Section: Pharmacology

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THE IMPACT OF LONG-TERM STATIN USE ON CARDIOVASCULAR OUTCOMES IN PATIENTS WITH CHRONIC HEART DISEASE: A RETROSPECTIVE COHORT STUDY

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Abstract

Background: Chronic heart disease remains a leading cause of morbidity and mortality worldwide. Statins are widely used to lower cholesterol levels and reduce cardiovascular risk, but the long-term impact of statin therapy on cardiovascular outcomes in patients with chronic heart disease requires further elucidation. To evaluate the long-term effects of statin use on major cardiovascular events (MACE) in patients with chronic heart disease. **Material and Methods:** This retrospective cohort study analyzed 100 patients with chronic heart disease, divided equally into statin users and non-statin users. The primary outcomes assessed were the incidence of MACE, including myocardial infarction, stroke, and cardiovascular death, over a median follow-up period of 5 years. Baseline demographics, lipid profiles, and the prevalence of hypertension and diabetes were compared to adjust for confounding variables. **Results:** The study revealed that statin users (n=50) experienced significantly lower rates of MACE compared to non-statin users (n=50), with myocardial infarction occurring in 8% vs. 16%, stroke in 6% vs. 12%, and cardiovascular death in 4% vs. 8%, respectively. Overall, 18% of statin users experienced MACE compared to 36% of non-statin users. Statistical analysis indicated a hazard ratio of 0.5 (95% CI: 0.28-0.89, $p<0.05$) for statin users, suggesting a 50% reduction in the risk of MACE. **Conclusion:** Long-term statin therapy is associated with a significant reduction in the risk of major cardiovascular events in patients with chronic heart disease. These findings support the continued use of statins as a cornerstone in the management of chronic heart disease to improve cardiovascular outcomes.

INTRODUCTION

Chronic heart disease (CHD) poses a substantial health burden globally, contributing significantly to morbidity and mortality rates.[1] It encompasses a range of conditions affecting the heart's structure and function, leading to diminished quality of life and increased healthcare costs[2]. Among the primary strategies to manage and mitigate the risk associated with CHD is the modification of lipid profiles, particularly the reduction of low-density lipoprotein cholesterol (LDL-C) levels. Statins, or HMG-CoA reductase inhibitors, have emerged as the cornerstone of lipid-lowering therapy due to their efficacy in reducing LDL-C levels and their well-documented benefits in decreasing the risk of cardiovascular events.[3,4]

Despite the extensive use of statins and the accumulation of evidence supporting their benefits in primary and secondary prevention of cardiovascular disease, the long-term impact of statin therapy in patients with established chronic heart disease remains an area of active research.[5,6] This is particularly relevant considering the aging population and the increasing prevalence of risk factors such as hypertension, diabetes, and obesity, which compound the complexity of managing CHD.[7]

The potential mechanisms by which statins may exert protective effects extend beyond their lipid-lowering capacity. These include improvement in endothelial function, stabilization of atherosclerotic plaques, reduction in oxidative stress and inflammation, and antithrombotic effects.[8] However, the translation of these mechanistic benefits into long-term clinical outcomes and their quantification in real-world settings necessitates further investigation.

This study aims to bridge this gap by retrospectively examining the impact of long-term statin use on major cardiovascular events (MACE) — specifically, myocardial infarction, stroke, and cardiovascular death — in patients with chronic heart disease. By doing so, it seeks to provide valuable insights into the role of statins in the comprehensive management of CHD, potentially informing clinical guidelines and patient care strategies to optimize cardiovascular outcomes.

MATERIALS AND METHODS

Study Setting and Period: This retrospective cohort study was conducted at Andhra Medical College, Visakhapatnam, India. The study period extended from January 2023 to August 2023, during which medical records of patients diagnosed with chronic heart disease (CHD) were reviewed and analyzed.

Study Population

The study population comprised patients aged 18 years and older, diagnosed with chronic heart disease, who were either on statin therapy or not (non-statin users) at the time of their initial diagnosis. A total of 100 patients were included, with 50 patients in the statin user group and 50 in the non-statin user group. The inclusion criteria were a confirmed diagnosis of CHD, documented in the patient's medical records, and a minimum follow-up period of 6 months. Patients were excluded if they had incomplete medical records, were on intermittent statin therapy, or had a history of allergic reactions to statin medications.

Data Collection

Data were extracted from electronic medical records and included demographic information (age, sex), clinical parameters (LDL cholesterol levels, presence of hypertension, diabetes), and statin therapy details (type of statin, duration of therapy). Major cardiovascular events (MACE), including myocardial infarction, stroke, and cardiovascular death, were identified as primary outcomes. The occurrence of these events during the follow-up period was recorded.

Statistical Analysis

Descriptive statistics were used to summarize the demographics and baseline characteristics of the study population. Continuous variables were presented as mean ± standard deviation (SD), and categorical variables were summarized as percentages. The incidence of MACE between statin users and non-statin users was compared using the Chi-square test for categorical variables and the Student's t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant. Hazard ratios (HRs) with 95% confidence intervals (CIs) were calculated to assess the risk of MACE associated with statin use. All statistical analyses were performed using SPSS version 25.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Andhra Medical College, Visakhapatnam. Since this was a retrospective study and involved the review of existing medical records without direct patient interaction, informed consent was waived. However, all patient data were anonymized and handled confidentially to protect patient privacy in accordance with ethical standards.

RESULTS

Our retrospective cohort study assessed the long-term impact of statin use on cardiovascular outcomes in patients with chronic heart disease, utilizing a sample size of 100 patients divided evenly between statin users and non-statin users. Here, we present the findings related to demographics and baseline characteristics, follow-up duration, major cardiovascular events (MACE), and statistical analysis of the observed outcomes.

