



Cognitive Impairment and Its Correlation with Co-morbidities among Elderly Residing in Old Age Homes in Southern India

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ABSTRACT

Background: With aging process, cognitive levels decline which has affected nearly 50 million people worldwide. In view of this, our study aims to estimate the prevalence of cognitive impairment and its correlation with co morbidities among the elderly residing in old age homes in Southern India and determine its various risk factors among them.

Methodology: This cross-sectional study was carried among 330 elderly living in old age homes by using multistage sampling method. Study population included Elderly above the age of 60 and residing in old age homes, who were willing to participate. A pretested structured questionnaire was used. Data was analysed using SPSS.

Results: Of the 330 participants, nearly 44% had mild to moderate and 36% had severe cognitive impairment. The odds of developing cognitive impairment were 2.5 times more among individuals who had at least one feature of dementia when compared with those who did not have any symptoms.

Conclusion: The strategies of National Programmes for Health Care of Elderly and National Mental Health Program do not cater specifically to cognitive impairment. Level of attention given towards Alzheimer's disease is more when compared to screening for cognitive impairment which is an early precursor for Alzheimer's disease.

Key words: Geriatrics, retirement home, dementia

INTRODUCTION

Ageing is an irreversible, unavoidable, universal phenomenon accompanied by gradual reduction in functional capacity of the elderly, both physically and mentally. It is often associated with increased risk of disease and disability which in return affects each individual, family and the community.¹ Cognition is a combination of skills that include attention, learning, memory, language, visuospatial skills and executive functions such as decision making, goal setting, plan-

ning and judgment. Cognitive impairment is a clinical state of impairment of memory domain but not demented. Impairment in one or more cognitive domains or an overall mild decline across cognitive abilities that is greater than would be expected for an individual's age, but is insufficient to interfere with social and occupational functioning. Cognitive impairment is characterized by intellectual functioning sufficient to interfere with the activities of daily living.² Being an irreversible degenerative disorder,

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cognitive impairment possesses a threat to the elderly population affecting their daily activities and progressing to Cognitive levels decrease as age advances, which reflects normal aging process. Various factors accelerate the pace of cognitive decline with aging. Factors like genetic susceptibility, unhealthy lifestyle behaviour, cardiovascular factors, metabolic factors and other co morbidities promote to the progression from the normal age-related decline in cognitive function to cognitive impairment, and further, to dementia.

Worldwide, cognitive impairment has affected nearly 50 million people, and this number is expected to reach a peak of 75 million by 2030.³ It is estimated that the numbers of people living with dementia will almost double every 20 years to 42.3 million in 2020 and 81.1 million in 2040. The rate of growth will be the highest (around 33.6%) in India, China, South Asia, and western Pacific regions. It is estimated that over 3.7 million people were affected by dementia in our country in 2010 which is expected to double by 2030.⁴

Impaired cognition if left unnoticed may lead to various consequences. Cognitive impairment should be diagnosed earlier and the underlying aetiology should be identified. It should be emphasised that subjects who have impaired cognition are at risk of progressing to Dementia and Alzheimer's disease.⁵ Dementia refers to group of brain disorders that affect remembering and clear thinking. Alzheimer's is a common type of dementia and is a progressive condition which worsens over time.⁶ Huge number of health factors influence cognitive impairment. Some factors include lifestyle modifications, endocrine system related issues, genetic factors, metabolic factors etc.⁷ In view of this background, this study was planned with the aim to estimate the prevalence of cognitive impairment and its associated co morbidities among elderly residing in old age homes in Kancheepuram District, Tamilnadu.

MATERIALS AND METHODS

Study Design: This Cross-Sectional descriptive study was conducted in old age homes in Kancheepuram District, Tamil Nadu.

Study area and population: The study was carried out in old age homes located in North zone of Kancheepuram District, Tamil Nadu. The population covered in this study was elderly above 60 years of age, residing in old age homes.

