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Original Article

A Cross-sectional Study on Correlation between Serum Lipid Profile and Microalbuminuria among Normotensive Diabetic Patients Attending a Tertiary Care Hospital, Bangalore

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Abstract

Background: Diabetes mellitus is considered to be the most serious risk factor for cardiovascular disease. Studies on diabetic populations have indicated that patients with albuminuria are at particularly high risk of cardiovascular morbidity and mortality. Individuals with diabetes mellitus may have several form of dyslipidemia. Some studies have shown that hyperlipidemia contributes to both macrovascular changes and to nephropathy. The most common pattern of dyslipidemia is hypertriglyceridemia and reduced high-density lipoprotein (HDL) cholesterol levels. The objective of present study is to study the relationship between dyslipidemia and albuminuria in diabetic subjects attending KIMS OPD.

Methods: In the present study, 100 patients with diabetes mellitus, 50 patients with microalbuminuria in Group I, and 50 patients with normoalbuminuria in Group II were included and the relationship between dyslipidemia and microalbuminuria was studied.

Results: Majority of the study participants belonged to the age group 61–70 years (33%) of age. The mean age of the study participants was found to be 57.26 ± 12.35. Overall, the mean lipid profile parameters were higher among Group I (with microalbuminuria) when compared with Group II (normoalbuminuria). The association was found to be statistically significant between the total cholesterol (TC), triglycerides (TG), HDL, and low-density lipoprotein (LDL) and the two groups of study participants. When TC, TG, HDL, and LDL values of the study participants were correlated with albuminuria values, positive correlation was found between the lipid profile parameters and the albuminuria levels and the correlation was found to be statistically significant.

Conclusion: To improve the prognosis and the quality of life in the diabetic patients even further, the treatment and care of patients must deal with all aspects of the disease, and thus, prevention and treatment of micro and macrovascular complications become vital. Early detection of high-risk patients, even before development of microalbuminuria, is of substantial importance to target early intervention at complication of diabetes.

Key words: Diabetes mellitus, Dyslipidemia, Hyperglycemia, Microalbuminuria

INTRODUCTION

"Diabetes mellitus is a syndrome with disordered metabolism and inappropriate hyperglycemia due to either a deficiency of insulin secretion or due to insulin resistance and increased insulin secretion to compensate or due to a combination of the two."[1] In recent years, diabetes mellitus has been found to be the most serious risk factor for cardiovascular disease identified at the individual level.[2] Increased urinary albumin excretion rate (UAER), even in the early microalbuminuric range, is associated with progressive renal failure and increased cardiovascular morbidity and mortality in diabetic and non-diabetic patients.[3-5] Although lipid metabolism has been extensively investigated in diabetes, little information is available concerning the lipid abnormalities associated with increased UAER.

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Objective of the Study

The objectives of this study were as follows:

- To study the relationship between dyslipidemia and albuminuria in patients with diabetes mellitus.

METHODS

Study Design

This study was cross-sectional study.

Study Duration

This study was 24 months (September 2019–August 2021).

Study Area

This study was Kempegowda Institute of Medical Science, Bangaluru.

Study Participants

This study was type II diabetes mellitus above 35 years attending the Medicine OPD/IPD of KIMS Hospital, Bangaluru.

Inclusion Criteria

The following criteria were included in the study:

1. Type II diabetes mellitus patients above 35 years
2. Type II diabetic patients with normoalbuminuria
3. Type II diabetic patients with microalbuminuria.

Exclusion Criteria

The following criteria were excluded from the study:

1. Pregnant patients
2. History of non-diabetic renal disease
3. Patients on lipid-lowering agents.

Conditions with transient increase in albuminuria such as urinary tract infections, acute febrile illnesses, burns, and marked hypertension.

Estimation of Sample Size

On the basis of statistics obtained from Department of Medicine, M.V.J. Medical College and Research Hospital, an average of five cases per month fitting the criteria of the study with study duration of 24 months, we can expect to have $n = 120$. Based on this population size, using

Table 1: Distribution of the study participants according to their age group

Age	Frequency *n*	Percentage
31–40 years	13	13
41–50 years	23	23
51–60 years	21	21
61–70 years	33	33
71–80 years	6	6
81–90 years	4	4
Mean±SD	57.26±12.35	

Table 2: Blood pressure among the two groups of study participants

Groups of study participants	SBP	DBP
Group 1		
Mean	120.20	78.60
SD	14.497	9.691
Group 2		
Mean	116.40	76.00
SD	10.053	6.999
Total		
Mean	118.30	77.30
SD	12.557	8.511

