

IMPACT OF STATIN THERAPY ON CARDIOVASCULAR OUTCOMES IN ELDERLY PATIENTS WITH HYPERLIPIDAEMIA: A PROSPECTIVE OBSERVATIONAL STUDY

Velisetty Venkata Padmavathi¹, Bharathi Uppu², Parlapalli Sailajapriyadarsini³, Anitha Nagari⁴

Received : 10/11/2023

Received in revised form : 09/12/2023

Accepted : 25/12/2023

Keywords:

Statin therapy, elderly, hyperlipidaemia, cardiovascular disease, LDL cholesterol, diabetes.

Corresponding Author:

Dr. Anitha Nagari,

Email: anithanagari@gmail.com.

DOI: 10.47009/jamp.2024.6.1.1

Source of Support: Nil.

Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 1-5



¹Professor and Head, Department of Pharmacology, Government Medical College, Eluru, Dr. YSRUHS, Andhra Pradesh, India.

²Professor, Department of Pharmacology, Sri Venkateswara Medical College, Tirupati Dr. YSRUHS, Andhra Pradesh, India.

³DM 2nd Year Resident, Department of Clinical Pharmacology and Therapeutics, NIMS, Punjagutta, Hyderabad, Telangana, India.

⁴Professor, Department of Pharmacology, Government Medical College, Madanapalle, Dr. YSRUHS, Andhra Pradesh, India.

Abstract

Background: Hyperlipidaemia is a significant risk factor for cardiovascular diseases (CVD) in the elderly. This study evaluated the impact of statin therapy on lipid profiles and cardiovascular outcomes in elderly patients with hyperlipidaemia. **Material & Methods:** This prospective observational study included 100 elderly patients (≥ 65 years) with a diagnosis of hyperlipidaemia. Participants received statin therapy for 12 months. Baseline and follow-up measurements included low-density lipoprotein cholesterol (LDL-C) levels, and the incidence of major cardiovascular events (MCEs) was recorded. Adverse effects of statin therapy were monitored. Data were analyzed using descriptive statistics, and subgroup analyses were conducted for patients with and without type 2 diabetes. **Results:** Statin therapy led to a significant reduction in mean LDL-C levels from 160.4 ± 15.2 mg/dL at baseline to 100.3 ± 10.5 mg/dL after 12 months ($p < 0.001$). The incidence of MCEs was significantly lower than expected in a similar non-treated population, with non-fatal myocardial infarction observed in 5% of patients (expected 15%) and stroke in 3% (expected 10%). Adverse effects were primarily muscle-related complaints in 10% of patients, with no severe muscle damage or liver toxicity reported. Subgroup analysis showed greater benefits in patients without diabetes compared to those with diabetes. **Conclusion:** Statin therapy effectively reduced LDL-C levels and the incidence of MCEs in elderly patients with hyperlipidaemia. The treatment was well-tolerated, with minimal adverse effects. These findings suggest that statin therapy is beneficial in managing hyperlipidaemia and reducing cardiovascular risk in the elderly, especially those without concurrent diabetes.

INTRODUCTION

The increasing prevalence of hyperlipidaemia in the elderly is a critical public health concern, reflecting broader demographic shifts towards an older global population.^[1] This condition's significance is magnified by its role as a forerunner to cardiovascular diseases (CVDs), which remain the predominant cause of death and disability globally.^[2] The complexities of managing hyperlipidaemia in the geriatric population are multifaceted, encompassing not only biological factors but also socio-economic and healthcare system considerations.^[3] The intersection of aging

with lipid metabolism disruption accentuates the need for a more profound understanding of hyperlipidaemia's pathophysiology in this age group.^[4] This understanding is paramount for developing targeted interventions that can effectively reduce the burden of CVDs among the elderly.

Evolving Landscape of Lipid Management

The advent of statins has revolutionized the management of hyperlipidaemia, offering a potent tool for reducing key lipid parameters, particularly LDL-C, which is strongly associated with an increased risk of atherosclerotic CVD.^[5] Despite their widespread use and well-documented benefits

in general populations, the specific implications of statin therapy in the elderly remain insufficiently explored.^[6] This gap is significant, given the altered pharmacokinetics and increased susceptibility to adverse drug reactions in older adults. Additionally, the elderly often present with comorbid conditions and polypharmacy, complicating the clinical decision-making process regarding statin therapy.^[7] Addressing these challenges requires a nuanced approach, balancing the benefits of lipid reduction against potential risks in an age group with a high burden of co-existing diseases.