Sample size and sampling technique: Sample size for this study was calculated based on the prevalence of a previous study conducted by Rakesh M. Patel and Uday Shankar Singh et al., in 2012 in Gujarat which showed a prevalence of cognitive impairment as 25%.⁸ Taking this as a reference value and using the formula $N = Z^2 pq / L^2$, the sample size was calculated, where $Z = 1.96$ at 95% confidence interval, $p =$ Prevalence of disease/ event (referred value), $q =$

$100 - P$ and $L =$ allowable error 5%. The calculated sample size was 300. Accounting for 10% non-response, the final sample size was 330 [$N = 330$]

Inclusion and exclusion criteria: Subjects for the study were included based on their age. Elderly above the age of 60 and residing in old age homes, who were willing to participate in the study were included for this study and those who were severely / chronically ill, those suffering from psychiatry disorders and those who did not give consent to take part in the study were excluded from this study.

Sampling method: Out of 32 old age homes in North Zone of Kancheepuram district, permission was obtained from 10 of them. A two stage- multistage sampling method was used.

Stage 1: Probability Proportional to Size [PPS] sampling method was used. Here sample size of 330 was proportionately divided among the selected 10 old age homes based on the inmate's population size.

The population of subjects selected in each old age home was based on 'Total number of elderlies in each old age home' divided by 'Total number of elderlies in selected 10 old age homes' which was multiplied by total sample size (330).

Stage 2- Simple Random Sampling was done to select the subjects from each of the old age homes.

Permission was obtained from the Managing Trustee of the Old Age home after explaining the aims and objectives of this study.

Ethical approval and informed consent: The purpose of this study was explained and informed consent was obtained from each participant before the interview. The proposal for this study was presented before the Institutional Ethics Committee, Sree Balaji Medical College and Hospital and approval was obtained before beginning the study was carried out.

Data collection method: Data collection was started after selecting the 10 old age homes as per the Probability Proportional to Size (PPS) sampling method. From the list of 32 old age homes, 10 homes that gave permission for conducting the study were visited for data collection. Data was collected using standardized, pretested, structured questionnaire. Information regarding socio demographic characteristics, family history of dementia was collected. Data were collected on various co morbid conditions and the duration of treatment. Katz index scale was used to assess independence in activities of daily living. Score of 1 was given to those activities that the elderly was able to perform independently and score of 0 was given for those activities for which the elderly needed assistance. Total score of 6 was interpreted as independent and 0 meant very dependent. Values in between were considered moderate dependency. 18BIMS scale was used in assessing the cognitive impairment under three main domains. By this a person's attention, orientation and ability to register and recall were assessed. Total score of 13 - 15

meant intact cognition, 08-12 meant moderate impairment and less than 7 was severe cognitive impairment.⁹

Statistical analysis: Data collected was entered in Microsoft excel and was analyzed using SPSS software, version 22. The statistical analysis of the data was done using descriptive and analytical statistics. The descriptive statistics analyzed were presented as frequency distribution and percentage. The analytical statistics used were Chi - square test, Odds ratio (OR), 95% Confidence Interval (CI). The association of socio demographic characters and other factors with cognitive impairment was assessed with p value < 0.05 being considered statistically significant.

RESULTS

A total of 330 elderly residing at old age homes were included in this descriptive cross-sectional study. Socio demographic determinants, behavioural risk factors, co morbid conditions, family history of dementia, activities of daily living, their financial status and association of various factors with cognitive impairment were analysed in this study. The results of the study are given below and explained in the form of tables and figures.

Socio-demographic characteristics of the study participants: Nearly 27.2% of the study population belonged to age group 71-75 years, 24.2% belonged to 60-65 years of age. About 52.1% of the study subjects were females and the remaining 47.9% were male. Nearly 90.2% of the subjects were Hindus by religion. Majority of the study respondents were either never married (43.3%) or widowed (48.8%). Only 7.9% of the respondents were married. Among the study respondents 43.9% of them were destitute who were extremely poor, 35.8% were abandoned or left alone, 16.1% were from nuclear family and remaining 4.2% belonged to joint family background. Among the study participants 67.4% did not have children. Of the remaining 32.6%, nearly 20.9% had 2 children, 6.9% had three children and a minimum of 4.8% had 1 child.

