



COMPARATIVE EXAMINATION OF BIOCHEMICAL DEVIATIONS IN PATIENTS WITH DIABETES WHO HAVE CARDIOVASCULAR COMPLICATIONS OR NOT

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ABSTRACT

Objectives: To evaluate the relationship between blood glucose levels and lipid profiles in diabetic individuals with and without cardiac disease.

Study Design: A Cross-sectional Study

Place and duration of study: Department of Diabetes & Endocrinology & Cardiology HMC Hospital Peshawar from 11 Jan 2022 to 11 July 2022

Methodology: For the study, 90 people were split up into comparative groups. Diabetes patients were divided into cardiac and non-cardiac groups. A questionnaire was used to gather demographic information, and a physical examination was used to document clinical data. Every patient had blood drawn for further lipid profile and glycemic tests. Data analysis was done using SPSS version 28.

Results: The average age of diabetic patients with cardiac problems (n = 45) was substantially more significant than that of patients without (44.49 ± 10.22 years), at 52.36 ± 09.77 years. The two groups showed markedly reduced HDL-C levels and higher total cholesterol, LDL-C, and glucose levels, suggesting a robust relationship between biochemical indicators and cardiovascular problems in diabetes.

Conclusion: The study's findings show a substantial correlation between biochemical markers and cardiovascular illness in individuals with diabetes. Hyperlipidemia is more common in those with diabetes.

Keywords: Biochemical parameters, cardiovascular disease, Diabetes Mellitus, Cholesterol, Dyslipidemia

Introduction:

Diabetes mellitus (DM) remains a significant global health challenge, with its prevalence steadily rising over the years¹. According to the International Diabetes Federation (IDF), approximately 463 million adults aged 20-79 years were living with diabetes in 2019, and this number is projected to escalate to 700 million by 2045^{2,3}. Alongside its well-documented metabolic effects, DM is intricately linked with various cardiovascular complications, which significantly contribute to morbidity and mortality rates among affected individuals^{4,5}. The relationship between diabetes and cardiovascular disease (CVD) is complex and multifactorial, involving intricate interplays of metabolic,

inflammatory, and vascular pathways^{6,7}. Individuals with DM have a two to four-fold increased risk of developing CVD compared to those without DM, making it imperative to explore the underlying mechanisms driving this association (Emerging Risk Factors Collaboration⁸. Dyslipidemia, characterized by abnormal lipid profiles, is a common metabolic abnormality observed in diabetic patients and is recognized as a critical contributor to the development and progression of CVD⁹. Alterations in lipid metabolism, including elevated levels of low-density lipoprotein cholesterol (LDL-C) and triglycerides (TG) and decreased levels of high-density lipoprotein cholesterol (HDL-C), are frequently observed in individuals with DM, further exacerbating their cardiovascular risk^{9,10}. Moreover, hyperglycemia, a hallmark feature of DM, has been implicated in the pathogenesis of atherosclerosis through various mechanisms, including the formation of advanced glycation end products (AGEs), activation of inflammatory pathways, and oxidative stress. These metabolic derangements culminate in endothelial dysfunction, impaired vascular reactivity, and accelerated atherosclerosis, predisposing diabetic individuals to an elevated risk of coronary artery disease, myocardial infarction, and stroke^{11,12}. Despite the well-established link between diabetes, dyslipidemia, and CVD, there remains a lack of studies elucidating the specific biochemical deviations associated with cardiovascular complications in diabetic patients¹³. Therefore, the present study seeks to address this gap by comprehensively evaluating the relationship between blood glucose levels, lipid profiles, and cardiovascular status in individuals with diabetes, focusing on identifying potential biomarkers predictive of cardiovascular risk¹⁴.

Methods:

A cross-sectional study was conducted at HMC Hospital, Peshawar, from January 11, 2022, to July 11, 2022. Ninety participants were categorized into diabetic groups with and without cardiac complications. Demographic data were collected via questionnaire, and biochemical analyses, including lipid profiles and glycemic tests, were performed using SPSS version 28.

Inclusion Criteria:

Participants aged 18 years and above, diagnosed with diabetes mellitus, and willing to provide informed consent were included in the study, irrespective of gender or ethnicity.

Exclusion Criteria:

Participants under 18 years of age, pregnant women, and individuals with a history of secondary causes of diabetes, and those unwilling to provide informed consent were excluded from the study.

Data Collection:

Demographic information was gathered through structured questionnaires. Clinical data, including blood pressure and BMI, were recorded during physical examinations. Blood samples were collected for lipid profile and glycemic tests and analyzed using standard laboratory techniques.

