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Geriatric Health

"COGNITIVE IMPAIRMENT AMONG ELDERLY IN URBAN BENGALURU – A COMMUNITY-BASED CROSS-SECTIONAL STUDY"

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ABSTRACT **Background:** Cognitive impairment (CI) is a growing concern among the elderly population in India and worldwide, often overlooked and underestimated in society. Cognitive Impaired are ten times more likely to develop dementia than healthy adults. In addition to having a higher risk of dementia, these people are more than twice as likely to die from any cause. Early detection and the use of social support and medical services can help improve the quality of life and slow the progression of the disease. Hence, our study aims to estimate the prevalence of Cognitive Impairment and assess the association of Cognitive Impairment with sociodemographic variables among elderly individuals residing in urban Bengaluru, India **Materials and Methods:** A cross-sectional study was conducted among the elderly population (age ≥60 years) of both sexes residing in the 3 wards of Rajajinagar (ward no. 99, 98, 100) area of the UHTC residing in that area for more than one year. 132 participated in the study. To assess Cognitive Impairment, the Elderly Cognitive Assessment Questionnaire (ECAQ) was used. It is a satisfactory scale for quantitative assessment of cognitive impairment among elderly people living in developing countries. This 10-item questionnaire shows a sensitivity of 85.3%, specificity 91.5%, positive predictive value 82.8% **Results:** The magnitude of cognitive impairment among the elderly population was found to be 49(37.12%) in our study, where 31(23.5%) were in Borderline CI and 18(13.6%) were case of CI. Among the elderly having CI, 73% belong to the age group 60-79 years, and around 67% were found to be females, reflecting CI is more among females. Cognitive impairment among elderly significantly increased with the increase of age Significantly higher CI seen among females, illiterate, population elderly belonging to below poverty line, those with any chronic disease, diabetes, hypertension and those without physical activity than compared to their counterparts. Positive association continued to be present among elderly who were illiterates and those with diabetes even after adjusting with confounding factors. **Conclusion:** In conclusion, our study highlights a high proportion of cognitive impairment among the elderly population. Approximately 1 in 3 elderly individuals in our study were found to have cognitive impairment. Screening for cognitive impairment among the elderly at the primary care level is important for early detection. Primary care workers and physicians should be trained to identify and manage geriatric cognitive impairment early, and community-based interventions should be implemented for the effective management of older adults with chronic diseases as most factors for cognitive impairment are preventable and treatable.

INTRODUCTION

The current estimated proportion of elderly population in India is 10.1%, as of 2021. This means that there are over 138 million elderly people in India, out of a total population of 1.38 billion. The elderly population is expected to grow rapidly in the coming years, reaching 194 million by 2031.[1]

According to a report by the World Health Organization (WHO), there were an estimated 47 million people worldwide living with dementia in 2015, and this number is expected to triple by 2050. The report also highlights that cognitive impairment is not limited to high-income countries, and low- and middle-income countries are expected to face the highest increase in the burden of cognitive impairment in the coming years.[2]

Cognitive impairment is a growing concern among the elderly population in India and worldwide. India, being the second most populous country in the world, has a rapidly ageing population.[3] The proportion of elderly population in India is expected to reach 20% by 2050, which will result in a significant increase in the burden of age-related cognitive impairment.[4]

According to a study published in the Lancet Global Health in 2018, the prevalence of dementia in India was estimated to be around 4.1 million, and this number is projected to double every 20 years.[5] Another study conducted in six urban and rural sites in India reported that the prevalence of cognitive impairment among the elderly

population aged 60 years and above was 10.3%.[6]

In India, it is estimated that around 4 million people are affected by dementia, and this number is expected to increase to over 7 million by 2030.[7,8]

Cognitive Impaired are 10 times more likely to develop dementia than healthy adults.[9-11] In addition to having a higher risk of dementia, these people are more than twice as likely to die from any cause.[12] Hence, it is crucial to take a step in the process to control the prevalence of CI to promote healthy, beautiful, and aging. CI affects not only the quality of life of the elderly but also caregivers and families. Therefore, early detection and the use of social support and medical services can help improve the quality of life and slow the progression of the disease.

Given this background, it is essential to understand the prevalence of cognitive impairment among the elderly population in different settings, including urban areas. In this context, a study was conducted with the objective to estimate the prevalence of cognitive impairment among the elderly population in urban Bengaluru.

