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Original Research Article

Mindful aging: an insightful examination of cognitive impairment in the elderly population of Chengalpattu, Tamil Nadu, using Mini-Cog scale

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ABSTRACT

Background: By 2050, United Nations projects that one in five Indians would be 60 years of age or older. This demographic transition is likely to be accompanied by substantial rise in prevalence of cognitive problems, which will have an impact on quality of life among elderly people. Effective screening at primary level would help in identification of burden of diseases and better planning at secondary and tertiary level.
Methods: A community-based cross-sectional study over a period of three months was conducted at Pulipakkam in Chengalpattu district. The estimated sample size was 215, and simple random sampling method was used. Elderly people aged 60 years and above who consented to participate were included in the study. After obtaining informed consent, they were screened using the Mini-Cog tool which combines a short memory test with a simple clock-drawing test followed by a recall component.
Results: The 215 participants in total were screened. The mean age of participants was 66.02±3.83 years. The prevalence of cognitive impairment (CI) based on Mini-Cog scale was 44.2%. Females (44.8%) had marginally higher prevalence than males (43.8%). CI was more prevalent among people over 65 years (57.6%). The likelihood of experiencing CI was higher among those who lived without their spouse (59.4%), were unemployed (53.7%), and who were smokers / alcoholics (63.7%).
Conclusions: Considering the high burden of CI, there is need for long term prospective research for a comprehensive profile of mental disorders at community level. Early assessment and detection of CI could help in improving quality of life of elderly. Implementing initiatives aimed at increasing awareness, reducing stigma, and conducting widespread screening using reliable tools.

Keywords: Elderly, CI, Mini-Cog, Screening

INTRODUCTION

Cognitive impairment (CI) refers to difficulties in remembering, learning new information, maintaining focus, or making decisions that impact daily functioning.[1] Globally, the prevalence of dementia is projected to affect 1.8% of individuals in their sixties, 5.1% in their seventies, 15.1% in their eighties, and 35.7% in their nineties.[2] Projection statistics suggest an increase in the population of individuals aged 60 and above is expected to rise from 900 million in 2015 to 2 billion by 2050, indicating a growth of 12 to 22% over a span of 35 years.[3] Alzheimer's dementia international's report estimated that 46.8 million people globally would be afflicted with dementia in 2015.[4] Projected growth indicates a doubling of this figure every two decades, estimating a populace of 74.7 million by 2030 and 131.5 million by 2050.

With a population exceeding 1.2 billion, India is poised to supersede China as the globe's most populous nation within roughly ten years. Moreover, India's elderly demographic, aged 60 and above, is anticipated to

escalate from 8% in 2011 to a substantial 20% by the year 2050.[5] India is presently undergoing a demographic transition characterized by a growing elderly population. Over time, India has experienced a significant increase in life expectancy, almost doubling from 36.98 years between 1950 and 1960 to 69.27 years spanning 2015 to 2020.[6] The elderly demographic is steadily increasing worldwide, particularly in developing nations where around 75% of the elderly currently reside.

This surge in older populations is accompanied by a growing concern regarding CI as a major public health challenge. CI poses a risk of progressing into various conditions like dementia and Alzheimer's disease, potentially impacting quality of life and leading to heightened dependence on family support.[7] There's been limited research on CI in rural settings, highlighting the need to ascertain its presence and employ a methodical approach to foster healthy, vibrant aging. With these considerations in mind, this study aimed to explore cognitive functions in the elderly and assess the prevalence of CI.[8] Most individuals with cognitive disabilities reside in low- or middle-income countries, accounting for 60% in 2001 and projected to reach 71% by 2040. Over the years, India is estimated to experience a significant rise in CI, approximately 300%, while high-income countries are expected to see a comparatively lower increase of 100%.[9]

Effective screening at the primary care level would aid in the identification of disease burdens and improved planning at the secondary and tertiary care levels. There's been limited research conducted in this area and the findings of this study will serve as a foundation for using other sophisticated tests for dementia screening. This would aid in the early detection of CI, improving old health care and eventually reducing the need for institutionalisation in eldercare settings. In light of this, the current study was carried out with the objective of determining the prevalence of CI among the elderly in a rural area in Chengalpattu district and identifying the sociodemographic factors associated with CI among the elderly.

METHODS

Study design

Community based cross sectional study design was used.

Study setting

Pulipakkam, a rural field practice area under the rural health and training centre of our institution in Chengalpattu district of Tamil Nadu.