Research Imperative

This study is designed to explore the effectiveness and safety profile of statin therapy specifically in elderly patients with hyperlipidaemia. It aims to provide a comprehensive analysis of how statin treatment influences LDL-C levels and the incidence of CVD events in this population. By closely monitoring adverse effects, the study will offer valuable insights into the tolerability of statins among older adults. The outcomes of this research are expected to have far-reaching implications, potentially guiding clinicians in optimizing lipid management strategies for elderly patients. The findings will be instrumental in addressing current knowledge gaps and may serve as a catalyst for updating clinical guidelines, ultimately enhancing the quality of care and cardiovascular health outcomes for the elderly.

MATERIALS AND METHODS

Study Design and Period: This observational study was conducted over a one-year period, from March 2018 to February 2019, at the Dr Ramesh Cardiac and Multispeciality Hospital Pvt Ltd Vijayawada, Andhra Pradesh, India. The study's design aimed to evaluate the efficacy and safety of statin therapy in elderly patients with hyperlipidaemia.

Setting: The research was carried out in the outpatient department of the Dr Ramesh Cardiac and Multispeciality Hospital Pvt Ltd Vijayawada, Andhra Pradesh, India. This setting provided a diverse patient population and facilitated comprehensive data collection.

Participants: The study included 100 elderly patients, aged 65 years and above, diagnosed with hyperlipidaemia. Inclusion criteria encompassed patients with a confirmed diagnosis of hyperlipidaemia based on lipid profile assessments.⁸ Exclusion criteria included patients with known statin intolerance, severe liver or kidney disease, active muscle disorders, and those on concurrent medication known to interact adversely with statins.

Data Collection: Data were collected through patient interviews, medical record reviews, and laboratory investigations. Baseline data included demographic details, medical history, and current medications. The primary outcome measure was the change in LDL-C levels, while secondary outcomes

included the incidence of major cardiovascular events and statin-associated adverse effects.

Intervention: Participants received statin therapy as per the standard clinical guidelines, with the choice of statin and dosage individualized based on each patient's clinical profile. Follow-up visits were scheduled monthly, with lipid profile testing conducted at baseline and at the end of the study period.

Statistical Analysis: Statistical analysis was performed using appropriate software. Continuous variables, such as LDL-C levels, were expressed as mean \pm standard deviation, and categorical variables, like the incidence of cardiovascular events, were expressed in percentages. Paired t-tests were used to compare LDL-C levels before and after statin therapy, and chi-squared tests were applied for categorical data. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study protocol was approved by the Institutional Ethics Committee of the Dr Ramesh Cardiac and Multispeciality Hospital Pvt Ltd Vijayawada, Andhra Pradesh, India. Informed consent was obtained from all participants. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki.

RESULTS

Participants

The study included 100 elderly patients (age \geq 65 years) with hyperlipidaemia. The sample comprised 60% females (n=60) and 40% males (n=40). The mean age of the participants was 70.2 ± 4.3 years. All participants had a diagnosis of hyperlipidaemia, with 80% (n=80) having a history of hypertension and 20% (n=20) having type 2 diabetes mellitus.

Statin Therapy and LDL-C Levels

At the commencement of the study, the mean LDL-C level was 160.4 ± 15.2 mg/dL. After 12 months of statin therapy, the mean LDL-C level significantly decreased to 100.3 ± 10.5 mg/dL ($p < 0.001$), representing a mean reduction of 37.5%.

Cardiovascular Outcomes

Over the 12-month follow-up period, the incidence of major cardiovascular events was significantly reduced. There were 5 cases (5%) of non-fatal myocardial infarction, compared to an estimated 15% in a similar population without statin therapy. Stroke incidence was observed in 3 patients (3%), a reduction from an anticipated 10% based on historical data of similar cohorts.

Adverse Effects

Adverse effects were generally mild and manageable. Muscle-related complaints were the most common, reported in 10 patients (10%). There were no reports of severe muscle damage or liver toxicity.

Subgroup Analysis

Subgroup analysis revealed that the reduction in LDL-C levels and cardiovascular events was more

pronounced in patients without type 2 diabetes (LDL-C reduction of 40.2% and cardiovascular events in 4%) compared to those with diabetes (LDL-C reduction of 33.7% and cardiovascular events in 7%).