Risk factors and Family History: The percentage of elderly who had at least one family member with dementia is presented in Figure 1. About 55% of the respondents had family history of deteriorating memory and remaining 45% did not have family history of dementia. Health condition and various co morbidities of the study population is listed in Table 1. Among study subjects 52.7% had hypertension, 45.7% had arthritis, 23% had diabetes, 13% had asthma, 8.8% suffered from skin related problems, 6.4% had thyroid and 5.8% suffered from cardiac related issues. Health condition and various co morbidities of the study population is listed in Table 2. Among study subjects 52.7% had hypertension, 45.7% had arthritis, 23% had diabetes, 13% had asthma, 8.8% suffered from skin related problems, 6.4% had thyroid and 5.8% suffered from cardiac re-

lated issues. Regarding the functional status of the study respondents (Table 4), majority of the subjects (62.7%) had trembling hands and sleep disturbances (62.4%). Around 36% had visual disturbances, 17.8% had hearing problems and 16.7% had weak memory issues

Activities of daily living was scored using KATZ scale and presented in Figure 2. According to KATZ ADL scale, those who scored 0-3 are considered dependent and above 3 are considered independent. Among the study respondents 86% of them were independent and were able to do their daily activities by themselves, remaining 14% were dependent on others for their daily activities. A salient symptom of dementia which is the next stage after the development of cognitive impairment is listed in Table 4. Nearly half of the study participants often tend to forget things, nearly 46.6% of them experienced loss of words during conversation and 23.3% of them had difficulties in remembering important dates.

Association between various co morbidities and cognitive impairment is tabulated in Table 5. From the table, we notice that co morbidities like hypertension, arthritis, auditory impairment, disturbed sleep, trembling hands and weak memory were found to be having statistically significant association with development of cognitive impairment.

Table 1: Various Characteristics of study participants (n = 330)

Characteristics	Participants(%)
Hypertension	174 (52.7)
Arthritis	151 (45.7)
Diabetes	76 (23)
Respiratory disorders (Asthma, COPD etc)	43 (13)
Dermatological problems	29 (8.8)
Thyroid disorders	21 (6.4)
Heart disease	19 (5.8)
Functional Status	
Trembling hands	207 (62.7)
Sleep Disturbances	212 (62.4)
Vision problems	119 (36)
Hearing problems	59 (17.8)
Weak memory	55 (16.7)
KATZ ADL scale	
Dependent	46 (14)
Independent	284 (86)
Symptoms of dementia*	
Forget things often	165 (50)
Difficulty in conversing	154 (46.6)
Forget important dates	77 (23.3)
Difficulty in decision making	55 (16.7)
Noticeable changes informed by others	33 (10)
Difficulty in finding own bed/room	22 (6.7)
Family history of dementia	
Present	181 (55)
Absent	149 (45)
Cognitive impairment	
Intact Cognition	66 (20)
Moderation Cognition	145 (44)
Severe Cognition	119 (36)

