

Clinical profile of patients with type II diabetes mellitus with respect to microalbuminuria – A cross sectional study

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Abstract

Background: Microalbuminuria is an important warning sign for both the physician and the patient, which, if ignored, can lead to an irreversible renal damage. Microalbuminuria is most commonly associated with other microvascular complications of diabetes, namely retinopathy, neuropathy, and ischemic heart disease. So, microalbuminuria may be a maker for widespread microvascular damage in a patient with DM. Hence there is an immense need to detect diabetic nephropathy early for better quality of the care of affected patients and treat effectively those at high risk of diabetic kidney disease.

Objective: To study various clinical presentations in patients of type II diabetes mellitus with respect to microalbuminuria and to study the association of microalbuminuria with lipid profile, age of diabetics and duration of diabetes.

Material and Methods: A cross sectional observational study was done with patients, diagnosed with type II diabetes mellitus over period of two years. Total 230 patients of mean age 48.82 ± 1.029 years, were included in this study.

Results: Most of study participants were having Mild (20-50 mg/g) microalbuminuria contributing 39 (47.56%) followed by Moderate (50-100 mg/g) in

27(32.93%) and Severe(100-300 mg/g) microalbuminuria in 16 (19.51%) participants respectively. Mean urine albumin among all participants was 15.63 ± 3.719 mg/g, Mean HbA1c (gm%) was 7.72 ± 0.0961 . Mean BMI was 23.84 ± 0.309 Kg/m², Mean total cholesterol 188.75 ± 4.87 , Mean HDL Cholesterol(mg/dl) 39.90 ± 0.962 , mean Fasting BSL(mg/dl) 112.6 ± 2.587 , mean PP BSL(mg/dl) 207.1 ± 4.653 , mean SBP 131.49 ± 1.717 mm/Hg and mean DBP was 84.30 ± 1.082 mm/Hg respectively. Hypertension among patients of Type 2 DM was present in 109(76%) subjects followed by obesity (BMI>25 Kg/m²) 103 (44.78%), Physical Inactivity 149(64.78%), Hypercholesterolemia (TC > 200 mg/dl) in 104(45.21%), Alcohol consumption in 75 (32.60%) and Smoking 100(43.47%) respectively. Positive correlation was seen between BMI and urine albumin ($p=0.020$), HbA1C and urine albumin ($p=0.016$), Systolic BP and urine albumin ($p=0.021$) and Duration Of DM and urine albumin ($p=0.028$). Weakly positive correlation was seen between age and urine albumin, however not statistically significant ($p=0.184$). A statistical significant association was seen between Hypertension and microalbuminuria ($p=.005$), Smoking and microalbuminuria ($p=.004$), Physical inactivity and microalbuminuria ($p=.0006$) and Duration of DM and microalbuminuria ($p=.001$) among patients of type II DM. However, no statistical significant association was seen between age, Obesity and hypercholesterolemia and microalbuminuria in present study ($p>0.05$).

Conclusion: Hypertension, Smoking, Physical inactivity and long duration of DM were risk factors associated with microalbuminuria among patients of type II DM.

Keywords: Microalbuminuria, Type II Diabetes Mellitus, Diabetic Nephropathy.

Introduction

Diabetes mellitus (DM), the most common endocrine disorder, is characterized by metabolic abnormalities and long-term microvascular and macrovascular complications. Besides increasing the risks for coronary heart disease, diabetes enhances the incidences of cerebrovascular accidents too. Moreover, it is the leading cause of acquired blindness and accounts for about a quarter of the cases with end-stage renal diseases as well as half of the cases of nontraumatic lower limb amputations.[1,2]

The International diabetes federation estimates that there are 463 million people with type 2 diabetes. Throughout the world 50 percent of these patients (232 millions) remain undiagnosed and the number of diabetic patients predicted to increase to 700 million by 2045.[3] Nephropathy is a frequent cause of morbidity & mortality in type 2 diabetes mellitus.[4] Diabetic nephropathy is accompanied with significant microvascular risk and is the leading cause of kidney disease.