Statistical Analysis:

Data were analyzed using SPSS version 28. Descriptive statistics were employed to summarize demographic and clinical characteristics. Comparative analyses between diabetic groups with and without cardiac complications were conducted using appropriate parametric or non-parametric tests.

Results:

The average age of diabetic patients with cardiac problems ($n = 45$) was significantly higher (52.36 ± 09.77 years) than that of patients without (44.49 ± 10.22 years). HDL-C levels were considerably lower in both groups, although glucose, LDL-C, and total cholesterol were raised. These results point to a strong correlation between biochemical indicators and diabetic cardiovascular problems. To effectively evaluate risk and implement risk management methods, the research emphasizes the

significance of monitoring lipid profiles and glucose levels in diabetics, particularly those at risk of developing cardiac problems.

Table 1: Overview of the research population's clinical and demographic features

The characteristics	Patients with Diabetes		p-value
	(45 cases) Non-Cardiac Disease	(45 cases) Cardiac Disease	
Age	52.36 ± 09.77	44.49 ± 10.22	[P<0.01]
BMI (kg/m ²)	27.25 ± 05.79	26.58 ± 03.22	P<0.04
Diabetes Duration			P<0.02
06-12-years	16 (28%)	27 (55%)	
> 13 years	28 (58%)	18 (38%)	
Genetic History			P<0.05
Yes	26 (52%)	35 (73%)	
No	19 (37%)	09 (17%)	
Smoking			P<0.05
Yes	28 (62.2%)	36 (79%)	
No	16 (33%)	09 (17%)	

Table 2: Lipid profile and serum glucose levels in diabetic individuals with and without heart problems are compared.

Findings	Patients with Diabetes		p-value
	(45 cases) Non-Cardiac Disease	(45 cases) Cardiac Disease	
1. Glucose	189.24 ± 76.37	214.53± 27.63	P<0.04
2. Cholesterol	232.74± 55.88	195.74±25.96	P<0.001
3. Triglycerides	166.66± 49.17	180.52± 28.79	P<0.04
4. HDL-C	43.26± 08.78	30.96± 07.79	P<0.001
5. LDL-C	148.78± 44.9	133.48± 39.78	P<0.01

Table 3: Lipid profile and serum glucose comparison between heart patients under control and those without diabetes.

Findings	Controls	Cardiac disease	p-value
1. Glucose	94.62 ± 19.28	122.49 ± 29.58	P<0.01
2. Cholesterol	204.67 ± 41.85	164.85 ± 30.21	P<0.001
3. Triglycerides	154.36 ± 52.28	178.51± 42.24	P<0.001
4. HDL-C	57.78 ± 31.15	30.23 ± 05.31	P<0.001
5. LDL-C	116.72 ± 40.51	103.09 ± 22.09	P<0.05

Discussion

The study's findings provide significant new insights into the intricate association between cardiovascular issues and diabetes mellitus (DM) and the underlying biochemical abnormalities¹⁵. The study discovered that the average age of diabetics with heart issues was much greater than that of those without, indicating the possibility of an age-related risk factor for cardiovascular morbidity in diabetic populations¹⁶. It was shown that diabetes individuals had changed lipid profiles, with increased levels of glucose, total cholesterol, and low-density lipoprotein cholesterol and lower levels of high-density lipoprotein cholesterol (HDL-C)¹⁷. These results show the importance of dyslipidemia in increasing cardiovascular risk in this group. These findings corroborate previous research demonstrating the substantial role dyslipidemia played in the onset and progression of cardiovascular disease¹⁸. Hyperglycemia, which increases the risk of cardiovascular events and

encourages the development of atherosclerosis via oxidative stress, inflammation, and endothelial dysfunction, is one of the primary features of diabetes mellitus¹⁹. Monitoring lipid profiles and glucose levels in diabetics is essential for early detection and management, particularly in individuals with a higher risk of cardiovascular problems (Emerging Risk Factors Collaboration 20). The research highlights the need for comprehensive risk assessment and specific treatment strategies in lowering cardiovascular risk in this high-risk group²¹ by providing relevant knowledge on the biochemical anomalies associated with cardiovascular issues in individuals with diabetes.

Conclusion :

The study emphasizes the significant correlation that exists between biochemical markers and cardiovascular issues in people with diabetes. Two critical variables that increase the risk of cardiovascular disease are dyslipidemia and hyperglycemia. It takes a comprehensive risk assessment and targeted treatment programs to lower cardiovascular morbidity in diabetic individuals.

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