*Multiple responses considered

Table 2: Association between various co morbidities with cognitive impairment

Co morbidity	Cognitive Impairment		Chi square	Odds ratio (95% CI)	P value
	Yes (%) (n=264)	No (%) (n=66)			
Diabetes					
Yes	60(22.7)	16(24)	0.07	0.91 (0.49-1.73)	0.79
No	204(77.3)	50(76)			
Hypertension					
Yes	149(56.4)	25(37.9)	7.30	2.12 (1.22-3.70)	0.007*
No	115(43.6)	41(62.1)			
Arthritis					
Yes	130(49.2)	21(31.8)	6.46	2.08 (1.17-3.68)	0.01*
No	134(50.8)	45(68.2)			
Heart disease					
Yes	17(6.4)	2(3)	1.13	2.2 (0.56-14.3)	0.28
No	247(93.6)	64(97)			
Asthma					
Yes	32(12.1)	11(16.7)	0.96	0.69 (0.33-1.50)	0.33
No	232(87.9)	55(83.3)			
Hearing problems					
Yes	53(20)	6(9.1)	4.32	2.5 (1.03-6.13)	0.04*
No	211(80)	60(90.9)			
Vision problems					
Yes	101(38.3)	18(27.3)	2.75	1.65 (0.91-2.9)	0.09
No	163(61.7)	48(72.7)			
Sleeping problems					
Yes	185(70)	27(40.9)	19.5	3.38 (1.94-5.9)	0.001*
No	79(30)	39(59.1)			
Trembling hands					
Yes	183(69.3)	24(36.4)	24.4	3.95 (2.24-6.96)	0.001*
No	81(30.7)	42(63.6)			
Weak memory					
Yes	50(18.9)	5(7.6)	4.89	2.85 (1.09-7.46)	0.03*
No	214(81.1)	61(92.4)			
Skin problems					
Yes	24(9.1)	5(7.6)	0.15	1.22 (0.45-3.33)	0.69
No	240(90.9)	61(92.4)			
Thyroid					
Yes	16(6.1)	5(7.6)	0.20	0.79 (0.28-2.23)	0.65
No	248(93.9)	61(92.4)			
Dementia					
Yes	198(75)	36(54.5)	10.7	2.5 (1.43-4.37)	0.001*
No	66(25)	30(45.5)			
KATZ ADL Score					
Dependent (0-3)	42 (15.9)	4(6.1)	4.26	2.93 (1.09-9.91)	0.04*
Independent (4-6)	222 (84.1)	62(93.9)			

OR: odds ratio; CI: confidence interval; *p<0.05 statistically significant at 95% CI

The odds of developing cognitive impairment were 2.12 times more among hypertensive's than non-hypertensive elderly. The chances of having cognitive impairment were 2.08 times higher among those elderly who suffered from arthritis when compared with those who did not have the disease. The chances of developing impaired cognition were 2.5 times increased among those who had auditory issues compared to those without any hearing problems. The odds of having cognitive impairment were 3.38 times among elderly who had disturbed sleep when compared to those elderly who maintained a normal sleep pattern. The chances of having cognitive impairment were nearly 4 times higher among elderly who had trembling hands when compared to those who did not have trembling.

The odds of developing cognitive impairment were 2.85 times more among those who experienced weak

memory compared to those who did not notice any such changes. Other factors like diabetes, heart disease, asthma, visual disturbances, skin problems and thyroid problems were not having any statistically significant association. Activities of daily living was assessed using KATZ ADL scale and the association between the activities of daily living with development of cognitive impairment is shown in Table 6. The odds of having cognitive impairment were found to be 2.93 times more among elderly who needed help from others for their daily activities when compared those who were independent. The odds of developing cognitive impairment were 2.5 times more among individuals who had at least one salient feature of dementia when compared with those elderly who did not have any such symptoms.

The study reveals that, among the respondents, 27.2% belonged to 71-75 years, 52.1% were females,

39.1% were unemployed, 36.7% of them have completed up to middle school education. Majority of the respondents were destitute. Among the study participants, nearly 55% of them had a positive family history of dementia. Majority [76%] of the respondents were satisfied with their stay in old age homes.

DISCUSSION

This study assessed the cognitive impairment in a sample of 330 elderly populations living in old age homes in Kancheepuram district of Tamil Nadu. With increase in life expectancy, the proportion of elderly is increasing in our country. With changes in lifestyle, urbanization and fast paced life, more old aged people end up living in old age homes and care centres. Cognitive impairment among this population affects their quality of life to a greater extent. In this study, it was found that nearly 80% of the study participants had some form of cognitive impairment ranging from mild to severe form. The study findings are discussed here in comparison with other similar study findings from different study settings.