Study duration

Study carried out for six months (February 2023 to July 2023).

Study population

Elderly people residing at Pulipakkam village were included in study.

Inclusion criteria

Elderly people aged 60 years and above who consent to participate were included as study subjects.

Exclusion criteria

People with morbidities like stroke with Aphasia, loss of hearing, visual impairment; known psychiatric morbidities and those who illiterates were excluded from study.

Sampling

Sampling frame: Elderly people residing at Pulipakkam village.

Sampling method: Sample households were selected by simple random sampling technique using random number tables, from the line listing of family folders maintained at rural health and training centre.

Sample size with calculation methods: The overall prevalence (95% CI) of CI was reported as 35.06% by Subramanian (2020).[10] With this reference and assuming a 95% confidence interval, 5% absolute precision value, and with the available population size of 550, the minimum required sample size will be 214 ~ 215.

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

Study tools: Mini-Cog scale. The Mini-Cog is a very simple and brief cognitive test that comprises a three-item verbal memory task and a simplified evaluation of the clock drawing test (CDT). Mini-Cog is not influenced by education status. A cut-off point of less than 4 on the Mini-Cog scale out of a total score of 5 will be taken as an indication for in-depth cognitive evaluation. Cronbach's alpha coefficient of Mini-Cog scale was 0.83.

Data collection procedures

After obtaining informed consent data was collected on pre-designed and pre-tested questionnaire. The first part of the questionnaire included general socio-demographic variables. Subsequently questions on dementia using the Mini-Cog scale were included.

Data analysis

Data was entered into Microsoft excel 2007, and subsequent statistical analysis was conducted utilizing statistical package for social sciences (SPSS) version 25.

Ethical considerations

Institutional ethics committee at Karpaga Vinayaga institute of medical sciences and research centre granted its approval.

RESULTS

A total of 215 participants were screened. Table 1 shows distribution of demographic and other baseline variables among participants. Table 2 shows socio-demographic factors associated with CI. Mean age of participants was 66.02±3.83 years. Overall prevalence of dementia was 44.2% (n=95). Results of research study revealed significant associations between certain factors and likelihood of CI. Among participants under 65 years of age, notably higher proportion exhibited lower likelihood of CI (67.2%) compared to those with a higher likelihood (32.8%) (p=0.000). Conversely, in over 65 age group, trend reversed, with a higher likelihood of CI observed (57.6%) compared to those with lower likelihood (42.4%) (p=0.000). Gender was not found to be a significant factor, as there was no substantial difference in likelihood observed between males (43.8%) and females (44.8%) with CI (p=0.876). Living arrangements played a crucial role, with participants living with a spouse displaying a significantly lower likelihood of CI (37.7%) compared to those not living with spouse (62.3%) (p=0.004). Employment status also emerged as significant factor, with a higher proportion of employed participants (71.6%) exhibiting a lower likelihood of CI compared to unemployed (28.4%) (p=0.000). Furthermore, alcohol and smoking habits were notably associated with CI, as a larger proportion of individuals who identified as alcoholic/smokers (63.7%) demonstrated a higher likelihood of CI, in contrast to non-alcoholic/ non-smoker counterparts (36.3%) (p=0.000). These findings underscore importance of considering age, marital status, employment, and lifestyle habits in understanding and potentially mitigating CI risks.

Table 3 shows co-morbidities associated with CI. The study investigated the relationship between various co-morbidities and the likelihood of CI. Surprisingly, no statistically significant differences were found across all co-morbidities. For individuals with no co-morbidities, 40.4% were associated with a higher likelihood of CI, while 59.6% exhibited a lower likelihood (p=0.716). Similarly, in cases of diabetes mellitus, the likelihood of CI was almost evenly distributed between the two groups, with 49.2% in the higher likelihood group and 50.8% in the lower likelihood group (p=0.716). Likewise, hypertension showed a comparable distribution, with 44.4% in the higher likelihood group and 55.6% in the lower likelihood group (p=0.716). Even for individuals with both diabetes mellitus and hypertension, no significant difference in likelihood of CI was observed (44.2% higher likelihood vs. 55.8% lower likelihood, p=0.716). Surprisingly, even Bronchial Asthma, an unrelated condition, showed no significant difference in CI likelihood, with 20% in the higher likelihood group and 80% in the lower likelihood group (p=0.716). These findings suggest that, in this study, co-morbidities did not emerge as significant predictors of CI.