This term microalbuminuria denotes a significant increase in albumin excretion rate. Albumin excretion in healthy individuals ranges from 1.5 to 20 μ g/min with geometric mean in the range of 6.5 μ g/min. These values have been termed as normoalbuminuria. Microalbuminuria, thus, defines the wide substantial range of hypersecretion of albumin, ranging between 20 and 200 μ g/min.[5]

Diabetic nephropathy manifests after 10 years duration of type 1 DM, but may be exists at the time of diagnosis of type 2 DM.[6] Onset of albuminuria assists to diagnose the development of diabetic kidney disease has significant unfortunate consequences. Diabetic nephropathy may progress from microalbuminuria to

macroalbuminuria with progressive loss of glomerular filtration rate (GFR) until End Stage Renal Disease (ESRD).[7]

Objective

1. To study various clinical presentations in patients of type II diabetes mellitus with respect to microalbuminuria.
2. To study the proportion of microalbuminuria .
3. To study the association of microalbuminuria with lipid profile, age of diabetics and duration of diabetes

MATERIAL AND METHODS

Study Design: A Cross Sectional Study conducted between period of November 2020 to November 2022 in Tertiary Rural Health Care Centre including OPD and IPD Patients of Type 2 Diabetes Mellitus who fulfill the inclusion criteria for study.

Sample size

It is decided with reference to study by Varghese A et al [8] , prevalence of microalbuminuria in type 2 diabetes mellitus among the study participants was found out to be 36.3%.

Sample size: Sample Size for present study is calculated by following formula

$$N=4 \times P \times Q / L^2 , \text{ Where } P= 36.3, Q=100-36.3=63.6$$

Allowable error i.e. $L=7\%$ absolute

$$N=4 \times 36.3 \times 63.7 / 49$$

$$N=188.76$$

However 230 subjects were included in the study.

Sampling method: A consecutive sampling method was used till desired sample size was achieved.

Ethical Clearance: Ethical clearance was obtained from institutional ethics committee.

Inclusion criteria

All diagnosed patients of Type 2 Diabetes Mellitus attending OPD and IPD of Tertiary Hospital.

Exclusion criteria

1. Patient with microalbuminuria
2. Patient with urinary tract infection
3. Pregnant patient
4. Patient with overt diabetic nephropathy

Research methodology specified for Data collection

The patients fulfilling to the inclusion criteria were enrolled into the study after being explained the proceedings of the study and after they signed the consent form. Predesigned and pretested case record form was used as tool for data collection. Data was collected about socio demographic characteristics of study subjects like age, sex , occupation, socioeconomic status and education.

Anthropometric measurements were done to calculate BMI and WHR.

$$BMI =$$

$$\text{Weight in kgs} / \text{height in m}^2$$

Classification (kg/m²).

Underweight- < 18 .

