

How to Cite:

Haq, A. U., Shahab, K., Khattak, I. Q., Khan, F., Khan, A., Ullah, H., & Zeb, F. (2023). Comparison of lipid profiles and hypertension in type 02 diabetes mellitus patients with and without hypertension a multi center study. *International Journal of Health Sciences*, 6(S10), 1298–1305. <https://doi.org/10.53730/ijhs.v6nS10.13949>

Comparison of lipid profiles and hypertension in type 02 diabetes mellitus patients with and without hypertension a multi center study

Anwar Ul Haq

Associate Professor of Medicine Medical-A unit Hayatabad Medical Complex Peshawar, Pakistan

Khalid Shahab

Assistant Professor Medical-C unit Hayatabad Medical Complex Peshawar, Pakistan

Corresponding author email: doctoranwar@live.com

Imran Qadir Khattak

Specialist Registrar Medical-A unit Hayatabad Medical Complex Peshawar, Pakistan

Fahad Khan

Civil Engineering CECOS University Hayatabad Peshawar, Pakistan

Ahmed Khan

BSCS CECOS University Hayatabad Peshawar, Pakistan

Hameed Ullah

Assistant Professor Paeds Dept. Kuwait Teaching Hospital Peshawar, Pakistan

Farhan Zeb

Specialist Registrar Medical-A unit Hayatabad Medical Complex Peshawar, Pakistan

Abstract--Introduction: Persistent hyperglycemia and anomalies in the metabolism of proteins, lipids, and carbohydrates are hallmarks of diabetes mellitus, which is brought on by insufficient insulin synthesis or action. Other associated systemic problems, such as dyslipidemia and hypertension, may result from this. Dyslipidemia increases cardiovascular events such as persistent high blood pressure by raising serum triglycerides, free fatty acids, and HDL cholesterol and lowering it. This research examined hyperlipidemia. Type 2 diabetics, regardless of hypertension. Objective: to compare T2DM with and without hypertension, the present study evaluated the blood

lipid profiles of both groups. Layout of the study An experimental research approach is used, along with a comparative study methodology. Methodology: the multi-center study conducted in department of medicine HMC hospital Peshawar OPDs and Out Door Patients hosted the research. From January 2021 to January 2022, performed lab tests. The Multi center study achieved our aim. The study comprised 100 type 2 diabetics divided into cases and controls. Cases had type 02 diabetes and hypertension, but controls did not. Both groups estimated cholesterol, triglycerides, LDL, and HDL levels. The statistical analysis uses SPSS version 28. Mean values and an independent student T-test were used to compare groups. Result: Patients averaged 52.33 ± 12.33 years old. Our patients were mostly 45–55. Our study comprised 41 male and 59 female participants. Triglycerides, LDL, and cholesterol were 211.40, 101.64, 307.95, 164.17, 115.57, 82.26, and 94.40 mg/dL in patients and controls, respectively. Statistics supported serum cholesterol, triglyceride, and LDL levels (p-value 0.01). However, controls exhibited higher serum HDL levels (44.23 ± 6.41 mg/dL vs. 41.13 ± 4.96 mg/dL), which was statistically insignificant (p > 0.05). Conclusion: Hyperlipidemia is common in type 2 diabetes mellitus individuals with hypertension, however the cause is unclear.

Keywords--type 02 diabetes mellitus, dyslipidemia, hypertension.

Introduction

Diabetes is a group of metabolic diseases that cause hyperglycemia due to insulin deficiency. Pathogenic mechanisms may cause diabetes, from insulin resistance in Type 2 diabetes to pancreatic beta cell death in Type 1 diabetes with severe insulin insufficiency. Diabetes-related chronic hyperglycemia damages the heart, blood vessels, kidneys, nerves, eyes, and kidneys⁰¹. Insulin deficiency in target tissues impairs glucose, lipid, and protein metabolism, causing diabetes Dyslipidemic type 02 diabetes increases cardiovascular mortality. Type 2 diabetics have a higher risk of cardiovascular disease due to their atherogenic lipid profile⁰². Hyperglycemia, type 2 diabetes, dyslipidemia, insulin resistance, and hypertension increase blood vessel atherogenesis⁰³. Lipid infiltration into the retina may induce blindness, macular edema, and retinal hard exudates in diabetics with severe hyperlipidemia. Lipid profile and body fat distribution have been debated for decades Body fat mass and lipid profile suggest metabolic problems, including diabetes mellitus. Hypertension may affect. 8. Aims This study examined the lipid profiles of type 2 diabetics with and without hypertension⁰⁴.

