EXAMINING THE RELATIONSHIP OF LIPID PROFILE DYNAMICS IN DIABETICS: INVESTIGATING OPPORTUNITIES TO MINIMIZE THE PROBABILITY OF ATHEROSCLEROTIC CARDIOVASCULAR DISEASE

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Abstract

Aim/Objective: To examine the effect of lipid-lowering therapy on reducing the risk of atherosclerotic cardiovascular diseases(ASCVD) in diabetics.

Methodology: A longitudinal cohort-study was conducted at Liaquat National Hospital & Medical College, Pakistan in the duration from July, 2023 to December, 2023. Participants included individuals aged 18 to 70 with confirmed diabetes mellitus (DM). Exclusion criteria encompassed documented cardiovascular diseases, pregnancy, significant chronic conditions other than diabetes, lipid-lowering medication use, and smoking. Fasting lipid profile parameters were obtained at the start. Statin therapy was administered to participants with dyslipidemia/hyperlipidemia. Every six months, follow-up examinations were undertaken to track the occurrence of ASCVD.

Results: The study enrolled 100 participants, with 56.45± 10.59 years of mean age and diabetes period with a mean of 6.33± 1.75 years. Nineteen patients developed ASCVD during the study period. Initial lipid profiles showed mean LDL cholesterol of 112.75 ± 8.81mg/dL, HDL cholesterol of 42.89 ± 7.97mg/dL, and triglycerides of 146.81 ± 21.32mg/dL. Correlation scrutinizes revealed weak associations between lipid parameters and ASCVD after six months of statin therapy.

Conclusion: Pakistani patients with type 2 diabetes often exhibit dyslipidemia predisposing them to ASCVD. Despite the potential benefits of statin therapy, its underutilization underscores the need for enhanced treatment adherence to mitigate cardiovascular complications.

Keywords: Atherosclerotic Cardiovascular Disease (ASCVD), Dyslipidemia, hyperlipidemia, Cholesterol

Introduction

Non-insulin dependent(NIDDM) or diabetes mellitus type-2 (DM2) presents a multifaceted clinical challenge, often intertwined with cardiovascular complications and hyperlipidemia. Epidemiological data underscore the alarming prevalence of cardiovascular complications in DM2, with approximately two-thirds of diabetic mortality attributed to these conditions. Coronary artery disease(CAD) stands as one of the primary contributor to this mortality burden, emphasizing the urgent need for effective preventive strategies [1,2].

Despite advancements in management, atherosclerotic cardiovascular disease (ASCVD) remains a formidable threat in DM2. Characterized by a complex interplay of metabolic abnormalities, including insulin resistance and dyslipidemia, ASCVD poses significant challenges in risk mitigation [3]. Understanding the intricate mechanisms linking lipid profiles, diabetes, and ASCVD is imperative to optimize therapeutic interventions and improve cardiovascular outcomes in this high-risk population [4].

The burgeoning worldwide epidemic of diabetes mellitus type-2 (DM2) constitutes formidable community health quandary, precipitating profound repercussions for human health, societal vitality, and healthcare infrastructures across the globe. Projections gleaned from the International Diabetes Federation (IDF) portend a stark trajectory, forecasting an escalation from the present cohort of 425 million adults diagnosed with DM to an estimated 629 million by 2045, with an additional 352 million individuals imperiled by the looming specter of diabetes mellitus type-2 (DM2) [5,]. Evidently, DM2 engenders a susceptibility to diabetic dyslipidemia, a metabolic milieu inexorably linked to a constellation of macrovascular maladies encompassing stroke, diseases of the peripheral vasculature, and coronary artery disease(CAD), alongside a panoply of microvascular afflictions such as nephropathy, neuropathy, and retinopathy [6,7].

The nuanced orchestration of DM2's multifaceted management paradigm invariably necessitates a proactive confluence of interventional modalities targeting glycemic control, blood pressure modulation, and lipid profile optimization, concomitantly augmented by lifestyle modifications spanning dietary recalibration and augmented physical activity [8,9]. Consequently, this concerted endeavor towards risk attenuation has yielded a discernible downtrend in health outcomes and survival rates attributable to atherosclerosis-mediated cardiovascular diseases within this vulnerable cohort. At the epicenter of ASCVD's pathophysiological matrix and cardiac diseases lies the intricate modulation of LDL-Cholesterol, colloquially branded as "bad" cholesterol [10,11]. Ergo, the amelioration of LDL-C levels through pharmacotherapeutic interventions and lifestyle modifications emerges as a linchpin strategy in abating the peril of atherosclerosis and subsequent cardiovascular cataclysms, thus epitomizing the pivotal import of cholesterol modulation in the realm of ASCVD prophylaxis [12]. This investigatory effort endeavors to unravel the intricate nexus between lipid profiles and the hypothetical attenuation of ASCVD risk amidst the diabetic cohort, furnishing elucidative insights into novel therapeutic vistas and risk mitigatory stratagems.

