Assessing Cognitive Impairment and Dementia in the Elderly Population of Chengalpattu District: A Community Based Cross Sectional Study

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Abstract:
Dementia, one of the major geriatric challenges, remains largely unrecognized in India, with over 90% of cases going unidentified due to limited physician knowledge and documentation. To address this issue, the objective of our study was to assess the prevalence of cognitive impairment and dementia among elderly patients in a rural area of Chengalpattu district, using the Mini-Mental State Examination (MMSE) and Picture Memory Impairment Screen (PMIS). Furthermore, we aimed to identify factors associated with cognitive impairment and dementia in this population.

Methods: A community-based cross-sectional study was conducted between February 2023 and June 2023, involving 174 elderly individuals in the rural area of chengalpet district. Prior to the study, informed consent was obtained from all participants. The assessments were carried out using the Picture Memory Impairment Screening test and the Mini-Mental State Examination Questionnaire.

Results: Out of the 174 study participants, 73% were female and 27% were male. The prevalence of dementia and cognitive impairment, as identified by PMIS and MMSE, was 22.4% and 40.8%, respectively. Notably, we observed a significant association between dementia and a history of co-morbidity, and another notable correlation between MMSE scores and the financial dependence of elderly individuals.

Conclusion: Our study reveals a concerning prevalence of dementia and cognitive impairment among the elderly population in rural areas, highlighting the urgent need for early screening and proactive primary care for this vulnerable group. The combined use of PMIS and MMSE scoring can serve as valuable tools for further evaluation and management of dementia cases. By addressing this issue proactively, we can improve the quality of life for elderly individuals and promote overall well-being in our aging population.

Keywords: Dementia, Cognitive impairment, Picture Memory Impairment Screen (PMIS), Elderly people, Mini-Mental State Examination (MMSE).

Introduction

According to the 2011 census, there were a total of 104 million elderly people living in India. It is projected that the number of elderly persons will increase to 133 million by 2026. Demographic aging has significantly increased in low-income countries across Asia, Latin America, and Africa.

India's population is currently experiencing a rapid demographic transition. The elderly population in India, which constitutes individuals above 60 years of age, accounts for 8.5% of the total population [1]. As per the data released by the Government of India, the elderly population in Tamil Nadu witnessed a significant increase from 75.10 lakhs in 2011 to 1.04 crore in 2021. Consequently, Tamil Nadu is projected to have the second-highest proportion of elderly population among all states.

Elders are a treasure trove of knowledge, possessing valuable experiences and skills. They serve as living evidence of history, social constructs, and cultural practices. Therefore, there

is an emerging need to address aging-related issues and promote holistic development through policies and programs tailored for the elderly. However, it is worth noting that some individuals may not be personally aware of these conditions.

Cognitive impairment refers to problems with learning and memory, language, executive function (managing daily tasks and life), attention deficit, and social cognition (interacting with others). It covers a wide spectrum of adults, ranging from mild, barely noticeable impairment to full-blown dementia, most commonly seen in Alzheimer's disease.

Cognitive impairment has a significant impact on the quality of life, causing a high burden of suffering for patients, their families, and society as a whole [2]. Surprisingly, over 90% of dementia cases remain unidentified in India [3]. The lack of dementia documentation or knowledge among physicians contributes to this issue [4]. The screening for dementia in primary care practice is relatively low, mainly due to the lengthy cognitive screening tests. Therefore, there is a pressing need to test the feasibility of strategies and implement community-based screening for cognitive impairment and dementia among the elderly population.

Objectives of the study: To assess the prevalence of cognitive impairment and dementia using Mini-Mental State Examination and Picture Memory Impairment Method.

To determine the factors associated with cognitive impairment and dementia among elderly people.

Materials and Methods:

A cross-sectional study was conducted between February 2023 and June 2023, to assess the prevalence of cognitive impairment and dementia among 174 elderly individuals in the rural area of Chengalpattu district. The study area consists of 16 villages, of which 2 villages were selected using a simple random sampling method. From these two villages, 174 elderly individuals were chosen through stratified random sampling method. The study included both men and women aged 60 years and above, who have been residing in Chengalpattu district. However, individuals with pre-existing psychiatric illnesses or those who were in a moribund state and unable to answer due to illness were excluded from the study.

