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Original Article

Frequency of Hyperlipidemia in Type 2 Diabetes Mellitus Patients with Microalbuminuria

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ABSTRACT

Objective: To evaluate the frequency of hyperlipidemia in type 2 diabetes mellitus (DM) patients with microalbuminuria attending a tertiary care hospital.

Study Design: Cross-sectional study

Place and Duration of Study: Combined Military Hospital, Jhelum Pakistan, from Jan 2020 to Feb 2021.

Methodology: All patients aged 30 years or above with type 2 DM mellitus presented with or without microalbuminuria were consecutively enrolled. Hyperlipidemia was defined based on the presence of an elevated lipid profile. This information, along with baseline and other predicting factors, was noted.

Results: Of 236 patients, hyperlipidemia was observed in 107(45.3%) patients with type 2 DM having microalbuminuria. The odds of hyperlipidemia were 53% less likely among patients aged ≤59 years than that of patients aged>59 years [aOR: 0.47, 95% CI: 0.27-0.85], 47% less likely among patients with ≤7 years of diabetes duration as compared to >7 years of duration of diabetes [aOR: 0.53, 95% CI: 0.29-0.96], and 75% less likely among patients with ≤140 mm Hg SBP as compared to the patients with >140 mm Hg SBP [aOR: 0.25, 95% CI: 0.14-0.46].

Conclusion: In the current study, hyperlipidemia was observed to be considerably higher in patients with type 2 DM having microalbuminuria. Moreover, elderly patients, longer diabetes duration, and elevated blood pressure are some of the risk factors reported in our patients.

Keywords: Diabetes Mellitus, Hyperlipidemia, Microalbuminuria

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INTRODUCTION

Diabetes is a major metabolic condition that causes varying degrees of insulin resistance, decreased insulin secretion, and elevated gluconeogenesis.[1] World Health Organization (WHO), in a report, stated that diabetes mellitus is expected to be the seventh greatest cause of mortality by 2030.[2] In Pakistan, diabetes prevalence has risen significantly in recent years, as it has in other developing nations, and is anticipated to continue to increase over time, with significant consequences for patient care.[3-5] According to a study data from the International Federation of Diabetes (IDF), Pakistan is currently among the top ten nations with the highest absolute growth in diabetes prevalence, with over nineteen million people affected with diabetes.[6]

It is believed that the risk of significant morbidity with diabetic nephropathy is increased in individuals with abnormal lipid profiles because aberrant lipid levels are also directly related to the formation of chronic renal disease.[7] It is also reported that among patients with diabetic nephropathy, microalbuminuria is thought to be one of the earliest symptoms. Furthermore, microalbuminuric type 2 diabetics showed a more atherogenic plasma lipoprotein profile than normoalbuminuric patients.[8] Furthermore, an unfavourable lipid profile can cause nephropathy among both types of diabetes, type 1 and type 2.[9]

Thus, in diabetic individuals, hyperlipidemia is also a risk factor for microalbuminuria. Researchers are considering using lipid-lowering medications to safeguard renal function because of the link between hyperlipidemia and renal illness.[10] Since limited research is done in this area in Pakistan and the disease's financial impact is so high, there is a dire need to keep working on it to figure out feasible prevention techniques. The purpose of this study was to determine the frequency of hyperlipidemia in diabetic individuals having microalbuminuria.

METHODOLOGY

The cross-sectional study was conducted at Combined Military Hospital, Jhelum Pakistan, from January 2020 to February 2021, after Institutional Ethical Committee approval. The sample size was estimated using the Epi Info sample size calculator, taking a percentage of low-density lipoprotein (LDL) in patients with diabetes having microalbuminuria of

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33.1%.[11] All patients were enrolled via non-probability consecutive sampling.

Inclusion Criteria: Patients aged 30 years or above having type 2 DM presented with or without microalbuminuria, were included.

Exclusion Criteria: Patients presented with high temperature, cardiac failure, urinary tract infection, and diabetic ketoacidosis, pregnant ladies and those with open wounds were excluded.

A spot urine sample was obtained at the start of the day to assess albumin level. In addition, the urine albumin to creatinine ratio (ACR) was computed. Albuminuria was defined as having at least two measurements of the Urine ACR 30 mg per gram or above, whereas microalbuminuria was defined as having an ACR of 30 to 299 mg per gram in a spot urine sample for a minimum of two times in a three—to six-month time frame.

Hyperlipidemia was described as having an elevated lipid profile (total cholesterol of 200 mg/dL or above, 150 mg/dL or above triglyceride, 100 mg/dL or LDL, or 40 mg/dl or less HDL for males and 50 mg/dl or less for females).