METHODOLOGY

Study design and setting

This community-based cross-sectional study was conducted between January and March 2023 carried out in the field practice area of the Urban Health and Training Centre (UHTC), under the Department of Community Medicine of a Government medical college of Southern

India which covers a population of around 1 lakh in Bengaluru. Bengaluru district is in the southern India, state of Karnataka. The UHTC provides curative, preventive, and promotive services to the people. There are weekly specialist clinics at the UHTC including psychiatry. Apart from this, there are regular health awareness activities conducted for them.

Our study used standardized cognitive assessment tools to measure cognitive impairment among elderly individuals and also collected data on various socio-demographic and health-related factors that may be associated with cognitive impairment.

Study population
The study was carried out among the elderly population (age ≥60 years) of both sexes residing in the 3 wards of Rajajinagar (ward no 99, 98, 100) area of the UHTC residing in that area for more than one year.

Sampling technique and sample size
The sample size was calculated using the formula for cross-sectional studies

$$N = \frac{(Z1-\alpha/2)^2 \, p(1-p)}{d^2}$$

where, the Z is value of area under two tailed normal curve and α, level of significance was taken as 0.05. 'p' is the prevalence rate of cognitive impairment among elderly. Based on the previous study by Patel RM et al., in 2018,[13] the prevalence of cognitive impairment was 8.8%, at 95% confidence level, 5% absolute allowable error the estimated sample size was 125, and considering a drop-out rate of 5% the sample size was calculated to be N=132.

A house wise list of elderly people in the study area was prepared with the help of data from Anganawadis and ASHAs. The elderly participants were selected by simple random sampling from this list. We contacted elderly persons through house-to-house visit. A total of 132 elderly persons from urban field practice area participated in the study.

Inclusion and exclusion criteria
Elderly equal to or more than 60 years of age and consented for participation in study, were recruited as study subjects. Those who were severely ill, bedridden, audio-visually impaired, or elderly having gross communication difficulties such as speech problems, hearing abnormalities were excluded from the study. Also the elderly who were not available even after three visits were excluded from the study.

Study Instruments
1. Interview schedule:
The study tool consists of two parts.
a) Part I - Demographic details and Assessment of physical health
b) Part II - Elderly Cognitive Assessment Questionnaire (ECAQ)

Part I: Demographic details and Assessment of physical health:
Details regarding sociodemographic details of the elderly including socio economic status, financial dependency, income was collected. The questionnaire consisted of inquiries regarding comorbidities, specifically addressing whether the study participants had any pre-existing chronic illnesses. This was self-reported by the participants. The comorbidities mostly included the presence of hypertension, diabetes, body ache, backache, joint pain, respiratory distress, bladder and bowel problem, eye and ear problems, cancer, etc. Wherever medical records were available, the diagnosis was obtained from the written records. The nutritional status was assessed from the Body Mass Index (BMI) calculated from the weight of an individual measured in kilogram divided by the height vertex squared measured in meters.

Part II: Cognitive Assessment:
To assess Cognitive Impairment, the Elderly Cognitive Assessment Questionnaire (ECAQ) was used. It consists of 10 questions divided into three categories ie, Category 1: Memory, Category 2: Orientation and Information, Category 3: Memory recall with options being 0-4 Probable case of cognitive impairment, 5-6 Borderline and > 6 Normal.

The Elderly Cognitive Assessment Questionnaire (ECAQ) is a scale that has been created by combining elements from the Mini-Mental State Examination and Geriatric Mental State Schedule. It serves as an effective tool for quantitatively evaluating cognitive impairment in older individuals residing in developing nations. This questionnaire consists of 10 items and has demonstrated a sensitivity of 85.3%, specificity of 91.5%, a positive predictive value of 82.8%, and an overall error rate of 10.5%. The ECAQ assesses two aspects of cognitive function, memory and orientation and information, and has a maximum score of ten points. There is less bias on educational status and the questionnaire can be completed in less than 10 min.[14]

The questionnaire includes details of sociodemographic information and was pretested and suitably modified to meet with the study objective. It was in English as well as in Kannada (standardized and validated tool).

Data collection
The investigators reached out to geriatric individuals by personally visiting their homes. We initiated conversations with the elderly by engaging in casual discussions to establish a connection, after which we obtained written consent to participate in the study. The study subjects were interviewed using a partially structured questionnaire, ensuring that the questions were presented in a language that the participants could understand. The age of the study participants was verified using government-issued identification cards such as the Aadhaar card. The process of data collection was completed within a span of three months, with an average of three to four interviews conducted per day. Elderly individuals who were screened positive for cognitive impairment were provided counseling by the interviewer himself on multiple occasions and were subsequently referred to a psychiatrist.