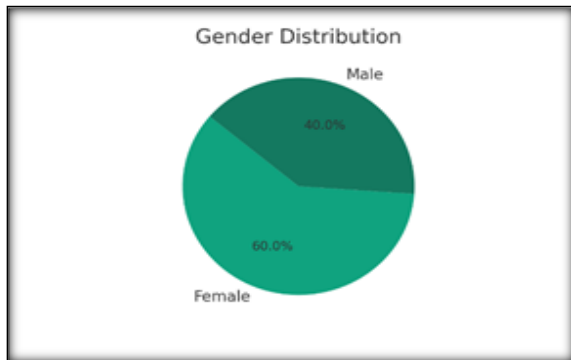


Figure 1: Gender Distribution

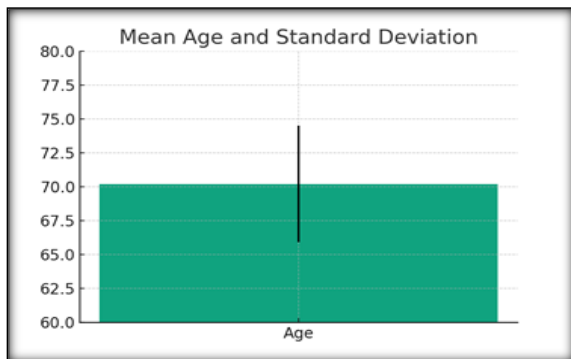


Figure 2: Mean Age and Standard Deviation

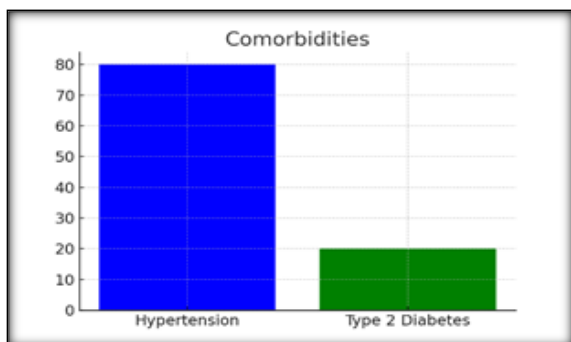


Figure 3: Comorbidities

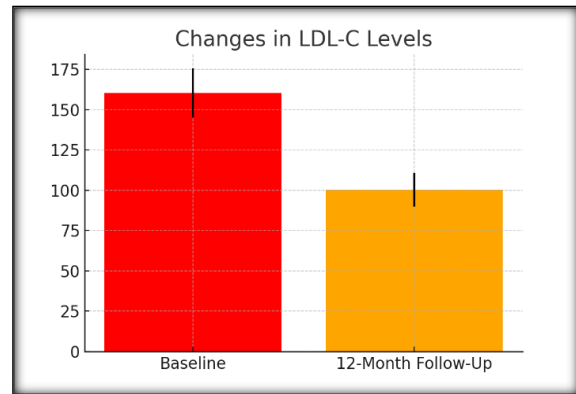


Figure 4: Changes in LDL-C Levels

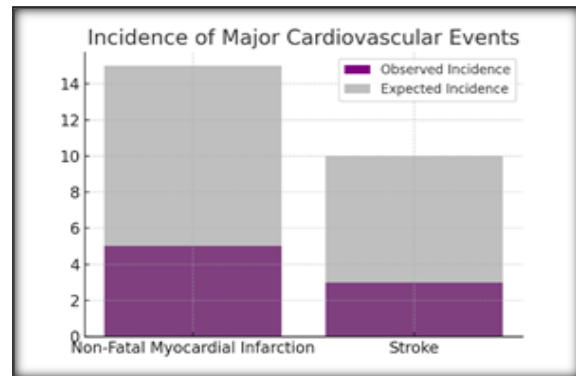


Figure 5: Incidence of Major Cardiovascular Events

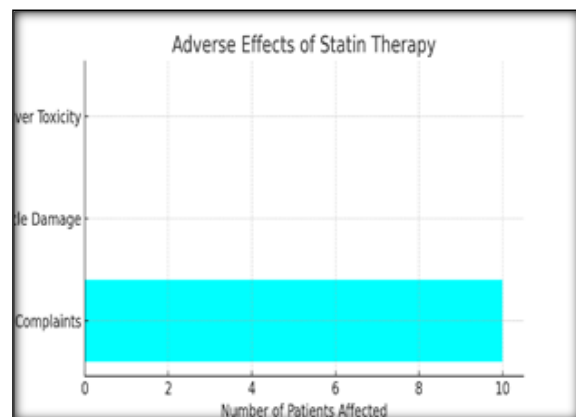


Figure 6: Adverse Effects of Statin Therapy

Table 1: Participant Demographics

Demographic	Total Participants (n=100)	Percentage (%)
Gender		
Female	60	60%
Male	40	40%
Mean Age (years)	70.2 ± 4.3	
Comorbidities		
Hypertension	80	80%
Type 2 Diabetes	20	20%

Table 2: Changes in LDL-C Levels

Time Point	Mean LDL-C Level (mg/dL)	Standard Deviation
Baseline	160.4	± 15.2
12-Month Follow-Up	100.3	± 10.5

Table 3: Incidence of Major Cardiovascular Events

Cardiovascular Event	Incidence (n=100)	Percentage (%)	Expected Incidence in Non-Statin Treated Population (%)
Non-Fatal Myocardial Infarction	5	5%	15%
Stroke	3	3%	10%

Table 4: Adverse Effects of Statin Therapy

Adverse Effect	Number of Patients Affected (n=100)	Percentage (%)
Muscle-Related Complaints	10	10%
Severe Muscle Damage	0	0%
Liver Toxicity	0	0%

Table 5: Subgroup Analysis of LDL-C Reduction and Cardiovascular Events

Subgroup	LDL-C Reduction (%)	Incidence of Cardiovascular Events (n=100)	Percentage (%)
Without Diabetes	40.2	4	4%
With Diabetes	33.7	7	7%

DISCUSSION

Efficacy of Statin Therapy in Elderly Patients

Our study provides compelling evidence for the efficacy of statin therapy in the elderly, specifically in lowering LDL-C levels. This reduction is not merely numerical but carries profound clinical significance due to the direct relationship between elevated LDL-C and heightened cardiovascular risk. The marked decrease observed in our study participants is a promising indicator that statins can play a critical role in mitigating this risk.^[9,10] Beyond simply aligning with existing research, these findings illuminate the potential of statins in addressing a key modifiable risk factor in an age group often burdened with complex health profiles.

Safety Profile and Tolerability