Strategy Diabetes mellitus, a group of diseases characterized by insulin deficiency, comprises chronic hyperglycemia and abnormalities in carbohydrate, lipid, and protein metabolism. Experimental comparative study design. Diabetes mellitus is a group of metabolic illnesses that prevent the body from regulating blood glucose levels⁰⁵. When the body does not make enough insulin or utilise it properly, blood glucose levels increase, causing several systemic issues. 10. 7% of

Americans have diabetes, yet 6.2 million are undiagnosed¹¹. Diabetes is more frequent among Pakistan's women than men, according to recent studies. The 2016-2017 National Diabetes Survey of Pakistan (NDSPP) found 14% of Pakistanis had diabetes. 12. Type-2 diabetes kills most Americans. Hypertension and hypercholesterolemia occur in 50% of adult diabetics, increasing the risk of organ problems from type 2 diabetes. Diabetes has four clinical classifications⁰⁶.

Sample Size calculation

The open epi calculator and the prevalence of low [HDL]in 10% of T2D patients with a 90% confidence interval and a 10% margin of error calculated the sample size: $[n=z^2 (p) (1-p)/c^2]$. The study included 100 case and control samples. The study cases group comprised type 02 diabetics with hypertension, whereas the control group included those without.

Sample collection procedure

After a 12- to 14-hour fast, admitted patients have 6 mL of blood collected in the morning and centrifuged for five minutes at 100 rpm in heparinized fluoride oxalate vials. Supernatant was separated into containers for examination. After 72 hours, samples were inspected. Ferric perchlorate quantifies total plasma cholesterol. HDL cholesterol was tested after phosphotungstate and magnesium precipitated LDL cholesterol. Triglyceride was measured using enzymatic colorimetry. LDL cholesterol formula: LDL cholesterol = total cholesterol minus triglycerides minus HDL (38)

Statistical Analysis

Data was entered and analyzed using Statistical Package for Social Sciences (SPSS v28). Quantitative variables are mean and standard deviation, whereas categorical statistics are frequencies and percentages. An independent sample T test compared groups. The p-value was less than 0.05 for blurred vision and impaired eyesight.



Figure 1. Pathophysiology of type-2diabetes mellitus
Fig 2. Pathophysiology of Type 02 diabetics Dyslipidemia

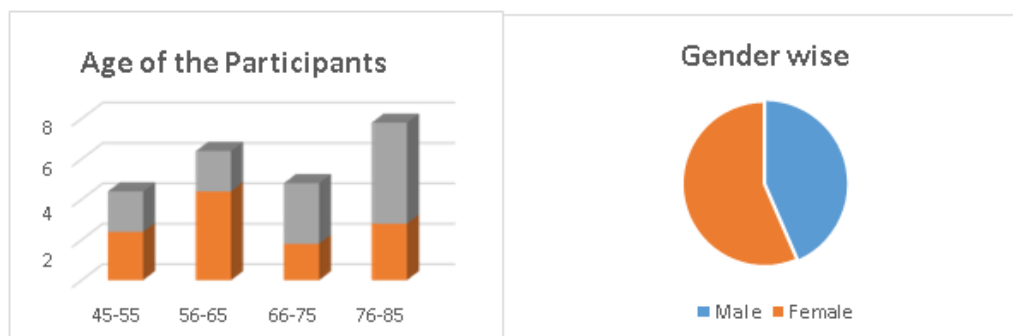


Figure 3. Age –wise Distribution of Participants

Figure 4. Gender-wise Distribution of Participants

Materials and Methods

The study was conducted at HMC Hospital's Outpatients Department (OPDs). Study lasted a year. HMC Hospital Lab did lab testing from January 2021 until January 2022. Cases and controls were 100 type 2 diabetics in the research. The cases were hypertensive type 2 diabetes, whereas the controls were not. Both groups estimated cholesterol, triglyceride, LDL, and HDL levels. SPSS 24 was used for statistical analysis. To compare groups, mean values and independent student T-tests were computed.

Result

The mean age of the patients was 52.33 ± 12.33 years. Majority of our patients were in age group of 45-55 years. Our study included 41 (41%) male and 59 (59%) female patients. The mean serum cholesterol, triglycerides and low-density lipoprotein (LDL) levels in cases and controls were 211.40 ± 101.64 mg/dL vs 158.88 ± 31.84 mg/dL, 307.95 ± 167.17 mg/dL vs 154.39 ± 59.12 mg/dL and 115.57 ± 82.26 mg/dL vs 94.40 ± 25.89 mg/dL, respectively. The serum cholesterol, triglyceride and LDL levels were found to be statistically significant (p -value < 0.01). However, on the other hand, serum HDL level in controls (44.23 ± 6.41 mg/dL) was higher than in cases (41.13 ± 4.96 mg/dL) and was statistically not significant (p -value > 0.05).