Ethical consideration
Ethics approval was taken from the Institutional Ethical Committee (IEC) before starting the study. All the participants were provided the informed consent in written, and explained to them in their local language with the explicit assurance that the data provided by them would remain confidential and will not be affected by study participation or protocols.

Data analysis
Data were collected using a structured questionnaire. The filled questionnaires were checked for completeness and consistency and were coded.

Data were entered using Microsoft Excel 2013 and analyzed using Epidata 3.1 Software.

Magnitude was expressed in percentage along with its 95% confidence interval (CI). Normally distributed data were presented as means and standard deviations at 95% confidence interval (CI). Categorical variables were presented as proportions (%) and variables with quantitative data were presented as mean and standard deviation (SD). Chi-square test was used to study the association of various factors with cognitive impairment.

Association between the cognitive impairment and the independent variables was analysed using Chi-square test/Fisher's exact test for proportions, and P < 0.05 was considered as significant. Crude odds ratio was calculated with 95% confidence interval. Adjusted odds ratio was calculated using binary logistic regression, adjusting with other confounding socio demographic variables.

RESULTS
The sociodemographic profiles of the participants are shown in **[Table 1]** The magnitude of cognitive impairment among the elderly population was found to be 49(37.12%) in our study, where 31(23.5%) were in Borderline CI and 18(13.6%) were probable case of CI. **[Figure 1]**

Majority of the participants were females in the age group 60 to 69 years, belong to Hindu religion, lacking in formal education (illiterate), married and from the low-income category, that is, they hold Below Poverty Line (BPL) card and they were fully dependent on others with no physical activity.

Coming to the elderly health condition majority of them are suffering from chronic disease, diabetes and hypertension. Around 69.7% were found to be with normal BMI and 51.5% were not engaged in physical activity. **[Table 2]**

Among the elderly having Cognitive Impairment, 73% belong to the age group 60-79 years, and around 67% were found to be females, reflecting Cognitive Impairment is more among females. As age category advanced, we can see a significant increase in the prevalence of cognitive impairment. Around 76% belong to illiterate and 61% were not working. Around 90% were found to be BPL card holders. Around 86% elderly with CI were suffering from other chronic diseases. Around 65% were Diabetic and 59% were Hypertensive. Around 96% elderly with CI were economically dependent and 61% did not have any form of physical activity. These factors show that cognitive impairment among geriatric people could be due to lack of physical activity, financial dependency on others, or suffering from chronic diseases like Diabetes and Hypertension. Also, it was found to be more among the below poverty line population and among the illiterates.

Table 3 shows the results of both univariate and multivariate logistic regression. In univariate logistic regression, higher odds were observed among elderly ≥ 80 years (p value = 0.0000087) (0.17 [95% CI 0.03-1.09]) ; females (p value = 0.004) (0.57 [95% CI 0.1-2.9]) as compared to the males ; elderly who are illiterate (p value = 0.0001) (10.79 [95% CI 3.3-35.0]) when compared to literate; those elderly who are not working (p value = 0.02) (0.3 [95% CI 0.03-2.37]) when compared to working sector and homemakers; elderly suffering from chronic diseases (p value = 0.05069) (0.32 [95% CI 0.03-3.00]) and elderly who did not do any physical activity (p value = 0.04318) (0.79 [95% CI 0.26-2.46]). Odds were also found to be higher (p value = 0.0001) (0.4 [95% CI 0.05-3.08]) among the elderly who are economically dependent. Positive association continued to be present among elderly who were illiterates and those with diabetes even after adjusting with confounding factors, however other factors association could not be established after adjustment.

