Section: General Medicine

Original Research Article

STUDY OF CORRELATION BETWEEN MICROALBUMINURIA AND DYSLIPIDEMIA IN PATIENTS WITH TYPE 2 DIABETES MELITUS

Navin James[1], Venu Balachandran[2], Francy Louis[3]

[1]Junior Resident, Department of General Medicine, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India
[2]Assistant Professor, Department of General Medicine, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India
[3]Professor, Department of General Medicine, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India

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Corresponding Author:
Dr. Navin James,
Email: navinathickal@gmail.com

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Abstract

Background: The study aims to explore the correlation between microalbuminuria and dyslipidemia in patients with type 2 diabetes mellitus. This relationship is significant because both conditions are known risk factors for cardiovascular and renal complications in diabetes. **Materials and Methods:** A cross-sectional study was conducted at the Department of General Medicine, Jubilee Mission Medical College, Thrissur, over a period of 18 months. A total of 113 patients with type 2 diabetes mellitus, aged 30-75 years, were selected based on specific inclusion and exclusion criteria. The inclusion criteria encompassed newly diagnosed and existing cases of non-insulin-dependent diabetes mellitus with fasting blood sugar levels greater than 126 mg/dl and postprandial blood sugar levels over 200 mg/dl. Patients with chronic kidney disease, hypertension, active urinary tract infection, liver disease, nephrotic syndrome, or those on medications affecting lipid metabolism were excluded. The study involved detailed clinical examinations and laboratory assessments, including fasting lipid profiles, urine microalbumin levels, and HbA1c. Statistical analysis was performed using descriptive statistics, chi-square tests, and Fisher‟s exact tests, with a p-value of less than 0.05 considered statistically significant. **Result:** The results demonstrated a significant correlation between microalbuminuria and dyslipidemia in the study population. Patients with microalbuminuria had higher levels of total cholesterol, LDL-C, and triglycerides, alongside lower HDL-C levels, compared to those without microalbuminuria. This lipid profile is indicative of an atherogenic pattern, commonly associated with increased cardiovascular risk. **Conclusion:** The findings establish a clear association between dyslipidemia and microalbuminuria in patients with type 2 diabetes mellitus, suggesting that lipid abnormalities may serve as an early marker for nephropathy. Early detection and aggressive management of dyslipidemia in diabetic patients, particularly those with microalbuminuria, are crucial for preventing the progression of renal and cardiovascular complications. The study underscores the importance of comprehensive cardiovascular risk management in the diabetic population.

INTRODUCTION

Long-term micro- and macrovascular problems as well as metabolic irregularities are hallmarks of diabetes mellitus. Diabetic nephropathy is a prime cause of mortality and morbidity and is now one of the more preferred reasons of end-stage renal disease. Nonetheless, there exists a preliminary stage of diabetic nephropathy, a form of diabetic renal disease. This stage is characterised by an increase in albumin excretion in the urine, or microalbuminuria.[1]

However, the increase can only be found with a sensitive urine albumin assay. At this point, routine clinical testing reveal normal renal function and a negative result for macroalbumin in the urine. Microalbuminuria occurs ten to fifteen years before overt diabetic nephropathy manifests. It is possible to stop diabetic renal disease from progressing to end stage renal disease at this point or perhaps reverse it.[2]

Hyperglycemia, hypertension, dyslipidemia, smoking, a family history of the condition, and gene polymorphisms influencing the renin-angiotensin-

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aldosterone axis activity are risk factors to advance the development of diabetic nephropathy.[3]

Dyslipidemia is one of the primary warning signs for diabetic nephropathy. Changes in blood lipid levels and vascular problems are more closely associated with Diabetes than with non-diabetics in the general populace. Individuals suffering from Diabetes will develop microvascular and macrovascular illnesses as a result of lipid imbalances. Both non-diabetic and diabetic populations exhibit lipoprotein abnormalities linked to big artery disease; however, diabetics experience an acceleration in atherogenesis.[4]