Normal - $18.5 - 22.99$

Overweight - $23 - 24.99$

Obesity - ≥ 25

Weight was measured with help of Analogue Weight Machine

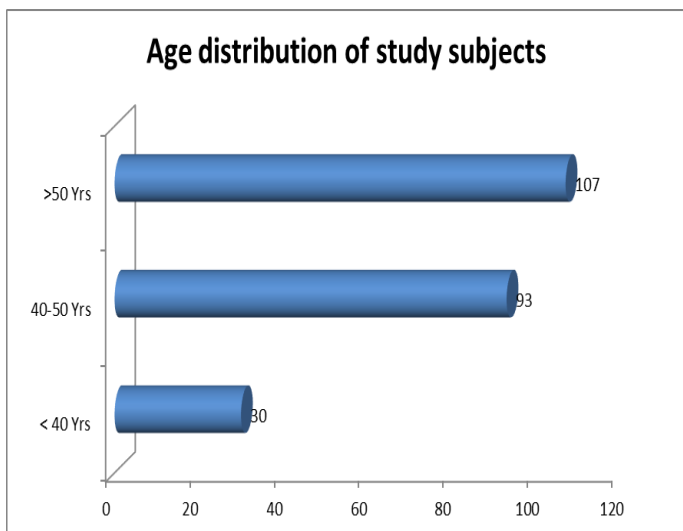
Data entry and analysis

The collected data was entered in Microsoft excel. The categorical variables were presents as number and percentage whereas for continuous variable were presented as mean and SD. Chi square test χ^2 and Pearson's correlation coefficient (r) were used as test of significance. p value of <0.05 was considered statistically significant

Results and Observations

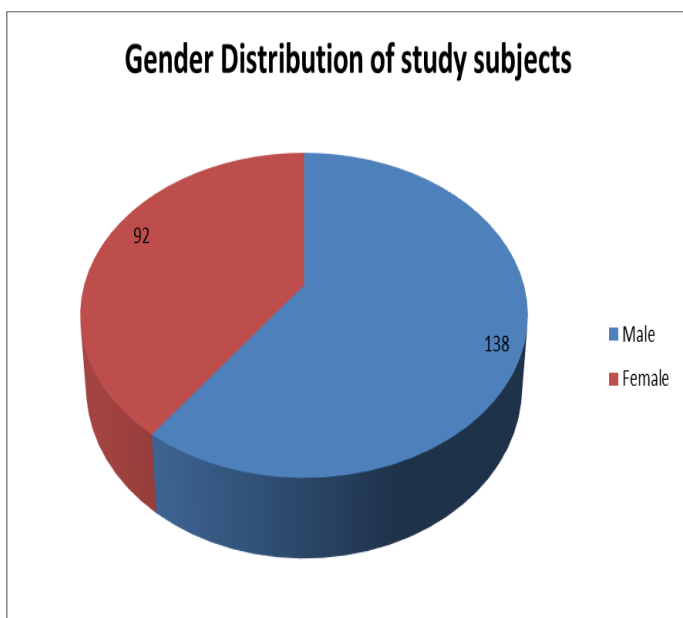
Total 230 subjects are included in study.

Figure 1: Distribution of study participants according to age (N=230)



Above figure shows that, majority of study participants were from age group > 50 years contributing 107 (46.52%) followed by 40-50 years 93 (40.43%) and <40 years 30(13.04%) respectively.

Figure 2: Distribution of study participants according to gender (N=230)



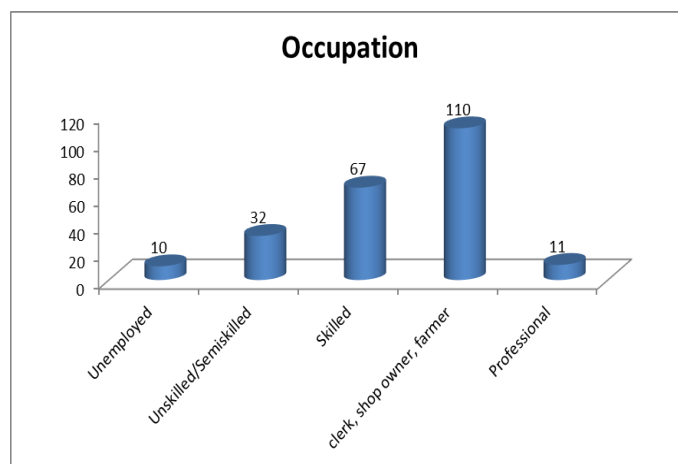
Above figure shows that, most of the study subjects were males contributing 138 (60%) and females 92(40%).M:F ratio is 1.5:1 .

Table 1: Distribution of study participants according to Education (N=230)

Education	Frequency	Percentage
Illiterate	13	5.65
Primary	32	13.91
Secondary	30	13.05
Higher secondary	54	23.47
Intermediate	77	33.47
Graduate or Post graduate	24	10.43
Total	230	100

Above table shows that majority of study subjects were educated upto Intermediate level contributing 77 (33.47%) followed by Higher secondary 54 (23.47%), Graduate or PG 34 (13.6%) ,primary 32(13.91%) ,secondary 30 (13.05%) and illiterate 13 (5.65%) respectively.