SBP: Systolic blood pressure, DBP: diastolic blood pressure

Table 3: Laboratory parameters among the two groups of study participants

Laboratory parameters	Mean	SD	95% CI for mean		*P*-value
			Lower bound	Upper bound	
Albuminuria value					
Group 1	73.19	825.60	65.920	80.476	0.000
Group 2	11.220	4.55	9.926	12.514	
Total	42.20	936.12	35.041	49.377	
Total cholesterol					
Group 1	228.80	54.89	213.20	244.40	0.000
Group 2	109.86	31.50	100.91	118.81	
Total	169.33	74.53	154.54	184.12	
Triglycerides					
Group 1	210.32	81.47	187.16	233.48	0.000
Group 2	92.22	36.73	81.78	102.66	
Total	151.27	86.46	134.11	168.43	
HDL					
Group 1	41.44	016.45	36.763	46.117	0.004
Group 2	34.106	5.67	32.494	35.718	
Total	37.77	312.78	35.236	40.310	
LDL					
Group 1	144.10	34.23	134.37	153.83	0.000
Group 2	82.16	32.71	72.86	91.46	
Total	113.13	45.59	104.08	122.18	

**t*-test, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

Table 4: Correlation between lipid profile parameters and albuminuria values

Lipid profile parameters	Albuminuria value
Total cholesterol	
Pearson correlation	0.814*
Sig. (two-tailed)	0.000
Triglycerides	
Pearson correlation	0.740*
Sig. (two-tailed)	0.000
HDL	
Pearson correlation	0.160
Sig. (two-tailed)	0.113
LDL	
Pearson correlation	0.641*
Sig. (two-tailed)	0.000

*Strong positive correlation, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

YAMANE equation, for a known population size, sample size (n) equal to

$$n = N/1+Ne2$$

n = sample size
n = population size
e= margin of error (for 95% of confidence level, margin error =0.05)
n = 120/1+120*0.05*0.05 = 120/1.3 = 92.30

Therefore after approximating, the sample size of the study participants was fixed at 100.

The study participants were divided into group of 2, with 50 study participants per group.

- Group I: Study participants with microalbuminuria (50 patients)
- Group II: Study participants with normoalbuminuria (50 subjects).

RESULTS

Majority of the study participants belonged to the age group 61–70 years (33%) of age. As seen from Table 1 , the mean age of the study participants was found to be 57.26 ± 12.35.

As seen in the above Table 2, the mean and standard deviation of the blood pressure among the two groups of study participants are comparable to each other

The above table 3, shows the mean and standard deviation of lipid profile parameters of the two groups of study participants. The association was found to be statistically significant between total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL) and the two groups of study participants.

The above figure shows the mean plots of laboratory parameters among the study participants. Overall, the mean laboratory parameters pertaining to the study were higher among Group I (with microalbuminuria).

When TC, TG, HDL, and LDL values of the study participants were correlated with albuminuria values as seen from above table 4, a positive correlation was found between the lipid profile parameters and the albuminuria levels, and the correlation was found to be statistically significant between TC, TG's, LDL and urine albumin levels [Figure 1].

As seen from Figure 2, as the urine albumin levels increases, TG and TC values also increase.

As seen from Figure 3, as the urine albumin levels increases, LDL levels also increase.

DISCUSSION

The present study, 100 patients with diabetes mellitus, 50 patients with microalbuminuria in Group I, and 50 patients with normoalbuminuria in Group II were included and the relationship between dyslipidemia and albuminuria was studied.

In the present study, majority of the study participants belonged to the age group 61–70 years (33%) of age.

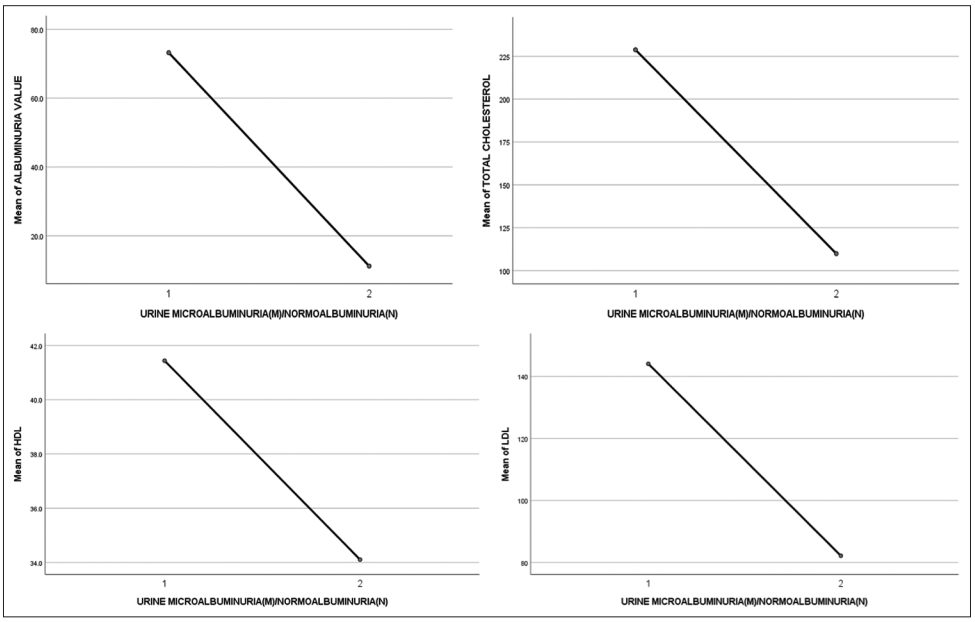

Figure 1: Mean plots of the laboratory parameters among the two group of study participants