Due to the "increased risk of morbidity and mortality associated with these patient categories, the American Diabetes Association (ADA) with the National Cholesterol Education Program (NCEP) has recognised the need for more aggressive lipid-lowering medication. The aim of this particular study is to examine the correlation between Microalbuminuria and dyslipidemia in individuals diagnosed suffering with type 2 diabetes.[5,6]

For those suffering from type I and type II" diabetes, the duration of the illness plays a significant role in determining the frequency of Microalbuminuria. Dyslipidemia is one risk factor for diabetic nephropathy. At the time of diagnosis, Microalbuminuria is present in 12–15% of individuals with type II diabetes mellitus; ten years later, that percentage increases to approximately, 25%.[7]

This study attempts to understand the relationship between Microalbuminuria and dyslipidemia and investigates the impact of glycemic management on diabetic dyslipidemia. The investigation may be significant for understanding whether Microalbuminuria is a sign of dyslipidemia progression and for managing dyslipidemia going forward.

Aims and Objectives

Primary objective: To study the correlation between Microalbuminuria and dyslipidemia in patients with type 2 diabetes mellitus

Secondary objective: To study the incidence of Microalbuminuria in patients with type 2 diabetes mellitus.

MATERIALS AND METHODS

Study Design: Cross sectional study.

Study Duration: 1 8 months.

Study Setting: Department of General Medicine, Jubilee Mission Medical College, Thrissur.

Study Population: A total of 113 patients satisfying all inclusion criteria were included in the study.

Sample Size: 113

Inclusion Criteria

- All new and diagnosed cases of Non insulin dependant Diabetes Mellitus (<15yrs since diagnosis) with FBS>126mg/dl & PPBS>200mg/dl
- Age 30-75years
- Patient or relative giving consent for study

Exclusion Criteria

- Patients with Chronic Kidney disease
- Patients with Hypertension
- Active Urinary tract infection
- Liver Disease
- Nephrotic Syndrome
- Patients on drugs interfering with lipoprotein metabolism like Progesterone, estrogen, thiazides, ACEi, ARBs and thiazides
- Patient or relative not giving consent for study.

Methodology: After meeting the inclusion and exclusion criteria, all confirmed diabetics with postprandial venous glucose >200gm% and fasting venous glucose > 126gm% were added to the study. All documented instances of type 2 diabetes with varying treatment regimens are qualified for inclusion. A thorough medical history was obtained, paying particular attention to age, BMI, diabetes duration, type of treatment, and symptoms and complications associated with Diabetes. A thorough clinical assessment is required. The patients included in the study were assessed for HbA1c levels (<7% well controlled and>7% poorly controlled as per ADA guidelines). The patients were estimated for Urine Microalbumin levels (30-300mg/g-are included in the study) and Fasting Lipid Profile

Plan of analysis: Present descriptive data using percentages and numbers. Fisher's "exact test or the Chi-square test are used to analyse categorical data. It was determined that a p-value of 0.05 or less was statistically" significant. Data was coded in Microsoft Excel and then further examined with SPSS software.

RESULTS

This Cross sectional study was conducted for a period of 18 months in the Department of General Medicine, Jubilee Mission Medical College, Thrissur. A total of 113 patients satisfying all inclusion criteria will be included in the study. The results obtained were as follows:

Based on their HbA1c level, 113 patients were split into two Groups

GROUP A = Patients with HbA1c <7 i.e. well controlled DM

GROUP B = Patients with HbA1c ≥7 i.e. Uncontrolled DM

Mean Urine microalbumin among the study population.

Table 1: Mean Urine microalbumin among the two groups.

