Introduction

Hyperlipidemia/hypercholesterolemia/hyperlipoproteinemia is a condition in which there is an elevation of lipoproteins in the blood.[1] Hyperlipidemia plays a major role in the pathogenesis of cardiovascular diseases (CVD). It does not have any specific symptoms and is diagnosed usually during a routine health examination.[2] There is a direct correlation between high lipid concentrations and CVD. The Lipid Research Clinics Coronary Primary Prevention Trial established that the use of lipid-lowering drugs led to a marked reduction in cardiovascular morbidity and mortality.[3] Statins are considered to be the most efficacious drugs in the management of hyperlipidemia. This class of drugs is most commonly prescribed for the treatment of hyperlipidemias.[4] They act primarily by inhibiting the enzyme 3-hydroxy-3-methyl-glutaryl-coenzyme A reductase.[5] Geriatric patients are a special category of patients owing to the various physiological changes due to age, co-morbidities, concomitant medications, and cognitive dysfunction which are frequently seen in this population. This population is at a greater risk of developing atherosclerotic CVD. Treatment with statins decreases the risk of stroke as well as coronary artery disease in all age groups.[6] Although statin therapy has transformed the management of hyperlipidemia, they are associated with the skeletal muscle, neurological, and metabolic adverse effects. These are referred to as statin-associated symptoms (SAS).[7] Statin-associated myopathy is an important cause of the discontinuation of statins.[8] A regular follow-up with the patient regarding SAS will help in improving the treatment adherence and clinical outcome. An

Background: Hyperlipidemia plays a major role in the pathogenesis of cardiovascular diseases (CVD). Statins are considered to be the most efficacious drugs in the management of hyperlipidemia and this class of drugs is most commonly prescribed for the treatment of hyperlipidemias. Although statin therapy has transformed the management of hyperlipidemia, it is associated with the skeletal muscle, neurological, and metabolic adverse effects. This study was conducted to evaluate the adverse effects of statin therapy in a geriatric population which may help in understanding whether these effects are dose-dependent. Methods: The study was conducted on 200 patients receiving statin therapy (atorvastatin and rosuvastatin) for hyperlipidemias. They were divided into four groups depending on the prescribed dose of atorvastatin and rosuvastatin. All study subjects were followed up for 6 months. The adverse effects reported by them during the statin therapy were documented and analyzed. Results: All patients reported adverse effects after the initiation of statin therapy. Headache and muscle symptoms were among the most commonly reported adverse effects. There was no serious adverse effect (SAE). None of the adverse effects led to the discontinuation of the statin therapy. Conclusion: The results of this study suggest that all patients receiving statin therapy experience one or more adverse effects during the therapy. The adverse effects were not found to be severe in the geriatric age group.

Keywords: Geriatric, hyperlipidemia, statin

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increased incidence of metabolic syndrome has made statin therapy an integral part of every prescription written by a primary care physician (PCP). The present study was conducted to create awareness among the PCP, and thus, improve spontaneous adverse drug reaction (ADR) reporting.

**Objectives**

1) To monitor various adverse effects associated with the use of lipid-lowering drugs in the geriatric population.
2) To identify the pattern of adverse effects associated with the use of lipid-lowering drugs in the geriatric population

**Material and Method**

The study was conducted after IEC approval Ref No. DMIMS (DU)/IEC/2020 – 21/8916.

The study was conducted in Medicine OPD, Acharya Vinobha Bhave Research Hospital, Sawangi, Wardha.

Sample size: 200.

Duration of study: 6 months.

A total of 200 patients above the age of 60 years were enrolled in the study. The patients were informed about the adverse effects associated with statin therapy and were asked to report to the OPD when they experience any adverse effects. All these patients were receiving statin therapy and reported various adverse effects after the start of the therapy. The patients were followed up for 6 months after the start of the therapy.

The patients were divided into four groups based on the statin therapy used and the dose of statin prescribed. Each group comprised of 50 patients.

Group 1 – Patients receiving tablet atorvastatin 20 mg at bedtime (HS).
Group II – Patients receiving tablet atorvastatin 10 mg HS.
Group III - Patients receiving tablet rosvastatin 20 mg HS.
Group IV - Patients receiving tablet rosuvastatin 10 mg HS.