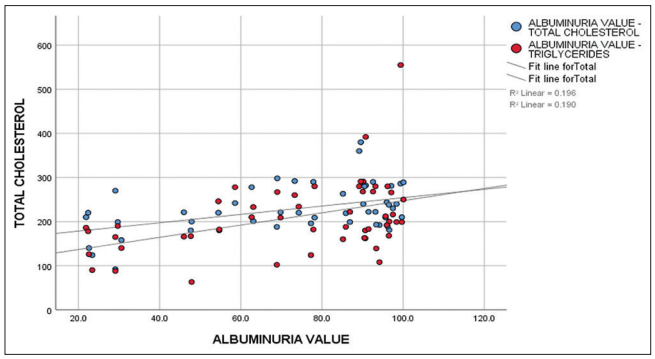

Figure 2: Correlation between albuminuria and total cholesterol, triglycerides

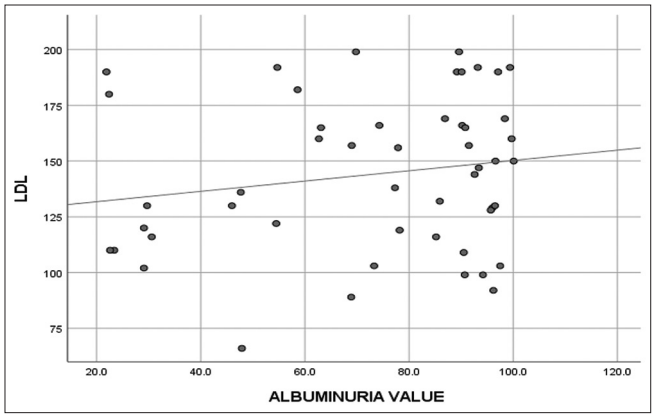

Figure 3: Correlation between albuminuria and low-density lipoprotein

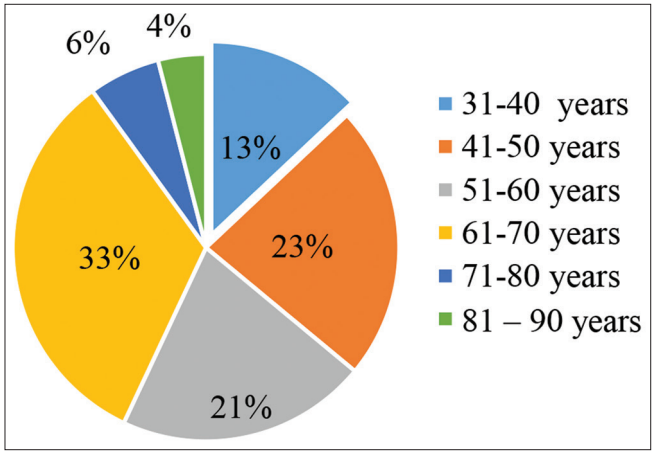

Figure 4: Distribution of the study participants according to their age group

The mean age of the study participants was found to be 57.26 ± 12.35. In a study done by Basu and Jhala,[6] the mean age of the study participants was found to be 57.36 ± 4.08, which is similar to the findings of the present study [Figure 4].

In the present study, the mean lipid profile parameters were higher among Group I (with microalbuminuria) when compared with Group II (normoalbuminuria). The association was found to be statistically significant between the TC, TG, HDL, and LDL and the two groups of study participants. In a study done by Basu and Jhala,[6] the mean lipid profile parameters were higher among study participants with microalbuminuria when compared with study participants with normoalbuminuria, which is similar to the findings of the present study. They also found that the serum cholesterol and triglyceride levels were found significantly higher in patients with albuminuria than without it, ($P < 0.05$) showing that lipids may have a role in albuminuria in diabetic patients. In a study done by Tseng,[7] the albuminuric group was characterized by significantly higher levels of TC, TG, and LDL cholesterol. This is comparable with the findings of the present study.

In the present study, when TC, TG, HDL, and LDL values of the study participants were correlated with albuminuria values, positive correlation was found between the lipid profile parameters and the albuminuria levels, and the correlation was found to be statistically significant between TC, TG's, LDL, and urine albumin levels. In a study done by Vannini *et al.*,[8] no correlation between lipid parameters and amount of albuminuria was observed, which is in contrast with the findings of the present study. In a study done by Thomas *et al.*,[9] they found that dyslipidemia contributes to the progression of microvascular disease in diabetes. However, different lipid variables may be important at different stages of nephropathy.

CONCLUSION

The main risk factors for development, progression, and remission of microvascular disease in diabetic are much alike and closely interrelated. To improve the prognosis and the quality of life in the diabetic patients even further, the treatment and care of patients must deal with all aspects of the disease, and thus, prevention and treatment of micro- and macrovascular complications become vital. Early detection of high-risk patients, even before development of microalbuminuria, is of substantial importance to target early intervention at complication of diabetes.

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