Table 4 shows study variables were used as independent variables for binary logistic regression analysis. The results showed that gender (B=1.753, OR=5.773) females exhibit a 5.773 times greater probability of acquiring a CI compared to males, Employment status (B=1.140, OR=3.126) The probability of obtaining CI among the unemployed is 3.126 times greater than that among the employed. and marital status (B=1.074, OR=2.926) The probability of experiencing CI is 2.926 times greater for individuals not living with their spouse compared to those living together, were the risk factors of CI.

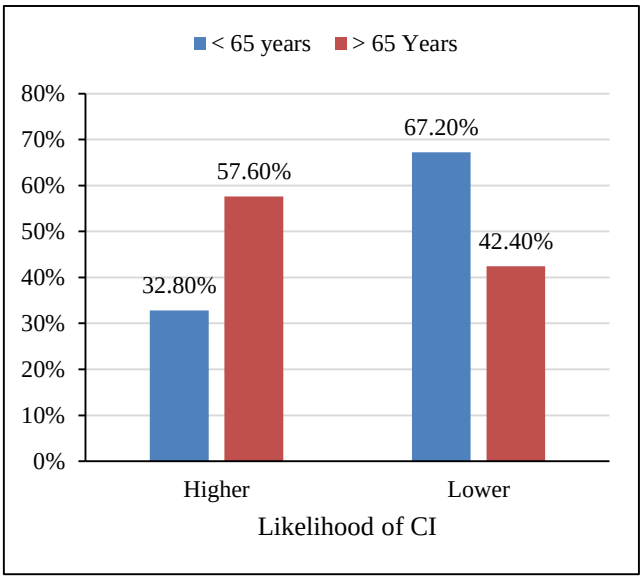

Figure 1: Comparison of likelihood of CI between age groups.

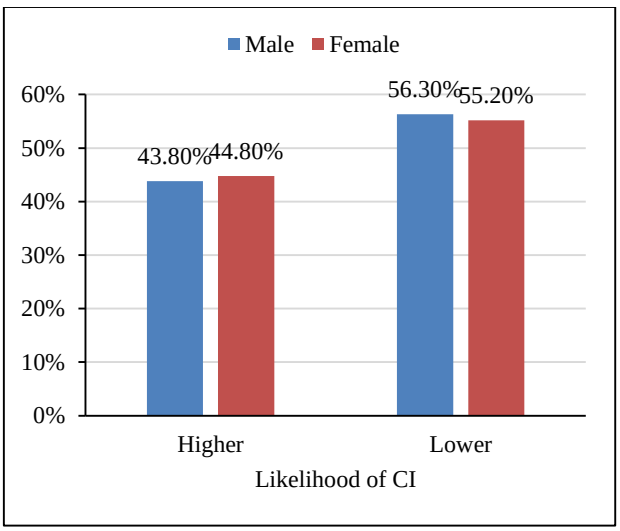

Figure 2: Comparison of likelihood of CI between gender.

Table 1: Distribution of demographic and other baseline variables among participants.

Variables		N	Percentages (%)
Gender	Male	128	59.5
	Female	87	40.5
Age (in years)	Less than 65	116	54.0
	More than 65	99	46.0
Marital status	Living with spouse	151	70.2
	Not living with spouse	64	29.8
Employment status	Employed	81	37.7
	Unemployed	134	62.3
Co-morbidities	Nil	52	24.2
	DM	61	28.4
	HTN	54	25.1
	DM/HTN	43	20.0
	BA	5	2.3
Habits	Alcoholic / smoker	80	37.2
	No	135	62.8
Likelihood of CI	Likely to get CI	95	44.2
	Not likely to get CI	120	55.8
Total		215	100

Table 2: Distribution of socio-demographic factors associated with CI.

Study variables	Likelihood of CI		P values
	Higher, n=95 N (%)	**Lower, n=120 N (%)**	
Age (in years)			
<65	38 (32.8)	78 (67.2)	0.000
>65	57 (57.6)	42 (42.4)	
Gender			
Male	56 (43.8)	72 (56.3)	0.876
Female	39 (44.8)	48 (55.2)	
Marital status			
Living with spouse	57 (37.7)	94 (62.3)	0.004
Not living with spouse	38 (59.4)	26 (40.6)	
Employment status			
Employed	23 (28.4)	58 (71.6)	0.000
Unemployed	72 (53.7)	62 (46.3)	
Habits			
Alcoholic/smoker	51 (63.7)	29 (36.3)	0.000
No	44 (32.6)	91 (67.4)	

Table 3: Distribution of co-morbidities associated with CI.

