24	48.0
NORMAL (<30 mcg/mg Creatinine)	26	52.0

TABLE 13. DISTRIBUTION OF HTN

Hypertension	FREQUENCY	PERCENT
NO	30	60.0
YES	20	40.0

TABLE 14. PLAQUE DISTRIBUTION

PRESENCE OF PLAQUE	FREQUENCY	PERCENT
NO	30	60.0
YES	20	40.0

TABLE 15. CIMT DISTRIBUTION

CIMT	FREQUENCY	PERCENTAGE
INCREASED (> 0.8 mm)	11	22.0
NORMAL (<= 0.8 mm)	39	78.0

Table 16: SERUM CREATININE

SERUM CREATININE	FREQUENCY	PERCENT
>1.5 (ABNORMAL)	4	8.0
≤ 1.5 (NORMAL)	46	92.0

Table 17. BMI DISTRIBUTION

BMI	FREQUENCY	PERCENTAGE
≤ 22.9	12	24.0
23 - 27.5	20	40.0
> 27.5	18	36.0

DURATION OF DM
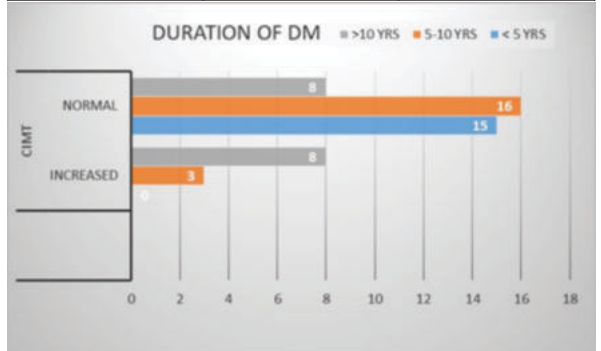
REFERENCES:
1. Ferrannini E, Cushman WC. Diabetes and hypertension: the bad companions. Lancet. 2012 Aug 11;380(9841):601-10. doi: 10.1016/S0140-6736(12)60987-8. PMID: 22883509.
2. Athyros VG, Doumas M, Imprialos KP, Stavropoulos K, Georgianou E, Katsimardou A, Karagiannis A. Diabetes and lipid metabolism. Hormones (Athens). 2018 Mar;17(1):61-67. doi: 10.1007/s42000-018-0014-8. Epub 2018 Apr 16. PMID: 29858856.
3. Jackson CE, Solomon SD, Gerstein HC, Zetterstrand S, Olofsson B, Michelson EL, Granger CB, Swedberg K, Pfeffer MA, Yusuf S, McMurray JJ; CHARM Investigators and Committees 2009 Albuminuria in chronic heart failure: prevalence and prognostic importance. Lancet 374:543–5501.
4. Tuttle KR, Bakris GL, Bilous RW, et al. Diabetic kidney disease: a report from an ADA Consensus Conference. Diabetes Care 2014;37:2864–2883.
5. Ito H, Komatsu Y, Mifune M, Antoku S, Ishida H, Takeuchi Y, et al. The estimated GFR, but not the stage of diabetic nephropathy graded by the urinary albumin excretion, is associated with the carotid intima-media thickness in patients with type 2 diabetes mellitus: a cross-sectional study. Cardiovasc Diabetol. 2010; 9: 18 [DOI] [PubMed].
6. Temelkova-Kurktschiev TS, Koehler C, Leonhardt W, Schaper F, Henkel E, Siegert G, et al. Increased intimal-medial thickness in newly detected type 2 diabetes: risk factors. Diabetes Care. 1999; 22(2):333-8 [PubMed].
7. 28.Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart. 2008;94:16–26. [PubMed].
8. Gray N, Picone G, Sloan F, Yashkin A. Relation between BMI and diabetes mellitus and its complications among US older adults. South Med J. 2015 Jan;108(1):29-36. doi: 10.14423/SMJ.0000000000000214. PMID: 25580754; PMCID: PMC4457375.
9. Diercks GF, Stroes ES, Van Boven AJ, Van Roon AM, Hillege HL, De Jong PE, et al. Difference in the relation between urinary albumin excretion and carotid intima-media thickness in nondiabetic and type 2 diabetic subjects. Diabetes Care. 2002;25(5):936-7.
10. Kannel WB, McGee DL. Diabetes and glucose tolerance as risk factors for cardiovascular disease: The Framingham study. Diabetes Care. 1979;2:120-6. [PubMed].