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A CROSS SECTIONAL STUDY TO ASSESS THE COGNITIVE FUNCTIONS OF PATIENTS ON CHRONIC STATIN THERAPY IN A TERTIARY CARE HOSPITAL

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ABSTRACT
INTRODUCTION: Statins are drugs which Act by lowering serum cholesterol levels and inhibiting enzymatic reactions that lead to amyloid deposition and plaque formation; both considered cornerstone pathways leading to the development of Alzheimer's disease.
OBJECTIVE: To assess the cognitive functions of patients on chronic statin therapy.
MATERIALS AND METHODS: This is a cross-sectional study done at Saveetha Hospital,Chennai. Patients were briefed and a written informed consent was obtained. They were given a Mini Mental State Examination questionnaire and their scores were entered. The data, thus collected was analyzed using SPSS software version 20
CONCLUSION: The study shows that as the duration of statin therapy increases, the risk of cognitive impairments also increase. On analyzing the average Mini Mental State Examination scores, a constant decline of 3.33% was found between the subsequent groups as age increased and a 4% decline as a result of increased duration of statin therapy.

KEYWORDS :

INTRODUCTION:

Dementia is an age-related neurodegenerative disease, characterized by a progressive decline in cognitive function often encompassing several domains (e.g. memory, attention, language, and problem solving). Worldwide, around 50 million people have dementia, with nearly 60% living in low- and middle-income countries. Every year, there are nearly 10 million new cases. According to the World Health Organization (WHO) estimates, the number of individuals affected by dementia is expected to triple by 2050, with the rapid aging of populations globally("Dementia," n.d.).It is estimated that over 3.7 million people are affected by dementia in our country. This is expected to double by 2030.–(India, 2010) Cognitive function may decline as a result of certain risk factors like hypertension, elevated cholesterol etc. This in turn could adversely impact the physical functioning and quality of life of older adults. Dementia is a major illness and cause of disability among the elderly. Meanwhile, the individual, societal and healthcare costs associated with dementia are steeply increased. Unsurprisingly, the prevention of cognitive decline and dementia is a worldwide public health issue.

Recently, interest has arisen in the potential for statins to delay cognitive decline in people with older age. Statins are drugs that inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase. Statins not only lower serum cholesterol levels, but also inhibit pivotal enzymatic reactions that lead to amyloid deposition and plaque formation; both are considered cornerstone pathways underpinning the development of Alzheimer's disease (AD). The aim of this study is to understand the controversial position of chronic statin therapy in affecting cognition amongst Indian population in a tertiary care setup.

MATERIALS AND METHODS :

This cross sectional study was done in the General Medicine department, Saveetha Medical College and Hospital, Chennai after obtaining the approval of the Institutional Review Board. We recruited 75 patients between the age of 35 and 65 years who were on statin therapy for more than 6 months; inclusive of both sexes. Patients with history of dementia or other cognitive disorders were excluded from the study. Patients of age of above 65 years were also excluded taking into account age-related cognitive decline. The patients were then briefed about the study and a written informed consent was obtained from them before proceeding. For assessing the cognitive functions of the patients, a standard Mini Mental State Examination questionnaire was used, which consisted of 11 questions and tasks, and each one was given a score between 1 and 5 depending on the difficulty levels summing up to a grand total of 30. A descriptive analysis was done using SPSS version 20.

RESULTS:

Out of the total participants, 69% were male, 31% were female. Based on the inclusion criteria, tha participants between 35-65 years of age were only chosen for the study, in which 37% were between 35-45 years; 27% between 45-55 years of age and 36% between 55-65 years of age. Majority of the participants, accounting to upto 95% of the participants were on atorvastatin , while the remaining 5% were on rosuvastatin. Patients were mostly prescribed for indications like prior cardiovascular surgery or dyslipidemia.

About 79% of the participants were only taking statins for less than a year. About 16% of them were on statin therapy for about 3-6 years. The rest 5% of the participants were on statins for more than 6 years.(Table 1)

Amongst the male patients, 4% scored a maximum of 29 while 1% scored 9,which was the least score obtained in the entire study. Amongst the female participants, 3%scored a maximum of 28 while 1% scored 21. On comparing the average score obtained by each sexes : male- 15% scored 27 and female- 13% scored 29 .(Figure 1)

The patients were categorized into 3 groups based on their age. The group consisting of patients between 35-45 years of age had an average score of 27 ,which was obtained by 12% of the participants. The maximum score was 29, obtained by 4% participants and the minimum score was 23, obtained by 1 % of the participants.