Study parameter	Likelihood of CI		P values
	Higher, (n=95) N (%)	**Lower, (n=120) N (%)**	
Co-morbidities			
Nil	21 (40.4)	31 (59.6)	0.716
Diabetes mellitus	30 (49.2)	31 (50.8)	
Hypertension	24 (44.4)	30 (55.6)	
DM/ HTN	19 (44.2)	24 (55.8)	
Bronchial asthma	1 (20)	4 (80)	

Table 4: Binary logistic regression of study variables on CI.

Study parameters	B	S.E.	Odds ratio	95% CI		P values
				Lower	Upper	
Gender	1.753	0.562	5.773	1.920	17.355	0.002
Age (in years)	-1.272	0.349	0.280	0.142	0.555	0.000
Marital status	1.074	0.376	2.926	1.401	6.109	0.004
Habits	-2.878	0.585	0.056	0.018	0.177	0.000
Employment status	1.140	0.369	3.126	1.516	6.444	0.002
Morbidities						
DM	-1.709	1.333	0.181	0.013	2.467	0.200
HTN	-1.520	1.310	0.219	0.017	2.848	0.246
DM/HTN	-1.564	1.319	0.209	0.016	2.778	0.236
BA	-1.162	1.315	0.313	0.024	4.119	0.377

DISCUSSION

The results of this research study shed light on several important factors associated with CI, emphasizing the significance of considering socio-demographic characteristics and lifestyle habits when addressing this complex issue.

As we age, there's a decline in neurotransmitter levels, grey matter, volume, and neocortical synapses, leading to CI. Aging also affects cerebrovascular reactivity, causing brain hypo perfusion. Moreover, with increasing age, there's a noticeable deterioration in thinking, reasoning, and memory, contributing to cognitive decline.[29] In our study, old age people above the age of 65 years have higher likelihood of developing CI (57.6%). Similarly, study done by Jan et al showed increased risk of dementia in the age group of 60 to 64 years and 70 to 74 years (63%).[11] Also, study done by Rajesh et al showed that proportion of CI was higher among 70-74 years of age group (50%).[10] Our study further confirms that elderly age can be taken as primary risk factor for developing CI and the prevalence of CI increases steeply with age in elderly populations.

In our study, the likelihood of developing CI were almost equal in both males and females (43.8% in males and 44.8% in females). In contrast, study done by Rajesh et al showed increased likelihood of CI in females (38.9%).[10] and study done by Jan et al also revealed increased incidence of CI in females (63.2%).[11] Other studies have found a correlation between being female and an increased likelihood of experiencing CI.[12,13] During menopause, women experience a decline in hormones like oestrogen, progesterone, and testosterone. Research indicates that these hormones play a protective role in brain health. Moreover, they help in lowering the levels of amyloid beta peptide, which adversely impacts the hippocampus.[12] Our observation is inconsistent with the notion that the prevalence of the CI is higher among women as compared to other studies which might be because of the differences in lifestyle factors in rural areas while the above-mentioned studies were done in urban areas. Also, both men well as the women are struggling more to achieve a balance between their family issues and safeguarding finances which itself is a major contributing factor for the impaired cognition among both the genders.

Our study shows that there is increased risk of developing CI in those who are not living with their spouse (59.4%) compared to those who are living with their spouses (37.7%). Similarly, study done by Rajesh et al also reveals that there is increased risk of impaired cognition in people living without spouse (45.2%).[10] Brain health might be adversely affected by the potential rise in loneliness resulting from factors such as population growth, aging, and social isolation.[14] Living independently doesn't automatically mean experiencing social isolation, loneliness, or having weak social connections. However, it's important to acknowledge that social networks often shrink as we grow older. While living alone is a factual situation, feeling lonely is about personally feeling dissatisfied with social connections and can vary from person to person. Looking at cognitive reserves, sharing a living space with others can boost cognitive stimulation through increased social interactions, providing numerous chances for engaging socially.[15] In our study, we observed that majority (59.4%) were leading a solitary life without spouse and were more prone for developing CI. Regular engagement in social activities has shown correlations with enhanced memory, executive function, visual spatial ability, and processing speed. Furthermore, consistent social support has been connected to improved memory.[16] Our study being performed in rural area, where people are not usually socially active and therefore contributing to impaired cognition during isolation.