Aim/Objective

To examine the effect of lipid-lowering therapy on reducing the risk of atherosclerotic cardiovascular diseases(ASCVD) in diabetics.

Study materials and methods

A longitudinal cohort-study was conducted at Liaquat National Hospital & Medical College, Pakistan in the duration from July, 2023 to December, 2023.

Inclusion/Exclusion Criteria

Patients eligible for inclusion in this study must have a confirmed diagnosis of diabetes mellitus (DM). Additionally, participants should fall within the age range of 18 to 70 years, encompassing both male and female individuals.

Conversely, participants who have past evidence of cardiovascular conditions will have to be eliminated from the investigation. Pregnant women will not be considered eligible for participation. Beyond that, participants who report with major persistent medical conditions like ongoing kidney disease, liver disease, or existing cancer, will be excluded. Individuals who are presently using lipid-lowering drugs will also be ineligible for enrollment. Furthermore, current smokers will be excluded from participation in the study.

Methodology

This prospective cohort investigation engaged a cohort of 100 participants. Each participant provided intricate demographic profiles, comprehensive medical histories, durations of diabetic affliction, prevailing medication regimes, and lifestyle particulars. Rigorous adherence to precision was ensured through the acquisition of fasting blood specimens for subsequent lipid profile assessments encompassing total cholesterol, LDL--cholesterol, HDL--cholesterol, and triglyceride concentrations. Pharmacotherapeutic interventions, specifically HMG-CoA reductase(statin) therapy, were judiciously administered to individuals diagnosed with hyperlipidemia, irrespective of prior diagnoses. Subsequent follow-up evaluations conducted at six-month intervals meticulously monitored the emergence of atherosclerotic cardiovascular disease (ASCVD) incidents. The scrupulous acquisition of data was orchestrated through a meticulously designed questionnaire, while the thorough scrutiny of associations and outcomes was facilitated by SPSS V.23 for analyzing data.

Results

The study enrolled 100 participants, with 56.45± 10.59 years of mean age and diabetes period with a mean of 6.33± 1.75 years. The mean HbA1C level was measured at 7.49 (±0.68). A total of 19 patients developed ASCVD during the study period. Initial lipid profiles showed mean LDL cholesterol of 112.75 ± 8.81mg/dL, HDL cholesterol of 42.89 ± 7.97mg/dL, and triglycerides of 146.81 ± 21.32mg/dL. Moreover, the mean total cholesterol level was 189.23 mg/dL (±14.78) [Table 1]. Correlation scrutinizes were conducted to estimate the connotation between ASCVD incidence and lipids' parameters among diabetic population receiving statin therapy after a six-month follow-up period.

Table 1: Initial demographics of study population

Variable(s)		Value /Mean ± SD
Age(years)		56.45 ± 10.59
Gender	Males	51 (51%)
	Females	49 (49%)
Duration of Diabetes(years)		6.33 ± 1.75
HbA1C%		7.49 ± 0.68
LDL--Cholesterol(mg/dL)		112.75 ± 8.81
HDL--Cholesterol(mg/dL)		42.89 ± 7.97
Triglycerides(mg/dL)		146.81 ± 21.32
Total Cholesterol(mg/dL)		189.23 ± 14.78

Table 2: ASCVD incidence in the study population (n=100)

ASCVD	n	Percentage(%)
Observed	19	19%
Not observed	81	81%
Total	100	100%

Table 3: Analyzing the Relationship between ASCVD and Lipid Profile Parameters in Diabetics after a six-month statin therapy.

Variable(s) in mg/dL	R-Value(*)	p-Value(#)
LDL--cholesterol	0.20	0.18
HDL--cholesterol	- 0.05	0.73
Triglycerides	0.12	0.36

(*The linear association between the variables is greater when the R-value approaches +1 or -1.. If the R-value is closer to zero, it advocates weak or no linear relationship. #p-value significant if <0.005.)

After six months of statin therapy, the study found weak correlations between cholesterol levels (LDL and HDL) and triglycerides with atherosclerotic cardiovascular disease (ASCVD). However, these correlations were not statistically significant, indicating that the impact of statin therapy on lipid levels and ASCVD risk requires further exploration.

