

Original Research Article

Non-communicable diseases and cognitive impairment among older adults in East Delhi: a cross-sectional study

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ABSTRACT

Background: Non-communicable diseases (NCDs) are a leading cause of morbidity among older adults and are increasingly recognized as being associated with cognitive decline. Cognitive impairment can adversely affect treatment adherence, self-management, and overall quality of life. This study aimed to assess the prevalence of cognitive impairment among elderly individuals with NCDs attending an urban health facility in east Delhi.

Methods: A clinic-based cross-sectional study was conducted among adults aged 60 years and above attending the NCD clinic of the urban health centre, Kalyanpuri, east Delhi. Data were collected through face-to-face interviews using a predesigned questionnaire. Cognitive function was assessed using the Montreal cognitive assessment (MoCA) scale, with a score of less than 26 indicating cognitive impairment. Data were entered and analysed using SPSS and Microsoft Excel.

Results: Cognitive impairment was found to be common among elderly patients with NCDs; more than half (55.1%) of the study participants showed some degree of cognitive impairment (mild to severe). Normal cognition was seen in less than half (44.9%) of the study participants. The prevalence of cognitive impairment was 57.2% among participants with hypertension, 60.5% among those with diabetes mellitus, 44.1% among individuals with thyroid disorders, 64.3% among those with chronic respiratory diseases, 50.0% among participants with coronary artery disease, and 38.9% among those with dyslipidaemia and other chronic conditions.

Conclusions: A considerable proportion of older adults living with NCDs demonstrated cognitive impairment. These findings underscore the importance of incorporating routine cognitive screening into NCD care services for the elderly. Early identification of cognitive decline may facilitate timely interventions, improve disease management, enhance treatment adherence, and promote healthy ageing.

Keywords: Cognitive impairment, India, MoCA, Non-communicable diseases, Older adults

INTRODUCTION

Non-communicable diseases (NCDs), such as cardiovascular diseases, malignancies, chronic respiratory diseases, and diabetes, are the leading causes of morbidity and mortality worldwide and represent an emerging global health threat. Deaths from NCDs now exceed all communicable disease deaths combined. Globally, chronic non-communicable diseases (NCDs) kill 41 million people each year. NCDs disproportionately affect

people in low- and middle-income countries, where more than three-quarters of global NCD deaths (31.4 million) occur.¹ These diseases are of public health importance globally and in India.

India is a vast country with a diverse population. The geriatric population is roughly one-tenth of its total population and is expected to increase to around 19% by the year 2050.² Old age is associated with a plethora of non-communicable diseases and comorbidities as a

consequence of cellular ageing and degeneration. With an increase in life expectancy, Chronic NCDs are rising exponentially in India and are now among the leading causes of death.

There is increasing evidence that cognitive impairment is highly prevalent in all chronic NCDs. Notably, three aspects- memory, attention span, and executive functions are affected most. Pathophysiological changes in the perfusion of the brain affect cognitive function, and therefore, they also reflect the severity of the disease and its effect on organ systems.

Cognitive impairment needs a special mention because it negatively affects the course of the disease, including treatment and prognosis of the disease. Cognitive impairment affects self-management of disease, adherence to treatment, social participation, and reduces patient autonomy, leading to a huge impact on the quality of life. Cognitive impairment affects the patient and his family by increasing the financial and social burden and social hardship.

Cognitive impairment in early stages is not easily diagnosed and is not taken into account while managing the patient until it progresses to an irreversible stage of frank dementia. A better understanding of the relationship between cognitive impairment and chronic NCDs may result in better self-management, adherence to therapy, and improved quality of life.

With an ageing population, especially in low- and middle-income countries like India, the dual burden of NCDs and cognitive impairment is becoming more evident. Early recognition and management of NCDs thus play a crucial role in preserving cognitive health and reducing disability among the elderly.