Statistical Package for Social Sciences (SPSS) version 23.00 was used for statistical analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test and Independent sample t-test were applied to explore the inferential statistics. The *p*-value of ≤0.05 was considered as significant. Furthermore, binary logistic regression was also applied. Those statistically significant variables in univariable regression analysis were selected for multivariable logistic regression analysis.

RESULTS

Of 236 patients, the mean age of the patients was 54.77±11.14 years. There were 135(57.2%) females and 101(42.8%) males. The patients' mean weight, height, and BMI were 59.88±5.29 kg, 1.54±0.06 m, and 27.68±4.44 kg/m2 respectively. BMI of the 100(42.4%) patients were >30 kg/m2. The mean duration of diabetes was 7.01±2.14 years. The mean HbA1c level of the patients was 8.91±1.07%. There were 117(49.6%) patients with an HbA1c level of >8.7%.

The frequency of hyperlipidemia was found to be 107(45.3%) patients with type 2 DM having micro-albuminuria. A significant association of hyper-lipidemia was observed with age (*p*-value:0.003), duration of diabetes (*p*-value:0.023), HbA1c (*p*-value:0.019), SBP (*p*-value:<0.001), DBP (*p*-value:<0.001), and diabetes mellitus family history (*p*-value:0.005). (Table-I)

Table-I: Comparison of Characteristics of the Patients with Hyperlipidemia (n=236)

Characteristics	Hyperlipidemia		*p*-value
	Yes (n=107)	No (n=129)	
Age, years	57.28±10.08	52.68±11.56	*0.001†
≤59	44(36.1)	78(63.9)	*0.003‡
>59	63(55.3)	51(44.7)	
Gender			
Male	44(43.6)	57(56.4)	0.636‡
Female	63 (46.7)	72(53.3)	
Weight, kg	59.66±5.36	60.06±5.25	0.558†
Height, m	1.54±0.06	1.54±0.06	0.880†
BMI, kg/m2	27.48±4.45	27.84±4.43	0.543†
≤30	63(46.3)	73(53.7)	0.723‡
>30	44(44.0)	56(56.0)	
Duration of Diabetes, years	7.45±2.29	6.63±1.93	*0.003†
≤7	54(39.1)	84(60.9)	*0.023‡
>7	53(54.1)	45(45.9)	
HbA1c, %	9.09±1.03	8.75±1.08	*0.016†
≤8.7	45(37.8)	74(62.2)	*0.019‡
>8.7	62(53.0)	55(47.0)	
SBP, mm Hg	145.62±6.94	139.20±5.11	*<0.001†
≤140	32(26.9)	87(73.1)	*<0.001‡
>140	75(64.1)	42(35.9)	
DBP, mm Hg	86.28±2.37	85.81±1.80	*0.088†
≤86	32(26.9)	87(73.1)	*<0.001‡
>86	75 64.1)	42(35.9)	
Family History of DM			
Yes	66(54.1)	56(45.9)	*0.005‡
No	41(36.0)	73(64.0)	

*†Independent t-test applied, ‡Chi-square test applied, *p-value <0.05*

The findings of the multivariable analysis reported that after adjusting for all other covariates, the odds of hyperlipidemia were 53% less likely among patients with age ≤59 years than that of patients>59 years of age (aOR: 0.47, 95% CI: 0.27-0.85), 47% less likely among patients with ≤7 years of duration of diabetes as compared to >7 years of duration of diabetes (aOR: 0.53, 95% CI: 0.29-0.96), and 75% less among patients with ≤140 mm Hg SBP as compared to the patients with >140 mm Hg SBP (aOR: 0.25, 95% CI: 0.14-0.46). (Table-II)

The mean cholesterol, TGL, HDL, and LDL levels were found to be 173.96±32.02 mg/dL, 149.28±6.11 mg/dL, 46.74±8.84 mg/dL, and 84.49±38.86 mg/dL respectively. A significantly higher mean lipid profile level was observed in patients with hyperlipidemia than those without. (Table-III)

Table-II: Regression Analysis of the Variables Associated with Hyperlipidemia (n=236)