In the study, a semi-structured interview schedule questionnaire divided into four parts was utilized:

A) The first part gathered socio-demographic details and variables such as morbidity profile, habits, and family history of dementia. B) Activities of daily living (ADL) were assessed using the Barthel index, where scores ranged from 0 to 20, with lower scores indicating increased disability. C) The Picture Memory Impairment Screening (PMIS) was conducted, and scores were calculated using a specific formula. The resulting scores ranged from 0 to 8, based on which individuals were classified as either having dementia or not. D) The Mini-Mental State Examination (MMSE) was performed, and scoring was used to identify individuals with or without cognitive impairment. We utilized Open Epi version 3.01 to calculate the required sample size for assessing the prevalence of cognitive impairment and dementia among the elderly in Thiruporur, using the formula mentioned below.

$$n = \frac{Z^2_{1-\alpha/2} * p * (1-p)}{d^2}$$

At a 96% confidence interval, with P=0.08 and a 4% absolute precision, the calculated sample size was 174. Data collection was carried out by the study investigator through a house-to-house survey in the study area, where a total of 186 elderly individuals were identified. Out of these, 174 met the inclusion criteria and were included in the study, analysis of the data collected were done using SPSS Software. Descriptive statistics, such as frequencies, means, and standard deviation, were utilized for data analysis. To compare categorical variables, Fischer's exact test or Pearson chi-square test was used, and statistical significance was assumed for P<0.05.

Results

In this study, the researchers assessed the prevalence of dementia and cognitive impairment among elderly individuals. A total of 174 subjects were included in the study. Out of these, 73% (127) were females, and 27% (47) were males. The majority of the participants (73%) belonged to nuclear families, while 16% were from joint families, 10.3% from three-generation families, and less than 1% from other types of families.

Regarding age-specific prevalence rates, 85% (149) of the participants were aged between 60 and 70 years, 10.9% (19) were aged between 70 and 80 years, and 3.4% (6) were above 80 years old. In terms of religion, the majority of the participants (96.6%) were Hindus, 2.9% belonged to Christianity, and 0.6% was Muslims. Socioeconomically, most of the participants belonged to Class IV (32.2%) and Class II (31%) socioeconomic status. In terms of occupation, the study included 41.4% (72) daily wage laborers, 33.3% (58) housewives, and 25.3% (44) who were not working. The living arrangements of the elderly participants varied, with 42% (73) living with their children, 22.4% (39) with their spouses, and 21.8% (38) with their grandchildren. The prevalence of

financial dependence among the participants was 54%, with 22.4% being fully independent and 22.4% being partially dependent. The researchers used the Barthel index to assess the activities of daily living (ADL) and found that 94.3% of the elderly participants were independent, 5.2% were slightly dependent, and 0.6% was severely dependent. Using the Picture Memory Impairment Screen (PMIS), 22.4% (39) of the elderly individuals screened positive for dementia.

There was a statistically significant positive association between PMIS scores and co-morbidity profile (ρ=0.007; p<0.05), suggesting that certain health conditions were linked to memory impairment. The Mini Mental State Examination (MMSE) was used to assess cognitive impairment, and it was found that 40.8% (71) of the elderly individuals had cognitive impairment.

The study also revealed a positive association between financial dependence and MMSE scores, with a significant p-value of 0.049 (p=<0.05), indicating that higher financial dependence was linked to greater cognitive impairment. However, the study did not find any significant associations between cognitive impairment and age, gender, tobacco or alcohol use, socioeconomic class, or morbidity (p>0.05).