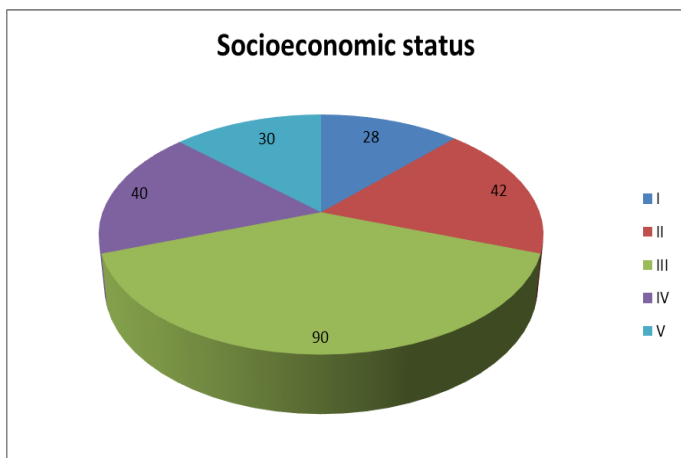
Figure 3: Distribution of study participants according to occupation (N=230)



Above Figure shows that majority of study subjects were having occupations like clerk, shop owner, farmer contributing 110 (47.83%) followed by Skilled 67 (29.13%), Unskilled/Semiskilled 32 (13.92%),

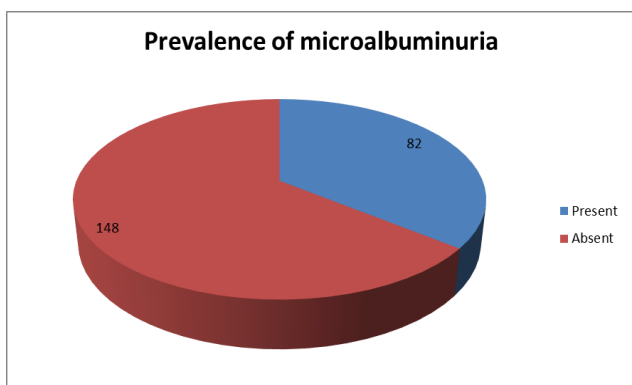
Professional 11 (4.78%), and Unemployed 10 (4.34%) respectively.

Figure 4: Distribution of study participants according to Socioeconomic status (N=230)



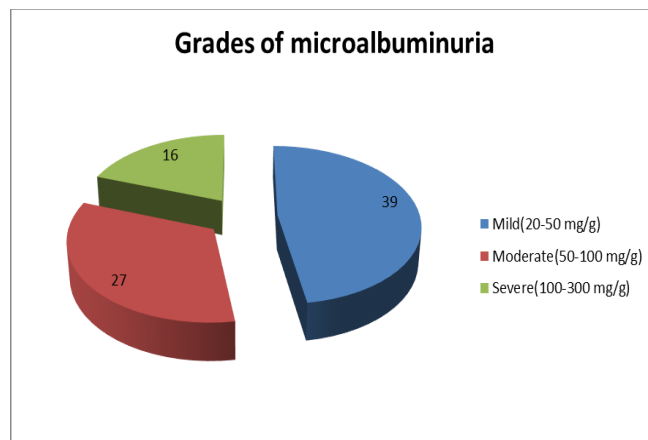
Above figure shows that majority of study subjects were belonging to SEC III contributing 90(39.13%) followed by Class II 42 (18.26%) ,Class IV 40 (17.39%) ,Class V 30 (13.04%), and Class I 28 (12.18%) respectively.

Figure 5: Prevalence of microalbuminuria among patients of type II DM (N=230)



Above figure shows that, Prevalence of microalbuminuria among patients of type II DM was 35.65%.