DISCUSSION
The magnitude of cognitive impairment among the elderly population was found to be 37.12% in our study. While this is comparable to the rates in some developed regions of the world, it is higher than the prevalence reported from other parts of India.[15-17] In our study, a positive association is found between cognitive and other factors like age, gender, education, occupation, BPL and APL card holders, chronic diseases, diabetes, hypertension, dependency and physical activity. Similarly in a study by Sunilkumar S et al, socio-demographic factors like advanced old age (≥70 years), female gender, illiteracy, and widow/widower status were found to be statistically significant risk factors.[18] In another study by Deepak Sharma et al, factors like old age, illiterate, and widowed showed a higher probability of cognitive impairment and were not associated with the factors like use of alcohol, cigarette smoking, or undernutrition.[19] The study was conducted by Ambika et al, the risk factors for cognitive impairment included age, gender, education, and socioeconomic status.[20] In Rashmi Kumari et al, the risk factors for cognitive impairment included age, gender, education, and socioeconomic status.[21] This disparity might be due to the difference in cultural background, genetics, and environmental factors or sampling methods or the screening tools used. These variabilities of findings might be due to interaction with age, gender, or other lifestyle factors.

Similarly, in a study done a study by Sunilkumar S. Jadenur et al, the prevalence of Cognitive Impairment was found to be 14%.[18] In a study by Deepak Sharma et al, the prevalence is 3.5%. It was higher in the rural (2.3%) than in the urban population (1.3%), with a rural/urban prevalence ratio (PR) of 1.8 (95% CI 0.6-5.7).[19]

Also, a study was conducted by Ambika et al, in 2020 in Belagavi, the prevalence of cognitive impairment was 10%.[20] In another study conducted by Rashmi Kumari et al, in 2021 in a rural area of Uttar Pradesh, the prevalence is 29.1%.[21] This difference in prevalence could probably be due to the difference in the study population and the definitions used. In our study, we enrolled subjects aged 60 years and above who were free of depression. Different study instruments among various studies could be one of the reasons for these variations.

Limitations
Findings of our study must be looked through two limitations. The small sample size affects generalizability and secondly the cross-sectional nature of study design, as in these cases, the causal relationships could not be inferred, and results could not be generalized.

CONCLUSION
In conclusion, our study highlights a high proportion of cognitive impairment among the elderly population. Approximately 1 in 3 elderly individuals in our study were found to have cognitive impairment. Screening for cognitive impairment among the elderly at the primary care level is important for early detection. Primary care workers and physicians should be trained to identify and manage geriatric cognitive impairment early, and community-based interventions should be implemented for the effective management of older adults with chronic diseases as most factors for cognitive impairment are preventable and treatable.

Recommendations
Several factors, including age, gender, education level, physical activity and economic dependency were identified as having a strong correlation with cognitive impairment in older individuals. Failure to identify and address cognitive impairment in the elderly can lead to significant clinical and public health repercussions, considering the heightened risk of developing dementia. Therefore, it is crucial for primary care providers to remain attentive when providing medical treatment to elderly patients, as dementia is prevalent within this age demographic.

Screening the elderly for Cognitive Impairment at the primary care level helps in early detection of risk of developing dementia. There is a need to sensitize primary care workers and physicians to identify and manage geriatric cognitive impairment early and the need for community-based interventions for effective management of older adults with chronic diseases.
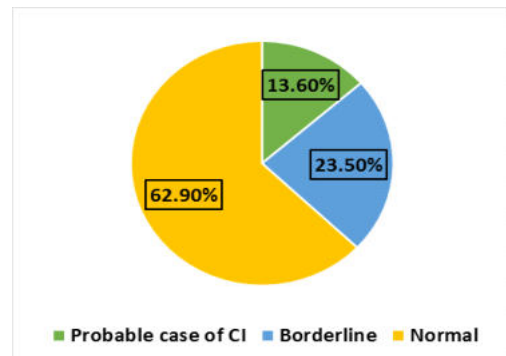

Figure 1: Magnitude of Cognitive Impairment among study population (N=132)

Table 1: Distribution of sociodemographic variables among the elderly (N=132)

Health conditions variables	Categories	n(%)
Diabetes Mellitus (DM)	Yes No	71(53.8) 61(46.2)
Hypertension (HTN)	Yes No	68(51.5) 64(48.5)
Other Chronic diseases	Yes No	103(78) 29(22)
Body Mass Index (BMI)	Underweight <18.5 Normal 18.5-24.9 Overweight > 25 Pre-obese 25-29.9 Obese - 30-34.9	25(18.9) 92(69.7) 15(11.3) 13(9.8) 2(1.6)
Physical activity	Yes No	64(48.5) 68(51.5)

Table 2: Distribution of health conditions among the elderly (N=132)