Table 1: Distribution of frequency for Activity of Daily Living and Dementia profile

Variable	Frequency (n=174)	Percentage
Habits (Tobacco/Alcohol)		
Yes	03	1.7
No	171	98.3
ADL score		
Independent	164	94.3
Slight Dependent	9	5.2
Severe Dependency	1	.6
PMI Score		
Dementia	39	22.4
No Dementia	135	77.6
MMSE Total		
Cognitive Impairment	71	40.8
No cognitive Impairment	103	59.2

Table 2: Chi-square test to study the association of PMIS Dementia score with socio-demographic variables

Variable	Picture Memory Impairment Screen		Chi-square (p-value)
	Dementia	No Dementia	
Gender			2.094 (0.160)
Male	40	7	
Female	95	32	
Education			1.437 (0.701)
Illiterate	58	19	
Primary school	53	16	
Middle school	13	03	
High school	11	01	
Financial Dependence			1.832 (0.616)
Fully dependent	70	24	
Fully independent	33	06	
Partially dependent	30	09	
Morbidity			9.345 (0.007)
Yes	40	03	
No	92	36	

Table 3: Chi-square test to study the association of MMSE cognitive impairment score with socio-demographic variables

Variable	Mini-Mental State Examination		Chi-square (p-value)
	Cognitive Impairment	No cognitive Impairment	
Age			4.277 (0.144)
60-70	63	86	
70-80	8	11	
More than 80	0	6	

Gender			0.004 (1.000)
Male	19	28	
Female	52	75	
Socio Economic Class			2.171 (0.711)
Class I	8	9	
Class II	19	35	
Class III	17	18	
Class IV	23	33	
Class V	4	8	
Education			1.004 (0.812)
Illiterate	33	44	
Primary school	29	40	
Middle school	5	11	
High school	4	8	
Financial Dependence			7.017 (0.049)
Fully dependent	41	53	
Fully independent	10	29	
Partially dependent	18	21	
Morbidity			3.699 (0.161)
Yes	22	21	
No	47	81	

Discussion

The study included a total of 174 elderly participants, with a significant proportion (44.3% or 77 individuals) being illiterate and 39.7% (69 individuals) having received only primary schooling, as it was conducted in a rural area. The prevalence of dementia among the elderly, as assessed using the Picture Memory Impairment Screening (PMIS), was found to be 22.4%. This figure is consistent with findings from a hospital-based study conducted in Kerala by Dr. Joe Varghese et al in 2010 [5] and another community-based study conducted in an underprivileged area of Bangalore by Dr. Geethu et al in 2013, where the prevalence rates were 15.3% [6]. The study identified co-morbidity as a significant factor associated with dementia among the elderly, as determined by PMIS.

In comparison to various other studies, the prevalence of cognitive impairment in the elderly, as assessed using the Mini Mental State Examination (MMSE), was found to be 40.8%, which is a considerably notable rate. Similar studies in Brazil showed a prevalence of 37.2% among elderly individuals using MMSE, a study by Maria et al among elderly people on the northern coast of Peru showed a prevalence of 63.3%, and another study by Shaji et al in Kerala revealed a prevalence of 33.6 per thousand elderly population [7,8].

These findings indicate a substantial burden of disease and a lack of available screening tools for dementia and cognitive impairment among the elderly population, particularly in the early stages. The Mini-Mental State Examination (MMSE) is the best-known and the most often used short screening tool for providing an overall measure of cognitive impairment in clinical, research and community settings. The MMSE contributes to a diagnosis of dementia in low prevalence settings, but should not be used in isolation to confirm or exclude disease.[9] PMIS is a quick and reliable screen for dementia that can be used in older adults with little or no education. It discriminated cognitively normal older adults from those with dementia regardless of age, sex, education, severity of dementia, or presence of depression.[10]

The study highlights the need for primary care interventions for dementia. One of the strengths of this study is that it was conducted in a rural area and involved a vulnerable group of elderly individuals in a community-based approach.

Conclusion

The study revealed a notable prevalence of dementia and cognitive impairment among the elderly population living in an underprivileged rural area, as determined through the Picture Memory Impairment Screen (PMIS) and Mini Mental State Examination (MMSE). These findings underscore the importance of early screening for cognitive impairment and the implementation of appropriate measures at the primary care level for elderly individuals. Taking these steps can significantly contribute to better management and support for the elderly population's cognitive health in such underserved regions.

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