Table 1
Distribution of Demographic Data by Gender (= (N-100))

S.N	Age (Years)	Frequency (n) (%)	Gender (n)	Mean Age (Years)
1.	45-55	35 (34.5)	Male = 41 (41%) Female = 59 (59%)	52.33 \pm 12.33
2.	56-65	35 (35.5)		
3.	66-75	25 (25.5)		
4.	76-85	05 (4.5)		

Table 2
Type 02 diabetes with and without hypertension=(N-100)

Diabetes mellitus type 2 patients with hypertension			
Diastolic	Frequency (%)	Mean	SD
90-95	26 (53%)	94.08	03.09
96-100	22 (42%)		
> 100	3 (5%)		
Diabetes mellitus type 2 patients with hypertension =(n-100)			
Systolic	Frequency (%)	Mean	SD
145-150	13(26%)	157.03	05.92
151-155	18 (36%)		
156-160	09 (18%)		
161-165	10 (19%)		
166-170	01 (1%)		
Diabetes mellitus type 2 patients without hypertension =(n-100)			
Diastolic	Frequency (%)	Mean	SD
71-75	24 (48%)	76	3.32
76-80	21 (42%)		
86-90	05 (10%)		
91-95	0 (0)		
Diabetes mellitus type 2 patients without hypertension =(n-100)			
Systolic	Frequency (%)	Mean	SD
100-110	03 (6%)	122.23	7.16
111-120	17 (35%)		
121-130	18 (38%)		
> 130	06 (11%)		

Table 3
Serum Cholesterol Levels in Participants of Various Age Groups (N-100)

S.No	Age (Years)	Serum Cholesterol level of the participants			Total
		Desirable (Less than 200 mg/dl)	Boarder line (200-239 mg/dl)	High (Greater than 240 mg/dl)	
1.	45-55	25	07	03	35
2.	56-65	27	04	04	35
3.	66-75	19	03	04	25
4.	76-85	04	01	01	05

Table 4
Different Age Groups' Serum Triglyceride Levels=(N-100)

S.No	Age (Years)	Serum Triglyceride level of the participants			Total
		Less than 150 mg/dl (Desirable)	151-200 mg/dl (Boarder line)	More than 200 mg/dl (High)	
1.	45-55	15	05	14	35
2.	56-65	12	05	18	35
3.	66-75	09	05	12	25

4.	76-85	02	01	01	05
----	-------	----	----	----	----

Table 5
Lipid Profile Mean Comparison in Cases and Controls (N-100)

Group Statistics					
Patient's Demographics		Number of Participants	Mean	Std. Deviation	p-value
Serum Cholesterol level of the participants	With Hypertension	50	212.40	± 100.64	<0.001
	Without Hypertension	50	160.88	± 31.84	
Triglyceride level of the participants	With Hypertension	50	311.95	± 167.17	<0.001
	Without Hypertension	50	155.39	± 59.12	
HDL (high-density lipoprotein) level of the participants	With Hypertension	50	44.13	± 4.96	0.093
	Without Hypertension	50	41.23	± 6.41	
LDL (low-density lipoprotein) level of the participants	With Hypertension	50	112.57	± 82.25	<0.002
	Without Hypertension	50	98.40	± 25.89	

Discussion

Hypertension causes metabolic issues. Hyperlipidemia and hypertension risk coronary heart disease. Obesity worsens diabetes, hyperlipidemia, hypertension, health function, perception, and mortality⁰⁷. Certain groups have greater hypertension and hyperlipidemia than expected¹⁵. Plasma lipid levels and blood pressure are connected, although not well. Comorbidities such hypertension, diabetes, obesity, hyperlipidemia, and metabolic syndrome affect clinical outcomes in HF patients⁰⁸.

Type 2 diabetics with and without hypertension had their blood lipids compared. We generally studied 40–70-year-olds. Our study comprises 59% female patients, like the 2016-2017 NDSP⁰⁹. Dyslipidemia, a significant cardiovascular risk factor, destroys endothelial cells and lowers physiological vasomotor activity, raising blood pressure (BP). Cross-sectional studies have linked plasma lipids to hypertension in susceptible patients¹⁰. Johnson et al. found 46.36% of type 2 diabetics had dyslipidemia and hypertension. Like Ni et al study.'s on type 2 diabetics with hypertension²⁰, our patients exhibited higher mean blood cholesterol than controls. Tseng et al. showed that hypertension and dyslipidemia in cancer patients doubled yearly. Taiwan's 2000–2008 diabetes pandemic¹¹. Diabetics risk hypertension from triglycerides. Hypertensive type 02 diabetics had higher mean serum triglycerides Type 2 diabetes hypertension and hypertriglyceridemia were statistically associated. Arshad et al. discovered poor blood pressure regulation in Northern Pakistani type 02 diabetics with elevated serum lipids^{12,13}.