Sociodemographic variables	Categories	n(%)
Age in years	60-69 70-79 >80	79(59.8) 36(27.3) 17(12.9)
Gender	Male female	63(27.7) 69(52.3)
Religion	Hindu Muslim	121(91.7) 11(8.3)

Education	Illiterate Primary Middle + High Secondary Undergraduate	53(40.2) 6(4.5) 59(44.7) 7(5.3) 7(5.3)
Occupation	Working Not working Homemaker	16(12.1) 75(56.8) 41(31.1)
Marital status	Married Single	121(91.7) 11(8.3)
Number of people	1 2 3 >4	6(4.5) 24(18.2) 25(18.9) 77(58.4)
APL\ BPL	BPL APL	104(78.8) 28(21.2)
Income	Working Pension Property No income	16(12.1) 54(40.9) 1(0.8) 61(46.2)
Economic Dependency	Independent Partially Fully	17(12.8) 53(40.2) 62(47)

Table 3: Association of Cognitive Impairment among elderly with select socio-demographic variables (N=132)

Variables	Categories	Cognitive Impairment			
		Present (0-6) n(%)	Absent (7-10) n(%)	Odds Ratio (95% CI)	Adjusted OR (95% CI)
Age in years	60-69 70-79 >80	18(22.8) 18(50.0) 13(76.5)	61(77.2) 18(50.0) 4(23.5)	Reference 0.29(0.13,0.68)* 0.09(0.03,0.31)*	Reference 0.51(0.14,1.80) 0.17(0.03,1.09)
Gender	Male Female	16(25.4) 33(47.8)	47(74.6) 36(52.2)	Reference 0.37(0.18,0.78)*	Reference 0.57(0.11,2.94)
Religion	Hindu Muslim	44(36.4) 5(45.5)	77(63.6) 6(54.5)	Reference 0.68(0.19,2.38)	Reference 0.58(0.09,3.42)
Education	Illiterate Literate	37(69.8) 12(15.2)	16(30.2) 67(84.8)	Reference 12.9(5.52,30.19)*	Reference 10.79(3.32,35.02)*
Occupation	Working Not working Homemaker	2(12.5) 30(40.0) 17(41.5)	14(87.5) 45(60.0) 24(58.5)	Reference 0.50(0.07,2.27) 0.21(0.03,0.94)*	Reference 0.26(0.03,2.37) 0.26(0.02,3.71)
Marital status	Single Married	5(45.5) 44(36.4)	6(54.5) 77(63.6)	Reference 1.46(0.42,5.06)	Reference 1.84(0.30,11.06)
APL\ BPL	BPL APL	44(42.3) 5(17.9)	60(57.7) 23(82.1)	Reference 3.37(1.19,9.57)*	Reference 2.94(0.68,12.69)
Chronic diseases	Yes No	42(40.8) 7(24.1)	61(59.2) 22(75.9)	Reference 2.16(0.85,5.52)*	Reference 0.32(0.03,3.00)
DM	Yes No	32(45.1) 17(27.9)	39(54.9) 44(72.1)	Reference 2.12(1.02,4.40)*	Reference 5.33(1.18,24.02)*
HTN	Yes No	29(42.6) 20(31.3)	39(57.4) 44(68.8)	Reference 1.64(0.80,3.34)*	Reference 1.66(0.37,7.40)
BMI	Underweight <18.5 Normal 18.5-24.9 Overweight >= 25	9(36.0) 34(37.4) 6(40.0)	16(64.0) 57(62.6) 9(60.0)	Reference 0.96(0.38,2.41) 0.84(0.23,3.15)	Reference 0.54(0.14,2.12) 0.67(0.07,6.07)
Income	Yes No	29(40.8) 20(32.8)	42(59.2) 41(67.2)	Reference 1.42(0.69,2.89)	Reference 2.64(0.81,8.56)
Economic Dependency	Dependent Independent	47(40.9) 2(11.8)	68(59.1) 15(88.2)	Reference 5.18(1.13,23.74)*	Reference 0.37(0.05,3.08)
Physical activity	No Yes	30(44.1) 19(29.7)	38(55.9) 45(70.3)	Reference 1.87(0.91,3.84)*	Reference 0.79(0.26,2.46)

Significant ($p<0.05$); OR: Odds ratio; CI: Confidence interval
Economic Dependence/Independence: Elderly were considered 'economically independent' if their life is economically productive; 'Partially Dependent' if they had very less income like old age pension or rent income; and 'Totally Dependent' if they were not having any income.

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