	Univariate		Multivariate	
	OR(95% CI)	*p*-value	aOR(95% CI)	*p*-value
Age, years				
≤59	0.457(0.27-0.77)	0.003	0.477(0.27-0.85)	0.012
>59	Ref		Ref	
Duration of Diabetes, years				
≤7	0.546(0.32-0.92)	0.024	0.531(0.29-0.96)	0.034
>7	Ref		Ref	
HbA1c, %				
≤8.7	0.539(0.32-0.91)	0.020	0.619(0.35-1.10)	0.104
>8.7	Ref		Ref	
SBP, mm Hg				
≤140	0.206(0.12-0.36)	<0.001	0.257(0.14-0.46)	<0.001
>140	Ref		Ref	
DBP, mm Hg				
≤86	0.787(0.45-1.36)	0.389	-	
>86	Ref			
Family History of DM				
Yes	2.09(1.24-3.54)	0.005	1.54(0.86-2.77)	0.141
No	Ref		Ref	

*†Independent t-test applied, ‡Chi-square test applied, *p-value <0.05*

Table-III: Mean Difference of Lipid Profile Parameters with Hyperlipidemia (n=236)

	Hyperlipidemia		
	Yes (n=107)	No (n=129)	*p*-value†
Cholesterol, mg/dL	178.9 ±37.03	169.89 ±26.64	0.032
TGL, mg/dL	154.73 ±3.99	144.75 ±3.13	<0.001
HDL, mg/dL	39.72 ±6.23	52.57 ±6.02	<0.001
LDL, mg/dL	109.97 ±45.54	63.35 ±7.87	<0.001

*†Independent t-test applied, *p-value <0.05*

DISCUSSION

In the current study, the frequency of hyperlipidemia was found in almost forty-five percent of diabetes mellitus patients with microalbuminuria. Though studies reporting the burden of hyperlipidemia in diabetes mellitus patients with microalbuminuria are scarce, previous studies have reported dyslipidemia in patients with type 2 DM having microalbuminuria.[12] In a study conducted by Ahmad *et al*. in Pakistan, it was reported that microalbuminuria was largely prevalent in diabetes mellitus patients and was at higher odds among patients with diabetes complications like dyslipidemia.[13] Furthermore, Wang *et al*. showed in their study that cholesterol-lowering medication and therapeutic strategies to decrease total lipid levels were less prevalent in diabetes mellitus patients with microalbuminuria than in patients without type 2 DM microalbuminuria.[14]

The findings of the current study showed that patients with type 2 DM having microalbuminuria at a younger age, less duration of diabetes, and controlled blood pressure are considerably less likely to have hyperlipidemia. In addition to this, a significant association of hyperlipidemia in microalbuminuria patients having diabetes was observed with age, duration of diabetes, HbA1c, SBP, DBP, and family history of diabetes mellitus. Various studies have reported that hyperlipidemia often persists even with good blood sugar control in type 2 diabetes mellitus patients.[15,16]

A significantly higher mean lipid profile level was observed in patients with type 2 DM having microalbuminuria. Some similar findings were reported in previous studies as well.[17] According to a previous study, LDL was significantly higher, and HDL was significantly lower among patients with type 2 DM with microalbuminuria.[18]

Though complications related to cardiovascular issues were not reported in this study, elevated blood pressure was observed as a significant contributing factor. Previous research has found that blood lipid profiles are predictive of coronary heart disease in the Asian diabetic population. Patients with type 2 DM who get aggressive therapies for dyslipidemia have a lower chance of having a cardiovascular incident. According to one research, primary prevention using statins is important in lowering the risk of a major cardiac event.[19] Furthermore, better glycemic management is particularly beneficial in lowering serum triglyceride levels. In diabetic individuals with hyperlipidemia, insulin treatment may be very successful at decreasing blood triglyceride levels.[20]

Despite the limitations, the current study is significant. This study has reported findings from the remote city of Pakistan. A thorough literature search has reported limited studies on the burden and risk factors of hyperlipidemia in patients with type 2 DM having microalbuminuria, so this study has generated local findings that would help healthcare professionals in a better therapeutic approach. Understanding the treatment strategy in these individuals, along with follow-ups about the treatment outcome, the occurrence of any other comorbidity or mortality, and the health-related quality of life, would be beneficial for the effective treatment and management of the patients.

LIMITATION OF STUDY

This study has certain limitations. First, the current study only reported the patients' baseline sociodemographic and clinical characteristics and compared them with individuals with and without microalbuminuria. However, the therapeutic profile of the individuals for both diabetes management and lipid-lowering medication and other drugs, such as anti-hypertensive treatment, was not reported. Secondly, the study did not follow individuals longitudinally, limiting the study's strength.

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CONCLUSION

Diabetes patients with microalbuminuria had a significantly greater frequency of hyperlipidemia. Furthermore, older individuals, diabetes for a longer period, and high blood pressure are some of the risk factors identified in our group.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MJ & SK: Conception, study design, drafting the manuscript, approval of the final version to be published.

JW & ASA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

KIA & AN: Data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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