Figure 6: Grades of microalbuminuria among study participants (N=82)



Most of study participants were having Mild(20-50 mg/g) microalbuminuria contributing 39 (47.56%) followed by Moderate(50-100 mg/g) 27(32.93%) and Severe(100-300 mg/g) microalbuminuria in 16 (19.51%) participants respectively.

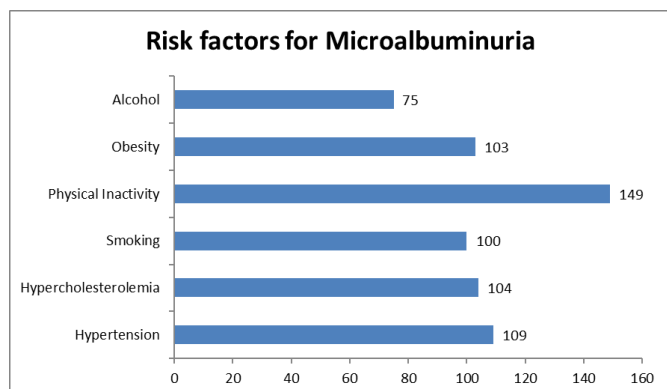
Table 2: Descriptive statistics of study participants (N=230)

Variable	Mean	SD	95% CI
Age(Yrs)	48.82	7.96	48.82 ±1.029
SBP(mm/Hg)	131.49	13.28	131.49 ±1.717
DBP(mm/Hg)	84.30	8.36	84.30 ±1.082
Total Cholesterol(mg/dl)	188.75	37.68	188.75 ±4.87
HDL Cholesterol(mg/dl)	39.90	7.44	39.90 ±0.962
Fasting BSL(mg/dl)	112.6	20.01	112.6 ±2.587
PP BSL(mg/dl)	207.1	36.00	207.1 ±4.653
HbA1c (gm%)	7.72	0.74	7.72 ±0.0961
BMI(Kg/m ²)	23.84	2.39	23.84 ±0.309
U Albumin	15.63	28.77	15.63 ±3.719

As per above table Mean age of study participants was 48.82 ±1.029 years .Mean urine albumin among all participants was 15.63 ±3.719 mg/g , Mean HbA1c (gm%) was 7.72 ±0.0961 .Mean BMI was 23.84 ±0.309Kg/m² , Mean total cholesterol 188.75 ±4.87,

Mean HDL Cholesterol(mg/dl) 39.90 ± 0.962 , mean Fasting BSL(mg/dl) 112.6 ± 2.587 , mean PP BSL(mg/dl) 207.1 ± 4.653 , mean SBP 131.49 ± 1.717 mm/Hg and mean DBP was 84.30 ± 1.082 mm/Hg respectively.

Figure 7: Risk factors for Microalbuminuria among patients of Type 2 DM (N=230)



As per above table Hypertension among patients of Type 2 DM was present in 109(76%) subjects followed by obesity (BMI>25 Kg/m²) 103 (44.78%), Physical Inactivity 149(64.78%), Hypercholesterolemia (TC > 200 mg/dl) in 104(45.21%), Alcohol consumption in 75 (32.60%) and Smoking 100(43.47%) respectively.

Table 3: Correlation between urine albumin and quantitative parameters (N=230)

Variable	Pearson's r	P value	Remark
Age	0.0878	0.184	Weakly positive
BMI	0.1529	.020*	Weakly positive
HbA1C	0.1586	.016*	Weakly positive
Systolic BP	0.1511	.021*	Weakly positive
Total Cholesterol	-0.0010	.987	Weakly Negative
HDL	-0.0072	0.91	Weakly Negative
Duration Of DM	0.1444	.028*	Weakly positive
(N=87)			

* Significant (p<0.05)

Above table shows that, positive correlation was seen between BMI and urine albumin (p=0.020) , HbA1C and

urine albumin (p=0.016), Systolic BP and urine albumin (p=0.021) and Duration Of DM and urine albumin (p=0.028) . Weakly positive correlation was seen between age and urine albumin, however not statistically significant (p=0.184).