The group consisting of participants between 45-55 years of age had an average score of 27,which was obtained by 9% . The maximum score was 28, obtained by 3% patients and the minimum score was 15, obtained by 1 % of the participants.

The group consisting of participants between 55-65 years of age had average score of 27, which was obtained by 9%patients, 7% patients scored a maximum of 28 and the minimum score from this group was 9, which was also the least score obtained in the entire study.

On analyzing the average scores of each group -a constant decline of 3.33% of the score was found between the subsequent groups as age increased.(Figure 2)

For understanding the possibility of cognitive decline associated with increased duration of statin therapy, the patients were grouped into 3 groups : patients on statin therapy for less than 3 years comprising of 79% of the total participants; patients on statin therapy for 3-6 years duration ,comprising of 16% of the total participants, patients on statin therapy for more than 6 years comprising of 5% of the total participants . On comparing the average score 0btained by all the patients in each group; There was a decline of about 1% in the mean Mini Mental State Examination score between 2 consequent groups and there was a decline of 4% between patients on statin therapy for less than 3 years and patients on statin therapy for more than 6 years. (Figure 3)Of all the patients ,95% patients were on ATORVASTATIN and 5% on

ROSUVASTATIN .Patients on atorvastatin on an average scored 27. Patients on rosuvastatin scored 28 on average. No significant difference in average score was seen between them.(Figure4)

FIGURES AND CHARTS
Table 1. DEMOGRAPHIC DETAILS

S.NO	PARAMETERS		PERCENTAGE
1	Sex	Male	69%
		Female	31%
2	Age	35-45 years	37%
		45-55 years	27%
		55-65 years	36%
3	Statin	Atorvastatin	95%
		Rosuvastatin	5%
4	Duration Of Statin Therapy	<3 years	79%
		3-6 years	16%
		>6 years	5%

FIGURE 1

Mean MMSE score based on age

27 | 27 | 27
- 34-45 years
- 45-55 years
- 55-65 years

FIGURE 2

Mean MMSE score based on Sex

29 | 27
- Male
- Female

FIGURE 3

Mean MMSE score based on duration of statin therapy

23 | 26 | 25
- <3 years
- 3-6 years
- >6 years

FIGURE4

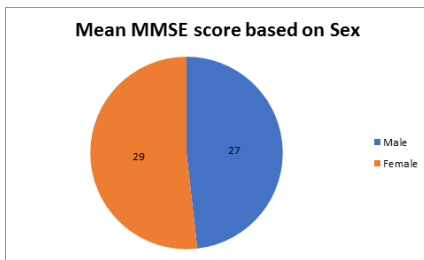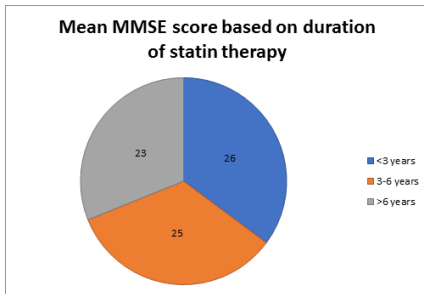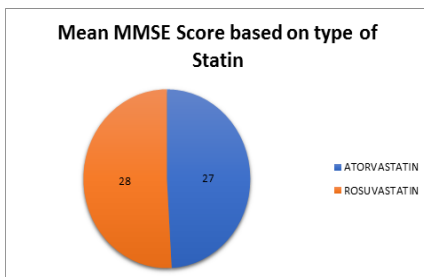Mean MMSE Score based on type of Statin

28 | 27
- ATORVASTATIN
- ROSUVASTATIN
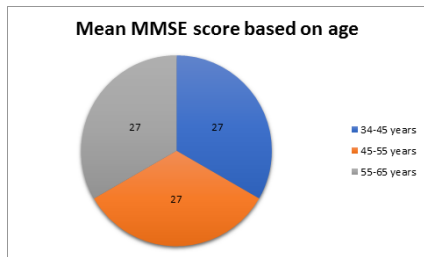
DISCUSSION:
Statins have been linked to short-term reversible cognitive impairment since early safety and tolerability testing . During a phase I clinical trial of atorvastatin, increasing doses showed a dose-dependent adverse reaction of mild, transient, restlessness, euphoria, and mental confusion(Posvar, Radulovic, Cilla, Whitfield, & Sedman, 1996) In a different study, which involved Nineteen patients whose symptoms improved or resolved after they discontinued statin therapy ;when subjected to re-challenge with a statin suffered recurrence of cognitive problems(Evans & Golomb, 2009) These impairments might be better understood by looking into how Vascular factors increase the risk of Alzheimer's disease (AD) by enhancing neurodegeneration(Lawler et al., 2017).

