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Original Research Article

Nutritional status and cognitive impairment in elderly population in a rural area of Thrissur district, Kerala

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ABSTRACT

Background: The past decade has witnessed a marked increase in elderly population of India. This rapid ageing will substantially increase the number of elderly individuals, who are affected by cognitive impairment. Recent studies suggest the association between malnutrition and cognitive impairment in elderly. This study aims to describe the nutritional status and cognitive impairment in elderly population in a rural area of Thrissur district, Kerala.
Methods: A community based cross-sectional study was conducted in 100 elderly residents of Adat Panchayat, Thrissur, from January to April 2016. Data was collected using a pre-tested structured questionnaire, which included socio-demographic variables, self-reported physical morbidities, mini mental state examination (MMSE) scale and mini nutritional assessment (MNA) scale.
Results: The prevalence of cognitive impairment and malnutrition in elderly was noted to be 55% and 12% respectively. Factors showing significant association with MMSE score included older age groups, female gender, elderly belonging to BPL families, financial dependence, single/widowed status and sleep difficulties. The association between cognitive impairment and nutritional status was found to be statistically significant with a p value of <0.001. A moderate to strong correlation was observed between MNA score and MMSE score (r=0.623).
Conclusions: There is an association between cognitive impairment and nutritional deficit. Therefore it is essential to screen elderly for nutritional status while assessing cognitive impairment.

Keywords: Cognitive impairment, Elderly, MMSE, MNA, Nutrition

INTRODUCTION

Population ageing is a global phenomenon. It is estimated that between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%. The people aged 60 years and older are expected to outnumber children younger than 5 years by 2020.[1] Old age dependency ratio is expected to be more than 35 per 100 persons aged 15-64 by 2050, as a result of which the total dependency ratio will likely show an upward trend.[2]

In India, the size of elderly population is increasing over time. From 5.6% in 1961, the proportion has increased to 8.6% in 2011. State-wise data reveal that Kerala has maximum proportion of elderly people in its population (12.6%).[3]

Age-related cognitive decline is a main predictor of disability among elderly people. Several studies suggest that nutritional status, as well as health behaviours, frailty, disability, functionality status and chronic diseases (e.g. hypertension, cardiovascular disease, diabetes mellitus and metabolic syndrome) are associated with cognitive impairment and dementia.[4] Cognitive impairment, being the most consistent and characteristic symptom of Alzheimer's disease, can be considered a proxy for the disease in population based studies.[5]

Nutrition is known to be a key factor that modulates ageing. Association between nutritional status of elderly and their cognitive status, particularly in those who are malnourished and at risk of malnutrition, have been found both in hospital and community based research.[6-8]

These findings reflect the need to study the cognitive impairment and its association with nutritional status amongst elderly in rural areas of a state like Kerala with a significant proportion of the population in the elderly age group. This study aims to describe the nutritional status and cognitive impairment in elderly population in a rural area of Thrissur district, Kerala.

METHODS

A cross sectional survey was conducted among elderly residing in Adat Panchayat of Thrissur district, Kerala over a period of 4 months from 1st January to 30th April 2016. One hundred elderly individuals were selected from the study area by systematic random sampling from the electoral roll available with the Panchayat.

Data was collected from selected participants using questionnaires, which were administered by the interviewer after explaining the study purpose and taking the written informed consent. The questionnaire included the following parts: socio-demographic data, use of habit forming substances, physical morbidities as per history given by the study subjects, cognitive assessment by Mini Mental State Examination (MMSE), and nutritional assessment by Mini Nutritional Assessment (MNA).

The MMSE scale consists of seven parts: temporal orientation, spatial orientation, learning, calculation, short-term memory, communication and constructive apraxia.[9] The maximum score is 30. Those with MMSE scores ≤25 were considered "cognitively impaired" in the present study. These cognitively impaired individuals were further classified as severe (MMSE score ≤10), moderate (MMSE score 11-21) or mild (MMSE score 22-25).[10]

The MNA scale is used to assess nutritional status of elderly. It is a questionnaire of 18 items which include anthropometry measures, global evaluation, evaluation of dietary habits, and subjective assessment. A score of less than 17 points (out of a maximum of 30) is regarded as an indication of malnutrition, 17-23.5 points indicate a risk for malnutrition and >23.5 points indicate that the person is well nourished.[11]