A statistical significant association was seen between Hypertension and microalbuminuria (p=.005) , Smoking and microalbuminuria (p=.004), Physical inactivity and microalbuminuria (p=.0006) and Duration of DM and microalbuminuria (p=.001) among patients of type II DM. However, no statistical significant association was seen between age, Obesity and hypercholesterolemia and microalbuminuria in present study.(p>0.05)

Discussion

Type 2 Diabetes Mellitus (T2DM) constitutes 90 to 95% of diabetes in the adults and is characterized by a combination of insulin resistance and insulin secretory defect.[9] Complications from diabetes mellitus can be microvascular (retinopathy, neuropathy, nephropathy) and macrovascular (acute myocardial infarction, peripheral vascular disease, stroke) that result in significant morbidity and mortality.[10]

Prevalence of microalbuminuria among patients of type II DM was 35.65% in present study. A similar study by Varghese A et al[8] revealed consistent finding with present study .The study shows overall prevalence of microalbuminuria was 36.3 % .Another study by Bhavya N et al (2017) [11] showed a overall occurrence of microalbuminuria as 38%.A study by Shrestha S et al (2021)[12] revealed that, Microalbuminuria was found in 35% of cases .Our findings are in line with these studies .

Sociodemographic factors

Mean age of study participants was 48.82 ± 1.029 years .Majority of study participants were from age group > 50

years contributing 107 (46.52%) followed by 40-50 years 93 (40.43%) and <40 years 30(13.04%) respectively.[Fig No.1] .No statistical significant association was seen between age and microalbuminuria .[Table No.3] Gender distributon revealed that, M:F ratio was 1.5:1.[Fig No.2] Most of study subjects were were educated upto Intermediate level contributing 77 (33.47%) followed by Higher secondary 54 (23.47%)[Table No.1]. Most of study subjects were belonging to SEC III contributing 90(39.13%) followed by Class II 42 (18.26%).[Fig No.4] .

A similar study by Shrestha S et al (2021)[12] revealed that , Mean age in patients with microalbuminuria was 54.8 yrs with standard deviation of 10.189. No statistically significant relation was found between microalbuminuria and age (P = 0.366).Our findings are in line with this study.

Similar findings were observed in study by Islam M (2017)[13] .It was seen that, half of the patients were from the middle-class family with low physical activity and their age was within the range of 30 - 45 years. The male and female ratio of the study population was 60:40. Most of the patients were found to be obese and educated.

Grades of microalbuminuria [Fig No.6]

Most of study participants were having Mild (20-50 mg/g) microalbuminuria contributing 39 (47.56%) followed by Moderate (50-100 mg/g) 27(32.93%) and Severe (100-300 mg/g) microalbuminuria in 16 (19.51%) participants respectively. A similar study by Ali MS et al (2019) shown that, Mild(20-50 mg/g) microalbuminuria in 59 (59%) followed by Moderate(50-100 mg/g) 24(24%) and Severe(100-300 mg/g) microalbuminuria in 17 (17%) participants. Our findings are consistent with this study.

Descriptive statistics of study participants [Table No.2]

Mean age of study participants was 48.82 ± 1.029 years .Mean urine albumin among all participants was 15.63 ± 3.719 mg/g , Mean HbA1c (gm%) was 7.72 ± 0.0961 .Mean BMI was 23.84 ± 0.309 Kg/m² , Mean total cholesterol 188.75 ± 4.87 , Mean HDL Cholesterol(mg/dl) 39.90 ± 0.962 , mean Fasting BSL(mg/dl) 112.6 ± 2.587 , mean PP BSL(mg/dl) 207.1 ± 4.653 , mean SBP 131.49 ± 1.717 mm/Hg and mean DBP was 84.30 ± 1.082 mm/Hg respectively.Simillar findings were seen in study by Dhonde S et al (2022) [14] and Bhavya N et al (2017) [11]