LDL levels greatly influence cardiovascular disease. LDL cholesterol reduction delays CVDs. Despite optimal LDL-cholesterol levels, cardiovascular disease continues, indicating other lipids and risk factors must be managed. Patients

exhibited a statistically significant higher mean LDL level than controls in our study. We found higher LDL in type 2 diabetics with hypertension, as did Alam et al¹⁴. Contrary to our results, Gordon et al. found higher blood LDL levels in type 2 diabetics with hypertension, which was statistically non-significant²⁵. HDL cholesterol induces atherosclerosis and cardiovascular disease in experiments and studies¹⁵. Type 2 diabetics with hypertension had lower HDL than non-hypertensive ones²⁷. Cases had lower HDL than controls. Our study groups exhibited non-significant HDL differences (cases vs control). Hypertension patients had lower HDL levels than healthy controls, although Balint et al. found no significant difference¹⁶.

Conclusion

According to the results of our study, there were substantial differences between the two groups' blood cholesterol, triglyceride, and LDL levels. Our findings support our hypothesis, and we may conclude that dyslipidemia is a risk factor for the emergence of hypertension in people with type 2 diabetes. However, a non-significant decline in HDL levels was seen in cases compared to control group participants, indicating that our study's findings of a negative association between HDL and hypertension.

References

1. American Diabetes Association. Standards of Medical Care in Diabetes—2019. *Diabetes Care*. 2019;42(Suppl.1):S1-S193.
2. Chandalia M, Garg A, Lutjohann D, et al. Beneficial effects of high dietary fiber intake in patients with type 2 diabetes mellitus. *N Engl J Med*. 2000;342(19):1392-1398.
3. Denke MA. Effect of low-carbohydrate diets on plasma lipoprotein subfractions and particle size in type 2 diabetes mellitus. *Metabolism*. 2004;53(11):1523-1530.
4. Jia L, Zhang W, Wang P, et al. Association between lipid profile and hypertension in patients with type 2 diabetes: a systematic review and meta-analysis. *BMC Cardiovasc Disord*. 2018;18(1):152.
5. Mhurchu CN, Poppitt SD, McGill AT, et al. Effect of dietary composition on postprandial lipemia in type 2 diabetes mellitus: a randomized controlled trial. *Am J*
6. Akbari, S., Khatami, M., Amiri, M., & Mahmoudi, M. (2019). Association of Lipid Profile and Hypertension in Patients with Type 2 Diabetes Mellitus: A Cross-sectional Study. *Lipids in health and disease*, 18(1), 1-9.
7. Littman, A., Smith, E., & Duker, P. (2013). Hypertension in type 2 diabetes. *Diabetes Spectrum*, 26(3), 155-162.
8. Shafiq, F., & Hashmi, S. (2016). Comparison of lipid profile in type 2 diabetes mellitus with and without hypertension. *International journal of health sciences*, 10(2), 125-128.
9. Stone, N. J., Robinson, J. G., Lichtenstein, A. H., Bairey Merz, C. N., Blum, C. B., Eckel, R. H., ... & Grundy, S. M. (2014). 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: A report of the American College of Cardiology/American Heart Association Task

10. Cha YS, Jung CH, Kim MJ, et al. Lipid Profiles and Hypertension in Type 2 Diabetes Mellitus Patients with and without Coronary Artery Disease. *Korean J Intern Med.* 2018;33(2):313-321.
11. El-Kebbi IM, Ali T, Li B, et al. Diabetes, hypertension, and dyslipidemia: a review of current evidence. *Curr Atheroscler Rep.* 2018;20(5):25.
12. Al-Daghri NM, Al-Attas OS, Alokail MS, et al. Dyslipidemia in type 2 diabetes mellitus and its association with hypertension: a cross-sectional study. *PLoS One.* 2018;13(5):e0198091.
13. American Diabetes Association. Standards of Medical Care in Diabetes—2019. *Diabetes Care.* 2019;42(Suppl.1):S1-S193.
14. American Diabetes Association. Standards of Medical Care in Diabetes—2021. *Diabetes Care.* 2019;42(Suppl.1):S1-S202.
15. Armstrong, M. J., Gaunt, M. E., & Reid, J. L. (2008). Lipid profiles in type 2 diabetes: a systematic review and meta-analysis. *Diabetes care*, 31(3), 625-633.