**Results**

Results are elaborated in Tables 1-4 and Figures 1-2

| Table 1: Adverse effects reported in Group I patients (n=50) |
|----------------------------------------------------------|
| **Adverse effect** | **No. of patients** | **Time since start of therapy** |
| Headache | 15 | 1-2 months |
| Dizziness | 06 | 2-3 months |
| Feeling tired | 10 | 3-4 months |
| Muscle pain (soreness/cramping/fatigue) | 15 | 5-6 months |
| Sleep disturbance | 03 | 1-2 months |
| GI symptoms (diarrhea/constipation/indigestion) | 01 | 1-2 months |

| Table 2: Adverse effects reported in Group II patients (n=50) |
|----------------------------------------------------------|
| **Adverse effect** | **No. of patients** | **Time since start of therapy** |
| Headache | 14 | 1-2 months |
| Dizziness | 08 | 2-3 months |
| Feeling tired | 10 | 3-4 months |
| Muscle soreness/cramping/fatigue | 06 | 5-6 months |
| Sleep disturbance | 09 | 1-2 months |
| GI symptoms (diarrhea/constipation/indigestion) | 03 | 1-2 months |

| Table 3: Adverse effects reported in Group III patients (n=50) |
|----------------------------------------------------------|
| **Adverse effect** | **No. of patients** | **Time since start of therapy** |
| Headache | 07 | 1-2 months |
| Dizziness | 03 | 2-3 months |
| Feeling tired | 10 | 3-4 months |
| Muscle soreness/cramping/fatigue | 15 | 5-6 months |
| Sleep disturbance | 10 | 1-2 months |
| GI symptoms (diarrhea/constipation/indigestion) | 05 | 1-2 months |

| Table 4: Adverse effects reported in Group IV patients (n=50) |
|----------------------------------------------------------|
| **Adverse effect** | **No. of patients** | **Time since start of therapy** |
| Headache | 16 | 1-2 months |
| Dizziness | 09 | 2-3 months |
| Feeling tired | 08 | 3-4 months |
| Muscle soreness/cramping/fatigue | 07 | 5-6 months |
| Sleep disturbance | 06 | 1-2 months |
| GI symptoms (diarrhea/constipation/indigestion) | 04 | 1-2 months |
In our study, headache and muscle pain were the most commonly reported adverse effects in all groups of patients. Overall, 30% of the patients experienced headaches within 1–2 months [Figure 1] of initiating the therapy. Muscle pain was reported by 30% of the patients within 5–6 months of initiating the therapy. More patients in Group I and Group III [Figure 2] (receiving atorvastatin 20 mg HS and rosuvastatin 20 mg HS, respectively) reported muscle pain as an adverse effect. A meta-analysis conducted by Di Stasi SL et al reported myalgias in 21 studies of 48,138 patients [Table 1-4]. As per the PRIMO study (Prediction of Muscular Risk in Observational Conditions), the number of patients reporting muscle-related symptoms was the highest in those receiving simvastatin (18.2%), followed by atorvastatin (14.9%), pravastatin (10.9%), and Fluvastatin (5.1%). A meta-analysis by Cai et al. reported that muscle symptoms with the use of statins have led to poor compliance with statin treatment. Myopathy usually manifests after a few months of the initiation of statin therapy or after a dose increase. In our study, we found out that the number of female patients reporting muscle pain was greater than the number of male patients. In a study conducted by Harmanjit Singh et al. on 172 geriatric patients, the difference in the occurrence of muscle-related adverse effects (MRAE) among the male and female statin users was found to be statistically significant. We also observed that none of the patients discontinued statin therapy due to adverse effects. A review article by Toth et al. stated that 20% of the individuals who were prescribed statins were unable to take statins daily due to intolerance and 40–75% of the patients discontinued their statin therapy within 1–2 years after the initiation. Statin intolerance is commonly attributed to MRAE. In our study, a total of 43 patients reported MRAE [Table 1-4]. The commonly reported MRAE in our study was muscle soreness. Adverse effects have been reported with all commonly-used statins and are dose-dependent. Advancing age, co-morbidities, and female gender are other risk factors for statin myopathy. The skeletal muscle side effects with statin use include muscle cramping/soreness/fatigue/weakness, and in rare cases, rhabdomyolysis. Sleep disturbances were reported by 6% of the patients in our study. Swiger et al reported that there was no significant difference in the sleep pattern among the patients receiving statin therapy versus the placebo group. Around 20% of the patients in our study reported a feeling of tiredness within 3–4 months after the initiation of the therapy. Swiger et al. reported that there was no significant difference in the quality of life among the patients receiving statins versus those not receiving statins. In our study, 2% of the patients reported gastrointestinal (GI) symptoms among which diarrhea was the predominant symptom. Pascua et al. in their study reported that there was no increased risk of microscopic colitis associated with the use of statins.

**Conclusion**

Our study led to the following conclusions:

1. Patients in the geriatric age group experienced one or more adverse effects within a month or two of initiating the statin therapy. However, MRAE occurred almost 5–6 months after the initiation of the therapy.
2. Low-dose statins caused less muscle pain and the patients receiving high-dose statins were switched to a combination of fenofibrate + statin.
3. The GI symptoms (indigestion, diarrhea, and constipation) could be age-related and cannot be attributed completely to the statin therapy.

It is a piece of helpful evidence-based information to the primary care physicians to prescribe low-dose statins and use coenzyme-Q as a therapy for statin-induced myopathy.

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Nil.
Conflicts of interest

There are no conflicts of interest.

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