Mean Urine microalbumin (mg/gm)	Mean (mg/gm)	S.D.	P value
GROUP A (HbA1c <7)	55.69	18.43	0.00001
GROUP B (HbA1c ≥7)	158.43	58.09	

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Overall	135.55 ± 68 mg/gm

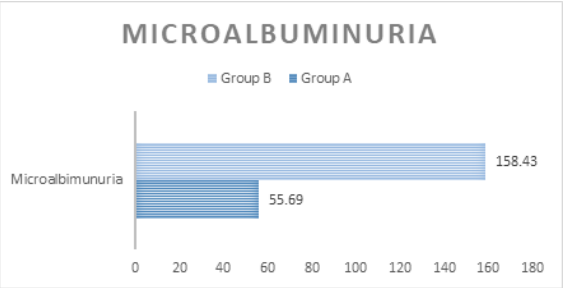


Figure 1: Mean Urine microalbumin distribution among the two groups

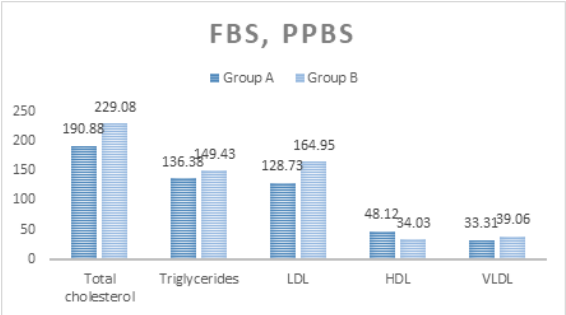


Figure 2: Lipid profile distribution among the two groups

The mean Microalbuminuria of patients in Group A (HbA1c <7) was 55.69 ± 18.43 mg/gm, and in patients of Group B (HbA1c ≥7) was 158.43 ± 58.09 mg/gm, which was statistically significant (p <0.05). There is a noteworthy high incidence of microalbuminuria among patients in Group B (HbA1c ≥7) in our study.

In our study, Group B (HbA1c ≥7) had significantly higher mean total cholesterol, serum triglycerides, LDL, and VLDL cholesterol levels. (p <0.05). Group A (HbA1c <7) had a significantly higher HDL cholesterol level. (p <0.05).

Lipid profile distribution among the study population

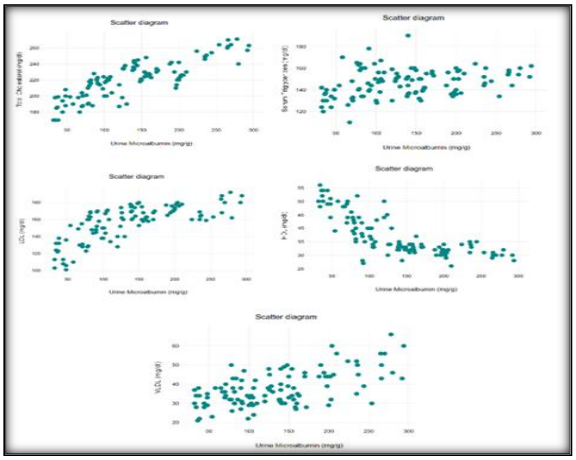
Table 2: Lipid profile distribution among the two groups

Lipid profile (mg/dl)	GROUP A (HbA1c <7)		GROUP B (HbA1c ≥7)		P value
	Mean	SD	Mean	SD	
Total cholesterol	190.88	12.91	229.08	17.37	0.0001
Triglycerides	136.38	12.32	149.43	11.19	0.0001
LDL	128.73	16.49	164.95	13.26	0.0001
HDL	48.12	4.66	34.03	4.45	0.0001
VLDL	33.31	6.56	39.06	9.17	0.001

Correlation between Microalbuminuria and dyslipidemia

Table 3: Correlation between Microalbuminuria and dyslipidemia

Lipid profile	Correlation with Microalbuminuria		
	Correlation Coefficient (r)	p-value	Interpretation
Total cholesterol	0.83	<0.001	very high, positive correlation
Triglycerides	0.3	0.001	Moderate positive correlation
LDL	0.72	<0.001	very high, positive correlation
HDL	-0.75	<0.001	very high, negative correlation
VLDL	0.6	<0.001	High, positive correlation



Scatter plot showing Correlation between Microalbuminuria and Dyslipidemia.

The Pearson correlation's result indicated that there was a very high, positive correlation between Urine Microalbumin (mg/g) and Total Cholesterol (mg/dl), there was a moderate, positive correlation between Urine Microalbumin (mg/g) and Serum Triglycerides (mg/dl), a strong, positive correlation between Urine Microalbumin (mg/g) and LDL (mg/dl), a high, positive correlation between Urine Microalbumin (mg/g) and VLDL (mg/dl).