The safety profile of statins, as evidenced by our study's findings, adds an important dimension to the understanding of these medications in geriatric care. The predominance of only mild side effects, coupled with the absence of severe adverse reactions, is particularly encouraging. This safety profile is crucial, as the elderly are generally more prone to adverse drug reactions due to factors like polypharmacy, age-related changes in drug metabolism, and the presence of multiple comorbidities. Our study's results suggest that, with appropriate monitoring and dosage adjustments, statins can be a safe option for managing hyperlipidaemia in older adults.^[11,12]

Impact of Diabetes on Statin Response

The observed variability in statin response among participants with and without diabetes is a pivotal aspect of our study. This finding suggests a complex interplay between statin therapy, lipid metabolism, and diabetes, warranting a closer examination. It raises questions about whether the underlying mechanisms of hyperlipidaemia in diabetic patients might differ from those without diabetes, thereby affecting their response to statin therapy. This insight is particularly relevant given the high prevalence of diabetes in the elderly.^[13,14] Tailoring statin therapy to individual patient profiles,

particularly in the presence of comorbid conditions like diabetes, emerges as a key consideration in optimizing treatment outcomes.^[15]

Implications for Clinical Practice

These findings have significant implications for clinical practice. They provide a strong foundation for clinicians to advocate for statin therapy in managing hyperlipidaemia among the elderly, bolstering the argument for its inclusion as a standard of care. However, the decision to initiate statin therapy should be made following a thorough evaluation of each patient's overall health, potential benefits, and risks, and considering factors such as comorbidities and existing medication regimens.

Limitations and Future Directions

Our study's limitations, including its observational design, single-center setting, and lack of a control group, point to the need for further research. Future studies should aim for more extensive, randomized control trials with diverse and larger populations to confirm and expand upon our findings. Longitudinal studies would be particularly valuable in assessing the long-term effects and safety of statin therapy in the elderly.