Ethical Clearance was obtained from Institutional Ethics Committee of Amala Institute of Medical Sciences, Thrissur prior to commencement. Data were entered and analysed using the statistical software SPSS (Statistical Package for Social Sciences) version 23. A p value of <0.05 was considered significant. Pearson's Chi-square test was used to compare categorical variables and the Fisher exact test when expected values were less than 5. Student's t-test and ANOVA were used for comparison of quantitative variables between two groups and more than two groups, respectively. Pearson's correlation was used to study the relation between two quantitative variables, i.e. MMSE and MNA scores.

RESULTS

Of the 100 participants, more than half (55%) were in the age group of 60-70 years. The median age of the sample was 69 years (IQR=64-76). The median age of males (70 years) was higher than females (69 years), though the difference was not statistically significant. A comparable BMI was found in both the sexes.

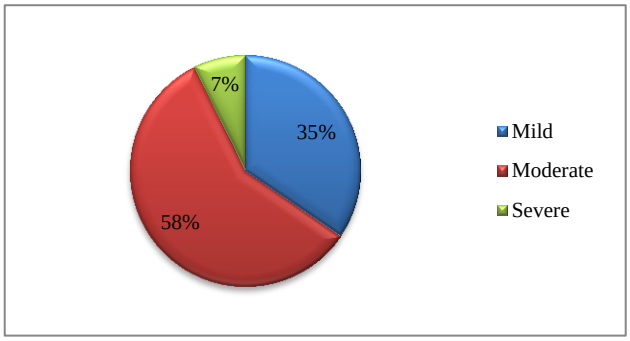

Figure 1: Cognitive impairment according to MMSE.

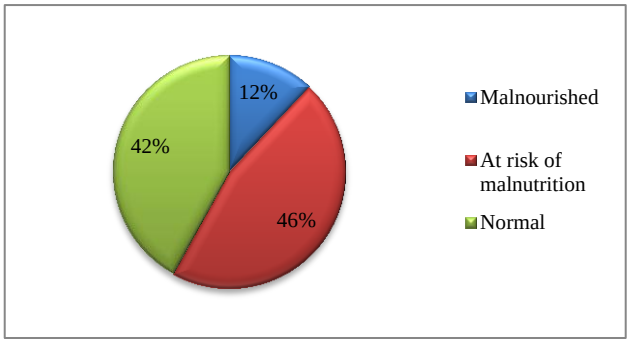

Figure 2: Nutritional status according to MNA score.

The mean MMSE score was 23.13±5.54. Cognitive impairment was noted to be severe in 7%, moderate in 58% and mild in 35% (Figure 1). The mean MNA score was 22.275±4.763; malnutrition was noted in 12%, 46% were at risk of malnutrition and 42% of normal nutritional status (Figure 2).

Among the various demographic characteristics, elderly in the age group of 81-90 years (p=0.008), female gender (p=0.026) and elderly belonging to BPL families (p<0.001) were found to have significantly lower MMSE scores. MMSE presented a significant difference in relation to financial dependence and literacy status (p<0.001) (Table 1). There was no significant association between age and MNA scores (p=0.13). MNA scores were found to be significantly lower in females when compared to males (p=0.013).

Table 1: Socio-demographic characteristics and MMSE Score.

Socio-demographic variables	MMSE score		Total	P value
	Cognitively impaired (≤25)	Normal cognition (26-30)		
Age				
60-70	24	31	55	0.008*
71-80	22	13	35	
81-90	9	1	10	
Gender				
Female	40	23	63	0.026
Male	15	22	37	
Literacy				
Illiterate	18	1	19	<0.001
Literate	37	44	81	
Socio – economic status				
BPL	37	12	49	<0.001
APL	18	33	51	
Financial dependence				
Fully dependent	10	7	17	<0.001
Fully independent	6	24	30	
Partially dependent	39	14	53	
Marital status				
Not married currently	31	15	46	0.022
Currently married	24	30	54	
Currently living with :				
Spouse	7	15	22	0.026*
Children along with or without spouse	45	26	71	
Alone / with relatives	3	4	7	
Type of family				
Nuclear	20	26	46	0.074*
Joint	3	3	6	
Three generation	32	16	48	

*Fisher exact test.