Risk factors for Microalbuminuria among patients of Type 2 DM

Hypertension among patients of Type 2 DM was present in 109(76%) subjects followed by obesity (BMI>25 Kg/m²) 103 (44.78%), Physical Inactivity 149(64.78%), Hypercholesterolemia (TC > 200 mg/dl) in 104(45.21%), Alcohol consumption in 75 (32.60%) and Smoking 100(43.47%) respectively.[Fig No.7]

Positive correlation was seen between BMI and urine albumin (p=0.020) , HbA1C and urine albumin (p=0.016), Systolic BP and urine albumin (p=0.021) and Duration Of DM and urine albumin (p=0.028) . Weakly positive correlation was seen between age and urine albumin , however not statistically significant (p=0.184).[Table No.3]

A statistical significant association was seen between Hypertension and microalbuminuria (p=.005) , Smoking and microalbuminuria (p=.004), Physical inactivity and microalbuminuria (p=.0006) and Duration of DM and microalbuminuria (p=.001) among patients of type II DM. However ,no statistical significant association was seen between age, Obesity and hypercholesterolemia

and microalbuminuria in present study.($p > 0.05$).[Table No.3]

A study by Ahmad T et al (2017)[15] revealed that, Microalbuminuria was diagnosed in 404(31.56%) patients and among these albuminuric patients 335(82.9%) had hypertension. They were also dyslipidemic, having raised triglyceride levels, lower HDL levels, with more prevalence of background diabetic retinopathy and peripheral neuropathy. They also showed higher HbA1C levels and longer duration of diabetes.

Another study by Amritanshu K et al.(2015)[16] shown that, factors associated with microalbuminuria in diabetic patients included duration of diabetes mellitus, higher blood pressure, higher cholesterol and triglyceride levels.

A similar study by Shrestha S et al (2021)[12] revealed that,microalbuminuria was found in 35% of the sample and the rate was significantly higher among males ($P = 0.027$). Microalbuminuria was significantly related to Body mass index ($P = 0.018$), duration of diabetes ($P = 0.000$), retinopathy ($P = 0.000$) and stroke ($P = 0.043$). No statistically significant relation was found between microalbuminuria and age ($P = 0.366$), hypertension ($P = 0.208$), HbA1c ($P = 0.098$), dyslipidemia ($P = 0.171$) and ischemic heart disease ($P = 0.651$).

A Study by Bhavya N et al (2017) [11]done an observational study among 100 participants in Karnataka . It was seen that, The occurrence of microalbuminuria showed a direct relationship with increasing age ($p = 0.053$) and increasing duration of diabetes since diagnosis. A hemoglobin (Hb)A1c value above 7% is associated with 50% or higher incidence of microalbuminuria ($p = 0.018$). Patients with a body mass index of more than 25kg/m² have increased risk of

developing type II DM and significant increase in microalbuminuria. The incidence of microalbuminuria is significantly associated with the presence of retinopathy ($p = 0.061$), peripheral neuropathy ($p = 0.009$), and hypertension ($p \leq 0.001$). Microalbuminuria is inversely associated with high-density lipoprotein ($p = 0.089$).

Another study by Dhonde S et al (2022) [14] observed that, highly significant difference ($p < 0.000$) was found among the results of the three groups based on duration of diabetes. It was found that, microalbuminuria was more predominant in patients having age more than 60 years as well as inpatients having more than 10 years of duration of DM.

Findings of these studies are consistent with present study.

Conclusion

Early diagnosis of diabetic nephropathy can be done using spot urine microalbumin in type 2 diabetes mellitus patients. Prevalence of microalbuminuria was 35%. Positive correlation was seen between BMI ,HbA1C, Systolic BP , Duration Of DM and urine albumin. However, larger trials with bigger sample size should be carried out to confirm this finding from our study.

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