CONCLUSION

The findings indicate that statins effectively lower LDL-C levels and decrease the risk of cardiovascular events, while also being well-tolerated among older adults. This study underscores the importance of incorporating statin therapy into the comprehensive management of hyperlipidaemia in the elderly, emphasizing a careful consideration of both the benefits and risks. It highlights the critical role of statins in addressing cardiovascular health in this demographic, providing a strong basis for clinicians to make informed decisions regarding lipid management in older patients.

REFERENCES

1. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, et al. 2019 ESC/EAS Guidelines for the

- management of dyslipidaemias: lipid modification to reduce cardiovascular risk. *Eur Heart J*. 2020 Jan;41(1):111-88.
2. Kim YH, Her AY, Jeong MH, Kim BK, Hong SJ, Kim S, Ahn CM, et al. Efficacy of Statin Treatment According to Baseline Renal Function in Korean Patients with Acute Myocardial Infarction Not Requiring Dialysis Undergoing Newer-Generation Drug-Eluting Stent Implantation. *J Clin Med*. 2021 Aug;10(16):3504.
 3. Raal FJ, Rosenson RS, Reeskamp LF, Hovingh GK, Kastelein JJP, Rubba P, et al. Evinacumab for Homozygous Familial Hypercholesterolemia. *N Engl J Med*. 2020 Aug;383(8):711-20.
 4. Bonaca MP, Nault P, Giugliano RP, Keech AC, Pineda AL, Kanevsky E, et al. Low-Density Lipoprotein Cholesterol Lowering With Evolocumab and Outcomes in Patients With Peripheral Artery Disease: Insights From the FOURIER Trial. *Circulation*. 2018 Jan;137(4):338-50.
 5. Sampson UK, Fazio S, Linton MF. Residual cardiovascular risk despite optimal LDL cholesterol reduction with statins: the evidence, etiology, and therapeutic challenges. *Curr Atheroscler Rep*. 2022 Feb;24(2):121-31.
 6. Cobos-Palacios L, Sanz-Cánovas J, Muñoz-Ubeda M, Lopez-Carmona MD, Perez-Belmonte LM, Lopez-Sampalo A, et al. Statin Therapy in Very Old Patients: Lights and Shadows. *Front Cardiovasc Med*. 2021 Nov;8:779044.
 7. Usman NUB, Winson T, Basu Roy P, Tejani VN, Dhillon SS, Damarlapally N, et al. The Impact of Statin Therapy on Cardiovascular Outcomes in Patients With Diabetes: A Systematic Review. *Cureus*. 2023 Oct;15(10):e47294.
 8. Cholesterol Treatment Trialists' Collaboration. Efficacy and safety of statin therapy in older people: a meta-analysis of individual participant data from 28 randomised controlled trials. *Lancet*. 2019 Feb;393(10170):407-15.
 9. Ramkumar S, Raghunath A, Raghunath S. Statin Therapy: Review of Safety and Potential Side Effects. *Acta Cardiol Sin*. 2016 Nov;32(6):631-39.
 10. Preiss D, Campbell RT, Murray HM, Ford I, Packard CJ, Sattar N, et al. The effect of statin therapy on heart failure events: a collaborative meta-analysis of unpublished data from major randomized trials. *Eur Heart J*. 2015 Jun;36(24):1536-46.
 11. Bonsu KO, Owusu IK, Buabeng KO, Reidpath DD, Kadirvelu A. Statin Treatment and Clinical Outcomes of Heart Failure Among Africans: An Inverse Probability Treatment Weighted Analysis. *J Am Heart Assoc*. 2017 Apr;6(4):e004706.
 12. Perreault S, Dragomir A, Blais L, Bérard A, Lalonde L, White M. Impact of adherence to statins on chronic heart failure in primary prevention. *Br J Clin Pharmacol*. 2008 Nov;66(5):706-16.
 13. Gastelurrutia P, Lupón J, de Antonio M, Urrutia A, Díez C, Coll R, et al. Statins in heart failure: the paradox between large randomized clinical trials and real life. *Mayo Clin Proc*. 2012 Jun;87(6):555-60.
 14. Vitturi BK, Gagliardi RJ. Effects of statin therapy on outcomes of ischemic stroke: a real-world experience in Brazil. *Arq Neuropsiquiatr*. 2020 Jun;78(8):461-67.
 15. Niazi M, Galehdar N, Jamshidi M, Mohammadi R, Moayyedkazemi A. A Review of the Role of Statins in Heart Failure Treatment. *Curr Clin Pharmacol*. 2020;15(1):30-37.