DISCUSSION

A dyslipidemia state characterised by abnormalities in all classes of lipoproteins is brought on by diabetes mellitus. Diabetes patients have a higher chance of developing Microalbuminuria, which highlights the significance of lipoprotein abnormalities in the disease. Regardless of the route of treatment, Type II DM is linked to albuminuria and dyslipidemia.

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Patients with Type II diabetes are more likely to have chronic kidney disease because it is an important contributor of morbidity and death in this population. Of the increased albuminuria in Diabetes, the presence of dyslipidemia and hyperglycemia is another clear risk factor. Yet, lipoprotein abnormalities appear throughout the mainly asymptomatic prodrome and significantly raise the risk of mortality and morbidity, while hyperglycemia appears quite late in the progression from insulin resistance to frank Diabetes.

This Cross-sectional study was conducted for a period of 18 months in the Department of General Medicine, Jubilee Mission Medical College, Thrissur. A total of 113 patients satisfying all inclusion criteria will be included in the study. The results obtained were as follows. A total of 113 patients who participated in the study were divided into two groups based on HbA1c level. GROUP A consisted of Patients with HbA1c <7, and GROUP B consisted of Patients with HbA1c ≥7.

113 patients with Diabetes mellitus, mean HbA1c in Group A (HbA1c <7%) was 6.74 ± 0.12% and in Group B (HbA1c ≥7%) was 7.77 ± 0.57%. The mean HbA1c was 7.74 ± 0.67 in the study population.

Demographic Details

The mean age in Group A (HbA1c <7) was 51.96 ± 13.01 years, and in Group B (HbA1c ≥7) was 59.88 ± 9.31 years. There is a statistically significant difference in age among the two groups in our study. (p= 0.007). Patients with more glycosylated hemoglobin were found to be in the older age group. The mean age of our study population was 57.96 ± 10.74 years.

The study population consisted of 16(61.54%) and 62(55.36%) were males, and 10(38.46%) and 40(46.51%) were females, respectively among Group A and Group B. There was no statistically significant difference in gender distribution between the two groups. (p = 0.469).

However according to MS Sigdel et al. in patients with Diabetes, Microalbuminuria was somewhat more common in females than in males.71

Duration of Symptoms

Among both the groups' duration of symptoms were 4.92 ± 2.31 years and 7.07 ± 2.46 years, respectively. A statistically significant variation in the duration of symptoms was observed. Patients with HbA1c ≥ 7 had more duration of symptoms. (p<0.05).

Similar to our study, A.A. Idowu et al. showed a relationship between the development and severity of albuminuria, poor glycaemic control, and a longer duration of Diabetes.[8]

G Bardini et al also suggested that the duration of exposure to T.G. levels above 150 mg/dL is predictive of incident microalbuminuria.[9]

Mean FBS AND PPBS

Patients in "Group A (HbA1c <7) had a mean FBS of 133.31 ± 5.71 mg/dl, while patients in Group B (HbA1c ≥7) had a mean FBS of 143.72 ± 11.51 mg/dl. These differences were statistically significant (p <0.05).

Group A" patients (HbA1c <7) had a mean PPBS of 212.88 ± 9.14 mg/dl, while Group B patients (HbA1c ≥7) had a mean PPBS of 249.19 ± 37.49 mg/dl. Both groups' results were statistically significant (p <0.05). These results are correlated with group B's higher HbA1C value.

Microalbumin: The mean Microalbuminuria of patients in Group A (HbA1c <7) was 55.69 ± 18.43 mg/gm, and in patients of Group B (HbA1c ≥7) was 158.43 ± 58.09 mg/gm, which was statistically significant (p <0.05). In our study, there is a significantly high incidence of Microalbuminuria among patients in Group B (HbA1c ≥7). Our study shows that there is an increased incidence of Microalbuminuria among patients with Diabetes.