Table 2: Factors associated with cognitive impairment.

	MMSE Score		Total	P value
	Cognitively impaired (≤25)	Normal cognition (26-30)		
Addictions				
Tobacco chewing	13	4	17	0.051
Alcohol	7	10	17	0.209
Smoking	4	5	9	0.505*
Snuff	0	1	1	0.267*
Physical morbidities				
Diabetes Mellitus	20	11	31	0.2
Hypertension	30	23	53	0.732
Dyslipidemia	12	10	22	0.961
Sleep abnormalities	18	7	25	0.049
Cardiac disease	10	6	16	0.511

*Fisher exact test.

Table 3: Association between cognitive impairment and nutritional status.

MMSE Score	MNA Score			Total	P value	Correlation coefficient (r)
	<17 (%)	17-23.5 (%)	24-30 (%)			
≤10	2 (50)	2 (50)	0	4	<0.001	0.623
11-21	8 (25)	20 (62)	4 (13)	32		
22-25	1 (5)	11 (58)	7 (37)	19		
26-30	1 (2)	13 (29)	31 (69)	45		

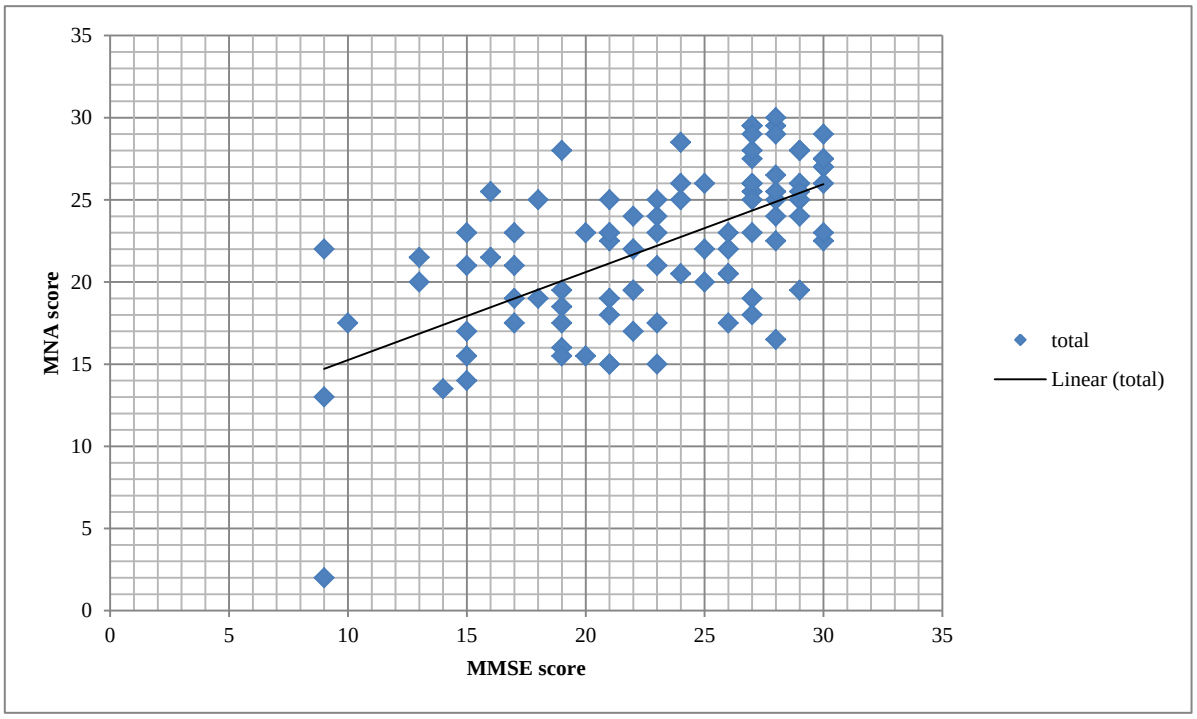

Figure 3: Correlation between MMSE Score and MNA score.

Significant association was observed between cognitive impairment and sleep difficulties (p=0.049) in the subjects. No association was observed between cognitive impairment and other morbidities. No significant association was seen between cognitive status and habit forming substances (Table 2).