Simvastatin is commonly prescribed for hypercholesterolemia to reduce vascular risk in patients. Some of these patients have dementia with cognitive defects of several domains(Suraweera, De Silva, & Hanwella, 2016) A similar case report describes two patients taking simvastatin, showed differences in day-to-day functioning. The negative effects resolved upon discontinuation of simvastatin'''''''(Cham, Koslik, & Golomb, 2016)

Several other studies have concluded that the possibility of new-onset cognitive dysfunction and the deterioration of existing cognitive deficits should be considered when prescribing simvastatin to patients. Preliminary data suggest that statins that are less lipophilic(pravastatin and rosuvastatin) may be less likely to contribute to cognitive impairment due to limited penetration across the blood-brain barrier [(Rojas-Fernandez & Cameron, 2012)] and so may be considered as alternate to simvastatin.

Although statins are repeatedly alleged to have caused cognitive impairment, some studies have shown Statins to be useful in reducing depression . Furthermore, in patients with schizophrenia, negative symptoms are shown to be reduced by adjuvant statin therapy. Studies on cohorts "at risk" for dementia have generally shown protective effects of statins [(Lu et al., 2007)], while those "on treatment" for dementia show inconsistent results'''''''(Cham et al., 2016). The study concluded that statins used in combination with conventional psychotropic medications may be effective for various psychiatric disorders including depression, schizophrenia, and dementia.

On assessing the cognitive performance related to procedural memory, attention, motor speed ,executive function, declarative memory, processing speed, or visual perception of chronic statin users (Schoen et al., 2014), no significant difference was concluded and the evidence from observational and prospective randomized trials led us to the conclusion that there is no causal relationship between potential mechanisms of the effect of cholesterol reduction of statin therapy on cognition to a significant degree(Bitzur, 2016)

Exploring the idea of how usage consistency may play a role in the cognitive effects, a retrospective cohort study attempted to unveil the difference in cognitive disorders between persistent and non-persistent statin users. After analyzing statin users and codes for psychological diseases it was interestingly concluded that non-persistent statin users were actually at greater risk(Lilly, Mortensen, Frei, Pugh, & Mansi, 2014). But the observations of this study which includes the Indian population at a tertiary care hospital between the age group 45-65 is that people on longer durations of statin therapy are more vulnerable to cognitive impairment. Slight difference in the degree of cognitive decline was also noted with use of different statin in coherence with the study that concluded that less lipophilic statins cause less cognitive impairment. The limitations of this study included the sample size considered, owing to which no clear observations on the association of chronic statin therapy with cognitive changes could be made. The study included Indian population in a tertiary care setup. Diverse observations could not be made.

A general outlook of the Food and Drug Administration post-marketing surveillance databases revealed a low reporting rate for cognitive-related adverse events with statins, which also applies to the rates seen with other commonly prescribed cardiovascular medications(Okerson et al., 2017). This low reporting and inconsistent results are the reasons for the questionable status of statin in altering cognitive function .The 2013 treatment of blood cholesterol guidelines do agree, however, that this potential reversible cognitive impairment should not be a reason to avoid statin use (Center for Devices and Radiological Health, 2006)

CONCLUSION:
The study shows that as the duration of statin therapy increases, the risk of dementia and other cognitive impairments also increase;

specifically impairment in recall, language and praxis aspects of the mental state are affected. On analyzing the average Mini Mental State Examination scores,a constant decline of 3.33% of the score was found between the subsequent groups as age increased. Also, there was a decline of 4% between patients on statin therapy for less than 3 years and patients on statin therapy for more than 6 years. Medical practitioners should therefore be also checking the patients cognitive functions when their patients are on chronic statin therapy.

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