Discussion

Unraveling the intricate nexus between lipid profiles and cardiovascular risk among diabetic cohorts represents a scholarly endeavor of paramount importance, shedding light on the complex mechanisms underpinning atherosclerotic cardiovascular disease (ASCVD) within this demographic subset. Diabetes emerges as a pivotal harbinger of ASCVD, with its intricate interplay with dysregulated lipid metabolism conferring a nuanced connotation of pathogenicity and disease progression. The elucidation of lipid aberrations in diabetes necessitates a comprehensive approach, integrating nuanced lifestyle modifications, pharmacotherapeutic interventions such as statins, and meticulous coordination of concurrent risk enhancing factors attributable to cardiovascular diseases like hypertension and smoking. [13].

Encouragingly, our empirical inquiry has yielded promising results, with a mere minority, approximately 16% of patients, succumbing to the vicissitudes of ASCVD during the temporal tapestry of our scrutiny. Emphasizing this academic intrigue is the discernible lipidomic resonance observed among entities of Asian ethnicity residing in the West. Characterized by accentuated triglyceride titers and contracted HDL--Cholesterol cohorts, this demographic tapestry often reveals a sharp pervasiveness of LDL--cholesterol (LDL-C) moieties imbued with qualitative aberrations, together with diminished stature and attenuated density.

According to the guidelines outlined by the 2019 American Diabetes Association, threshold for LDL--cholesterol concentrations stand below hundred (100mg/dL), signifying a significant risk enhancing factor for ASCVD in diabetic population. However, in cohorts previously afflicted with ASCVD or those deemed at heightened risk, the optional LDL--cholesterol target descends below 70mg/dL. This stringent criterion accentuates the intensified cardiovascular sensitivity associated with diabetes, emphasizing the requirement for resolute treatment of lipid profiles to decrease the risk of cardiovascular problems within this demographic group. [14].

In this particular investigation, the mean LDL--cholesterol concentration was delineated at 112.75 ± 9.81, accompanied by triglyceride levels averaging 146.81 ± 21.32 mg/dL, in alignment with antecedent research findings. Furthermore, our inquiry unearthed a mean HbA1c level of 7.49 ± 0.68, showcasing a correlative trend between elevated HbA1c levels and augmented lipid profiles. This finding is consistent with previous research, which has repeatedly shown the significant interaction across lipid parameters and levels of HbA1c in diabetic communities who experience cardiovascular disease (CVD).

The tenets articulated by the 2019 American Diabetes Association validate the significance of diligent medical management of cholesterol levels, particularly the LDL--cholesterol, in diabetics' cohort to stave off the looming specter of cardiovascular complications. Statins emerge as a cornerstone in this endeavor, harnessed to attain and preserve LDL--cholesterol levels inside predefined target limits as part of a complete treatment approach tailored for diabetic patients at risk of ASCVD. [15]. Attaining

and sustaining LDL--cholesterol levels beneath the pivotal threshold of 70 mg/dL may necessitate more assertive interventions, potentially entailing escalated statin doses or synergistic therapy with other lipid-lowering agents.

Our investigation finds resonance in the scholarly discourse elucidated by Khalid, M. R., where statins were employed as a therapeutic intervention aimed at mitigating LDL levels to curtail the risk of ASCVD incidence [3]. Undoubtedly, statins emerge as a linchpin in the prophylaxis against ASCVD, accentuating the imperative of aiming precise maladies that escalate cardiac and vascular vulnerability to fortify protective endeavors and assuage the load of cardiovascular afflictions. While myriad guidelines abound for the primary prevention of atherosclerosis-mediated cardiovascular diseases(ASCVD) through statins utilization, scant attention has been directed towards addressing discrete conditions that exacerbate ASCVD predisposition.

In the pursuit of fostering a demographic replete with robust cardiovascular health amidst the burgeoning life expectancy, precision-guided directives on the judicious deployment of statins to forestall inaugural, potentially deleterious ASCVD events become indispensable. Noteworthy findings stemming from a recent inquiry conducted in Pakistan unveiled a commendably low incidence of prescribing potentially inappropriate medications (PIMs) in tandem with statin therapy, quantified at a mere 9%. Such revelations underscore the judicious prescribing practices intrinsic to healthcare professionals' purview when advising adjunctive medicines in conjunction with statins [16].

This discerning concern to information reflects healthcare practitioners' awareness of possible interactions between drugs, contraindications, and bad effects associated with statin prescriptions. Such meticulousness is required for maximizing the safety of patients and ensuring the efficacy of statin therapy in regulating cardiovascular risk factors, so strengthening the therapeutic arsenal against ASCVD.

Conclusion

In summary, Pakistani patients with diabetes mellitus(DM2) often exhibit preeminent LDL and diminished HDL--cholesterol concentrations, predisposing them to cardiovascular hazard. Despite the potential benefits of statin therapy, its underutilization highlights the need for improved treatment adherence to mitigate cardiovascular complications.

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