Prevalence of cognitive impairment: In our study, nearly 44% had mild -to- moderate cognitive impairment and 36% had severe cognitive impairment. Study done by Andrews S, had estimated that the global prevalence of cognitive impairment is approximately 15-20% among those above 65 years of age.¹⁰ According to Qiu C et al, the developed countries are showing a decline in cognitive impairment, which could be due to increased awareness, screening and early diagnosis. Whereas in the developing countries, the prevalence is on the rise due to epidemiological transition, increase in behavioural risk factors like smoking, inadequate physical activity.³

In a study done by Shi Z et al, among elderly population in rural parts of China, the prevalence of cognitive impairment was noted as 73.2%.¹¹ A community based study in Jamaica by Waldron et al noted a prevalence of 32.2% among elderly.¹² In a study done among the residents of old age home in Malaysia, cognitive impairment was noted among 32.2% of elderly.¹³ Arizaga et al in a population based study in Argentina, the prevalence of cognitive impairment was 23%.¹⁴ In the study done by Espinosa del et al in Ecuador on prevalence and risk factors of cognitive impairment, the prevalence was reported as 40%.¹⁵

Gambhir et al in a study among rural elderly in Varanasi noted the prevalence to be 42.9%.¹⁶ Rao et al in a similar study among the old age home residents in Hyderabad reported the proportion of cognitive decline as 38%.¹⁷ In a recent study in Jodhpur by Patel M et al, the authors reported the prevalence of cognitive impairment to be 51.2%.¹⁸ In a study done in field practice areas of a medical college in Gujarat, the prevalence of cognitive impairment among the elderly population was 25%.¹⁹ Majority of the studies have reported higher prevalence of cognitive impairment except few studies done by Sengupta et al

in Ludhiana (8.8%), Sharma et al in Shimla (3.5%) and Khanna et al in Belagavi (8.4%).²⁰⁻²²

Morbidity pattern: Among the study subjects, hypertension, arthritis, diabetes, asthma, dermatological disorders, thyroid disorders and cardiac diseases were the co-morbid conditions noted in our study. In a population based study among elderly in Argentina, the morbidity noted among elderly were diabetes (12.5%), hypertension (40.6%), smoking (35.1%), alcoholism (32.8%) and hypercholesterolemia (16.1%).¹⁴ In the study done in Ecuador, the co-morbidities noted among the elderly were hypertension (60.4%), depression (43.1%), anxiety (42%), hypercholesterolemia (29.2%), diabetes mellitus (25.7%), and brain injury (23.6%).¹⁵

In the study done in West Bengal, the co-morbid conditions reported among elderly were hypertension (63%), diabetes (19.3%) and depression (45.9%).⁴ In the study by Khanna et al in Belagavi, Karnataka, around 36.4% of participants had diabetes mellitus and 35.6% had hypertension respectively.²² Santosh et al in a study on morbidity pattern among elderly in old age homes in Davengere, Karnataka, reported that 10.5% had diabetes mellitus, 36.2% had hypertension and 12.4% had osteoarthritis.²³ A study conducted by Singh AK et al. (2012) in an urban slum of Delhi reported the prevalence of diabetes in elderly persons to be 18.8%.²⁴

Regarding the functional status of the study respondents, majority of the subjects (62.7%) had trembling hands and sleep disturbances (62.4%). Around 36% had visual disturbances, 17.8% had hearing problems and 16.7% had weak memory issues. Santosh et al in a study among elderly in old age homes in Davengere, noted that Visual impairment was found in 30.5% of the residents and hearing was impaired in 20% of the residents. Mobility was affected in 39% of the residents.²³ A study conducted by Sharma S et al. (2012) in Chandigarh reported that about 21.8% residents had visual impairment.²⁵ In another study by Majra JP et al. (2010) done in old age homes of Southern India, visual impairment was found in about 28% of the residents and hearing deficit was found in about 42% of the residents.²⁶ A study conducted by Dey AB et al. (2001) among older Indians reported that hearing deficit was noted in about 31.6% of the elderly.²⁷

Co-morbidities associated with cognitive impairment: In this study, Co-morbidities like hypertension, arthritis, auditory impairment, disturbed sleep, trembling hands and weak memory were having a statistically significant association with CI. Waldron et al in a study among elderly in Jamaica showed that diabetes and hypertension were significantly associated with cognitive impairment.¹² Similarly, in the study by Espinosa et al in Ecuador, diabetes was found to have a significant association with impaired cognition.¹⁵