Previous researches have demonstrated a strong correlation between lower income levels or unemployment and CI.[12] Perhaps the reason could be linked to the participants' lack of financial resources to access healthcare services, especially those with low income or without employment. Our study reveals that about 53.7% of unemployed people were at higher risk of developing CI compared to people who were employed (28.4%). Similar results were obtained by a study conducted by Rajesh et al which showed higher

prevalence of CI in unemployed people (38.3%).[10] Unemployment leads to a spectrum of health issues, where the absence of a paid occupation is closely associated with notable cognitive impacts.

When it comes to smoking, known for its link to cardiovascular risks and consequently, a higher risk of dementia.[17,18] A recent study revealed that nicotine has the potential to shield the hippocampus from stress-induced harm, indicating a possible role in neuroprotection.[17] Furthermore, nicotine exhibits potential in addressing CIs resulting from traumatic brain injury. It demonstrates the ability to reverse changes in signalling pathways within the brain, impacting nicotine receptors, tyrosine hydroxylase, and dopamine levels.[18] In our study 63.7% of smokers and alcoholics have higher likelihood of increased CI as compared to 32.6% in non-smokers and alcoholics. In contrast to other studies [19] the results of increased CI among smokers and alcoholics in our study might be due to strained relationships with other family members and neighbours due to inappropriate behaviour could potentially have contributed to adverse mental health outcomes, impacting cognitive functions. Also, people in rural areas mostly fall under low socioeconomic groups and are more prone for tobacco and alcohol use.

In our study, 49.2% of people with diabetes mellitus had higher likelihood of developing CI. Multiple studies have established a connection between type 2 diabetes mellitus and a heightened risk of cognitive decline and dementia. Consequently, lowering the occurrence of diabetes can potentially decrease the likelihood of dementia among individuals with diabetes.[20] Additionally, diabetes mellitus has been recognized as a contributing factor in as many as one-third of Alzheimer's disease cases. It stands as a significant focal point in efforts to prevent dementia within the broader population.[21] Also, studies showed that those with type II DM showed poor performance in cognitive functions, including attention, information, processing, speed and memory.[22]

Lowering the risk of cardiovascular issues stands out as one of the most promising and effective strategies, given its well-established connection with CI.[23] Managing and adjusting hypertension stands out as a crucial factor influencing dementia, given its controllable and modifiable nature.[24] Furthermore, prolonged and cumulative high blood pressure has been linked to subsequent cognitive decline and an increased risk of developing dementia.[25] In our research, we found that 44.4% of individuals with hypertension were more likely to experience CI, whereas 55.6% of those with hypertension had a lower likelihood of developing cognitive issues. While research conducted by Obisesan et al revealed a correlation between optimal blood pressure levels and enhanced cognitive performance across all age brackets. Conversely, severe hypertension was linked to the poorest cognitive performance regardless of age groups.[26]

Our study reveals that 20% of people with bronchial asthma have higher likelihood of developing impaired cognition while 80% of people with bronchial asthma have lower likelihood of developing CI. On the contrary, study done by Kubysheva et al showed increased incidence of CI in patients with bronchial asthma.[27] This difference in results might be due to the reason that our study being done in rural area where there is a drastic lifestyle and environmental change as compared to urban areas with increased air pollution and hence increased chances of severe bronchial asthma. Severe bronchial asthma is linked to synaptic degeneration, potentially exacerbating the risk of dementia already posed by cardiovascular disease and genetic predispositions. In individuals with bronchial asthma, higher levels of the synaptic degeneration biomarker neurogranin are observed regardless of cognitive status, cardiovascular health, or genetic risk factors. Furthermore, there is a more rapid escalation in the levels of synaptic degeneration biomarkers like neurogranin and alpha-synuclein as cardiovascular risk increases.[28]

CONCLUSION

Detecting CI in the elderly doesn't just impact their quality of life; it also affects their caregivers and families. Early identification and the implementation of social support measures and therapeutic interventions play a pivotal role in enhancing life quality and slowing down the progression of the condition. Addressing modifiable risk factors offers the best strategy presently for averting or lessening the onset of cognitive decline. Training ASHA workers to identify cognitive issues in the elderly using various examination scales and involving medical officers at primary healthcare centres for further assessment is recommended. Detected cases should be referred to specialized centres for comprehensive management. Establishing geriatric departments across healthcare levels is crucial for comprehensive care. Further exploration and longitudinal studies are warranted to delve deeper into these relationships, aiding in the development of more targeted interventions and strategies aimed at preventing or delaying cognitive decline in at-risk populations.

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