MMSE score was significantly different between the age classes, with the mean score decreasing with increasing age (F=7.037**,** p=0.001). There was a negative correlation between MMSE Score and age, and this was found to be statistically significant (r= -0.394; p<0.001). Mean MNA score was also observed to decrease with increasing age (F=2.812, p=0.065). The direction of correlation between age and MNA score was negative (r = -0.279; p=0.005).

Relation between cognitive impairment and nutritional status

Out of four subjects who had severe cognitive impairment, two were found to be malnourished. 25% of those who had moderate cognitive impairment and 5% elderly with mild impairment were malnourished. Of the 45 subjects with normal cognition, 69% were well nourished. The association between cognitive impairment and nutritional status was found to be statistically significant with a p<0.001. A moderate to strong correlation was observed between MNA score and MMSE score (r=0.623) (Table 3) (Figure 3), A stronger correlation between MMSE and MNA scores was observed among males (r=0.792; p<0.001) than females (r=0.514; p<0.001).

DISCUSSION

To our knowledge, this is the first study in South India which examines the association between nutritional status and cognitive function of community residing elderly. Cognitive impairment and nutritional deficit among elderly have been studied separately; however, literatures studying the relation between the two are not common.

The results of this study are similar to other research studies on cognitive function and nutritional status. Ferdous et al, in a study done in 457 elderly subjects in rural Bangladesh, found that poorer cognitive

performance was independently associated with older age, female sex and illiteracy.[12] In a study done among inmates of an old age home in Telengana, cognitive impairment was significantly associated with age (p=0.024) and lower education (p=0.04). Other factors associated with cognitive impairment in this study were female gender (p=0.426), marital status (p=0.627), low socioeconomic status (p=0.469) and nuclear family (p=0.06).[13] Our study did not find a significant association between diabetes and cognitive impairment (p=0.2). This was in contrast to many studies including one in which Ojo et al reviewed the association between diabetes mellitus, cognitive decline and dementia, of various primary research articles. It showed that diabetes is a risk factor in the development of dementia. They further noted that a cognitive impaired diabetic individual is at risk of poor self-management, leading to further complications including inadequate control of diabetes, hypoglycaemia and hyperglycaemia.[14]

A study done using MNA scale for nutritional assessment in West Bengal found nearly 29% of the elderly to be malnourished and 60% to be at risk of malnutrition, which is much higher than the current study. Similar to our finding, females were significantly more malnourished than males.[15]

Similar findings to our study were noted in other published articles with regard to association between nutritional status and cognitive impairment. A study done in Brazil found underweight to be positively associated with altered cognitive function (OR: 3.52).[16] A Lebanese institution-based cross-sectional study found a significant associationbetween the MMSE score and the MNA score (r=0.208; p=0.028).[6] A recent study in Italy points towards the same conclusion (r=0.39; p=0.001).[7]

This relationship can be explained by the effect of dietary factors on multiple brain processes by regulating neurotransmitter pathways, synaptic transmission, membrane fluidity and signal-transduction pathways. Particularly to note is the effect of oxidative damage on the brain, wherein lies the importance of vitamins C, E and β-carotene.[17] Many studies also throw light on the importance of dietary omega-3 fatty acids and vitamin B6, B12 and folate in the prevention of cognitive deterioration.[18-20]

This study has a few limitations. Our study was done on community dwelling elderly. Since the elderly residing in institutions were not studied, it may have led to an altered estimation of the prevalence of nutritional and cognitive impairment. Secondly, MMSE cut-off of 23 for those educated up to high school and 25 for those who underwent higher education are commonly used to indicate significant impairment. A cut-off of 25 has been used in this study considering the higher literacy status in Kerala. Hence, the prevalence of cognitive impairment in our study may be slightly higher than those studies which used 23 as MMSE cut-off.

CONCLUSION

Among the study subjects, there was significant association between nutritional status and cognitive impairment. However, the relationship between the two is complex and it is difficult to conclude whether malnutrition contributes to cognitive impairment or vice versa. Further studies are required to know whether prevention and treatment of malnutrition in elderly can limit the progression of cognitive impairment in them.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Amala Institute of Medical Sciences, Thrissur, Kerala

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