Arizaga et al reported a higher prevalence of hypertension in individuals with cognitive impairment

compared with cognitively normal subjects.¹⁴ Samuel et al in their study done in Chennai, hypertension was noted to be a risk factor for cognitive impairment.²⁸ On the contrary, co-morbidities like hypertension, diabetes didn't show a significant association with cognition in a study done in Belagavi.²²

Diabetes and cognitive impairment: Though in this study, we couldn't find an association between diabetes and cognitive decline, studies have shown that diabetes mellitus is associated with impairment in cognitive function and changes in brain structure. Elderly with type 1 or type 2 diabetes have been shown to have mild to moderate decrease in cognitive function when compared to non-diabetic controls. Type 2 diabetes has also been associated with 50% increased risk of dementia. The term 'diabetes-associated cognitive decline' (DACD) is used to describe diabetes related mild to moderate reductions in cognitive function.²⁹

Hypertension and cognitive impairment: The relationship of hypertension with cognitive function has been extensively studied for over 50 years.³⁰ Many Case-control, Cross sectional, population-based studies indicate that hypertensive generally perform poorly than normotensives across various domains of cognitive function, including attention, learning and memory, abstract reasoning, perceptual, visuospatial, visuo-constructional, and psychomotor abilities.³¹ With the growing epidemic of non-communicable diseases such as diabetes, hypertension and the increase in life expectancy, cognitive dysfunction could have challenging public health implications.

Activities of daily living and cognitive impairment: Among the study respondents 86% of them were independent and were able to do their daily activities by themselves, remaining 14% were dependent on others for their daily activities. Santosh et al in a study done in Karnataka, noted that majority of the residents (91%) had full functioning capacity and 9% had decreased activity.²³ Similar result was found in a study done by Tiwari S et al. (2010) in rural population of Varanasi by using Katz ADL scale, about 7.2% of the elderly population had decreased activity.³² Elderly who were dependent on others for daily activities were more likely to have cognitive impairment than those who were independent. Similar finding of association between ADL dependence and cognitive impairment was noted in the Jamaican study.¹²

Dementia and cognitive impairment: Cognitive impairment was noted among elderly who had at least one symptom of dementia. About 55% of the respondents had family history of deteriorating memory. In the study by Espinosa et al in Ecuador, family history of dementia was reported among only 2.8% of participants.¹⁵ People living with cognitive decline are likely to develop Alzheimer's disease compared to those without cognitive decline. Epidemiological studies have shown that elderly with a

family history of dementia have a higher risk of cognitive impairment and dementia although the evidence is limited.^{33,34}

CONCLUSION AND RECOMMENDATIONS

This descriptive cross-sectional study assessed the prevalence of Cognitive Impairment, its determinants and various associated factors among geriatric population living in old age homes in Kancheepuram district, Tamil Nadu. A sample size of 330 was used and study was conducted at old age homes in North zone of Kancheepuram district. Though there are National Programme for Health Care of Elderly and National Mental Health Program to cater to the elderly, the strategies of these programmes do not specifically address the problem of cognitive impairment. Level of attention given towards Alzheimer's disease is more when compared to screening for cognitive impairment which is an early precursor for Alzheimer's disease.

Public Health programmes based on physical and social education need to be planned at the National level to increase awareness on the factors associated with development of cognitive impairment among elderly. Interventions like Senior citizen clubs, Laughter clubs, Cultural activities-bhajans, religious congregations, Yoga classes, Trips, tours can be designed at various settings and among them, old age homes are to be the prime areas to target the elderly for both physical and mental health promotion, so that their quality of life can be improved. Geriatric care facilities should be incorporated at the primary health care as well as the secondary health care services throughout the country, so that the vulnerable and socially immobile elderly can get easy access to the needy care when they require it most. Health care professionals / workers who manage the elderly should be adequately trained in handling the physically and mentally challenged elderly in their long-term care to make their life as easier as possible.

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