In their research, Afkhami-Ardekani et al. found that 14.2% of individuals with Diabetes had Microalbuminuria.[10]

Similarly, Urinary albumin levels were shown to be abnormal in 30–40% of patients with type 2 diabetes by WP Battisti et al. 31.56% of individuals with Diabetes were found to have Microalbuminuria by Tauseef Ahamed et al.[11]

Lipid Distribution: The mean Total cholesterol, serum Triglycerides, LDL and VLDL cholesterol levels were significantly high in Group B (HbA1c ≥7) in our study. (p <0.05). this shows an increased incidence of dyslipidemia and associated complications in patients with Diabetes according to our study.

The HDL cholesterol level was significantly high in Group A (HbA1c <7) in our study. (p <0.05). patients with Diabetes showed reduced HDL level according to this study.

Correlation Between Microalbuminuria and Lipids: Pearson correlation showed that there was a very high, positive correlation between Urine Microalbumin (mg/g) and Total Cholesterol (mg/dl). This was statistically significant, r(111) = 0.83, p = <.001.

Similarly Pearson correlation showed that there was a moderate, positive correlation between Urine Microalbumin (mg/g) and Serum Triglycerides (mg/dl). This was statistically significant, r(111) = 0.3, p = .001.

According to CH Tseng et al the level of albuminuria increases as the triglyceride levels increases which was similar to our findings.[12]

Pearson correlation also showed that there was a very high, positive correlation between Urine Microalbumin (mg/g) and LDL (mg/dl). This was statistically significant, r(111) = 0.72, p = <.001.

Similarly according to Jameli et al., Diabetes with Microalbuminuria, Diabetes with overt proteinuria, and Diabetes with normoalbuminuria all had elevated lipid profile values.[13]

There are noteworthy correlations among HBA1c, TC, HDL-C, T.G., and creatinine according to A.A. Idowu et al.[8]

Microalbuminuria was not shown to be correlated statistically significantly with age, sex, body mass index, fasting blood sugar, glycosylated hemoglobin

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(HbA1c), serum triglyceride, serum cholesterol, or systolic blood pressure levels. According to Afkhami et al.[10]

While assessing the HDL level and Microalbuminuria, the result of the Pearson correlation showed that there was a very high, negative correlation between Urine Microalbumin (mg/g) and HDL (mg/dl). This was statistically significant, r(111) = -0.75, p = <.001.

X Sun et al came to the conclusion that individuals with type 2 diabetes had lower incidences of Microalbuminuria when their serum HDL-C levels were higher.[14]

High serum cholesterol levels were substantially correlated with Microalbuminuria. There was a modest negative connection shown to be statistically significant between Microalbuminuria, very low density lipoprotein cholesterol, and triglycerides according to Belli BG et al.[15]

The result of the Pearson correlation showed that there was a high, positive correlation between Urine Microalbumin (mg/g) and VLDL (mg/dl). This was statistically significant, r(111) = 0.6, p = <.001.

Summary

We summarize that the mean HbA1c was 7.74 ± 0.67 among the study population.The mean age of our study population was 57.96 ± 10.74 years among the patients.The incidence of Diabetes Melitus was more in older age group. We did not find any significant difference in incidence od Diabetes Melitus among males and females. Duration of symptoms were more in patients with HbA1C more than 7. There is significant high Microalbuminuria among patients in Group B (HbA1c ≥7). The mean Total cholesterol, serum Triglycerides, LDL and VLDL cholesterol levels were significantly high in Group B (HbA1c ≥7). The HDL cholesterol level was significantly high in Group A (HbA1c <7). There was a very high, positive correlation between Urine Microalbumin and Total Cholesterol. There was a moderate, positive correlation between Urine Microalbumin and Serum Triglycerides. There was a very high, positive correlation between Urine Microalbumin and LDL. There was a very high, negative correlation between Urine Microalbumin and HDL.There was a high, positive correlation between Urine Microalbumin and VLDL.

CONCLUSION

This study concludes that there is positive correlation between Microalbuminuria and dyslipidemia in patients with type 2 diabetes mellitus.

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