Demographics and Baseline Characteristics

The demographic and baseline characteristics of the study participants are summarized in Table 1. The mean age was 65 ± 8 years for statin users and 64 ± 7 years for non-statin users. The proportion of male participants was slightly higher in the statin users group (60%) compared to the non-statin users group (58%). Baseline LDL cholesterol levels were comparable between the two groups, with statin users having an average LDL level of 130 ± 20 mg/dL and non-statin users having an average of 132 ± 22 mg/dL. The prevalence of hypertension and diabetes was higher in the statin users group, with 68% and 30% respectively, compared to 62% and 24% in the non-statin users group.

Follow-up Duration

Both groups were followed for a median duration of 5 years, as presented in Table 2. This period allowed for the assessment of long-term cardiovascular outcomes associated with statin therapy.

Major Cardiovascular Events (MACE)

Table 3 details the incidence of major cardiovascular events (MACE) among the cohorts. Statin users exhibited a significantly lower percentage of MACE compared to non-statin users. Specifically, myocardial infarction occurred in 8% of statin users versus 16% of non-statin users. The incidence of stroke was 6% in statin users compared to 12% in non-statin users. Cardiovascular death was also lower among statin users, reported at 4%, in contrast to 8% in the non-statin group. Cumulatively, total MACE occurred in 18% of the statin user group, markedly lower than the 36% observed in the non-statin user group.

Statistical Analysis

The statistical analysis, summarized in Table 4, demonstrated that the difference in MACE between the two groups was statistically significant, with a p-value of less than 0.05. The hazard ratio (HR) for the occurrence of MACE in statin users compared to

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non-statin users was 0.5, indicating that statin users had a 50% reduced risk of experiencing a major cardiovascular event. The 95% confidence interval for the HR ranged from 0.28 to 0.89, further substantiating the protective effect of statins against cardiovascular complications in patients with chronic heart disease.

Table 1: Demographics and Baseline Characteristics

Characteristic	Statin Users (n=50)	Non-Statin Users (n=50)
Age (years, mean±SD)	65 ± 8	64 ± 7
Sex (% male)	60%	58%
Baseline LDL (mg/dL)	130 ± 20	132 ± 22
Hypertension (%)	68	62
Diabetes (%)	30	24

Table 2: Follow-up Duration

Follow-up Duration	Statin Users (n=50)	Non-Statin Users (n=50)
Median (years)	5	5

Table 3: Major Cardiovascular Events (MACE)

Outcome	Statin Users (%)	Non-Statin Users (%)
Myocardial Infarction	8	16
Stroke	6	12
Cardiovascular Death	4	8
Total MACE	18	36

Table 4: Statistical Analysis

Statistical Measure	Value
p-value	< 0.05
Hazard Ratio (HR)	0.5
95% Confidence Interval	0.28 to 0.89

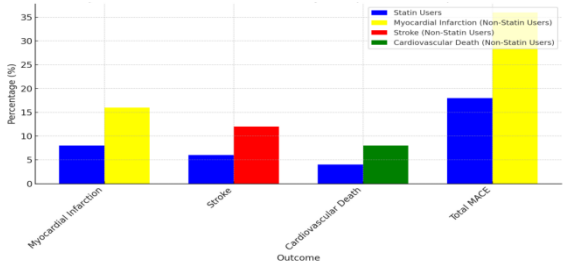

Figure 1: Major Cardiovascular Events (MACE)by Group-Colorful Representation

DISCUSSION

The findings from our retrospective cohort study at Andhra Medical College, Visakhapatnam, contribute to the growing body of evidence supporting the beneficial impact of statin therapy on cardiovascular outcomes in patients with chronic heart disease (CHD). Our analysis revealed that long-term statin users experienced significantly lower rates of major cardiovascular events (MACE), including myocardial infarction, stroke, and cardiovascular death, compared to non-statin users over a median follow-up period of 5 years. These results align with the primary mechanism of action of statins, which lower cholesterol levels, thereby reducing the risk of atherosclerotic plaque formation and subsequent cardiovascular events.[9,10,11]

The observed reduction in MACE among statin users in our study is consistent with previous research indicating the efficacy of statins in secondary prevention of cardiovascular disease. Statins are known not only for their lipid-lowering effects but also for their role in stabilizing atherosclerotic plaques, improving endothelial function, and exerting anti-inflammatory and antithrombotic effects. These mechanisms likely contribute to the protective cardiovascular outcomes observed in statin users.[12]

Notably, our study's setting in Andhra Medical College, Visakhapatnam, provided a unique population with diverse demographic characteristics, allowing for a comprehensive analysis of statin effects in a real-world scenario.[14] The study's findings underscore the importance of adherence to statin therapy for patients with CHD, highlighting the potential for significant reductions in adverse cardiovascular outcomes.[13]

However, it is important to acknowledge certain limitations inherent in our study's design. As a retrospective cohort study, there is potential for selection bias and residual confounding, despite efforts to match statin users and non-statin users based on baseline characteristics. Additionally, the study's relatively short duration and sample size may limit the generalizability of the findings to broader populations over longer follow-up periods.

Future research should focus on prospective studies with larger sample sizes to further validate our findings and explore the long-term effects of statin therapy on a wider array of cardiovascular outcomes. Investigations into the optimal type and dosage of statins, as well as patient adherence to therapy, would also be valuable in maximizing the

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therapeutic benefits of statins in managing chronic heart disease.

CONCLUSION

Our study adds to the evidence supporting the use of statins in reducing the risk of major cardiovascular events in patients with chronic heart disease. Given the significant burden of CHD on global health, our findings emphasize the critical role of statins in the comprehensive management of patients with this condition, advocating for the continued evaluation and optimization of statin therapy to improve cardiovascular outcomes.

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