Though many recent studies have tried to assess the prevalence of cognitive impairment in the elderly, but very limited number of studies have estimated the prevalence of cognitive impairment in elderly patients suffering from chronic NCDs.³⁻⁵ Available evidence from studies suggests that the prevalence of cognitive impairment is relatively higher in patients with NCDs, such as diabetes mellitus and Hypertension. With this background, this study was planned to assess the prevalence of cognitive impairment in elderly patients suffering from chronic NCDs.

METHODS

General study settings

The study was a cross-sectional observational study conducted among patients suffering from non-communicable diseases attending the non-communicable disease clinic of urban health and training centre, Kalyanpuri, East Delhi. The study was conducted from April 2024 to August 2025.

Study area

The Study was conducted in UHTC Kalyanpuri, one of the field practice areas of the department of community medicine, Lady Hardinge Medical College. Kalyanpuri is an urban resettlement colony in the east Delhi District. According to the survey conducted by the department of community medicine, LHMC in 2011, the population of Kalyanpuri (consisting of blocks 11-21) was 25,754. The projected population for the year 2021 was 31,018. The urban health centre caters to Kalyanpuri as well as the neighbouring resettlement colonies of Khichripur, Trilokpuri and Himmatpuri, East Vinod Nagar, Kondli, and Khoda. Both government and private health agencies cater to the healthcare needs of the residents. The urban health centre of LHMC provides primary health care services, including general OPD, antenatal clinic and special clinics in many broad specialities, namely pediatrics, medicine, immunisation, psychiatry, ophthalmology and dermatology.

The non-communicable disease clinic at UHTC Kalyanpuri was established in 2019 with an aim of screening and management of non-communicable diseases, especially diabetes mellitus, hypertension, and chronic obstructive pulmonary disease. So far, 1150 NCD patients are enrolled in the NCD clinic, Kalyanpuri. An average of 30-40 patients attend the NCD clinic daily, with approximately 180 new patients being registered every year. Out of these new registrations, 100 are in the geriatric age group (>60). The records of all patients are maintained in the NCD clinic registry since its inception in 2019.

Study population

Elderly (≥ 60 years old) patients with non-communicable diseases attending the NCD clinic in UHC Kalyanpuri in the east Delhi district of Delhi.

Inclusion criteria

All patients with NCDs and ≥ 60 years of age under treatment at UHC Kalyanpuri.

Exclusion criteria

Patients who were unable to communicate for any reason.

Sample size and sampling

Sample size has been calculated assuming the prevalence of cognitive impairment as 27% at 95% level of significance, and 20% of relative error.⁶

$$N = [Z^2(1 - \alpha/2)pq] / L^2$$

$$P \text{ (prevalence)} = 27.3\%, q = 72.7\% \quad L^2 = (\text{allowable error}) = 20\% \text{ of } p \quad (27.3\%) = (5.46)^2$$

And $Z^2 (1 - \alpha/2) = 3.84$. The final sample size was calculated to be 256.

Universal sampling of elderly patients (≥ 60 years) with Chronic NCDs attending Urban Health Centre Kalyanpuri was carried out to enrol study subjects till the sample size was achieved.

Operational definitions

Elderly persons- persons aged 60 years or older.⁷

NCDs- non-communicable diseases (NCDs) are chronic diseases that are not transmissible from one person to another. Persons who are diagnosed with a known noncommunicable disease and are under treatment for that condition.¹

Cognitive impairment

Cognitive impairment is when a person has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life. Cognitive impairment in this study will be defined as a score of <26 in the Montreal cognitive assessment.⁸

Study Tools

Interview schedule

A self-designed, pre-tested, semi-structured interview schedule was used, consisting of identification details, sociodemographic profile, disease, and treatment details. Pilot testing was done in 10% of participants at Palam Health Centre. Initial piloting and design of the questionnaire were carried out from May 2024 to June 2024.

Montreal cognitive assessment-basic (MoCA-B)⁹

The Montreal cognitive assessment scale (MoCA) was developed by Dr. Ziad Nasreddine as a very highly sensitive tool for early detection of mild cognitive impairment (MCI) in 2005. MoCA has been widely adopted in clinical settings and used in academic and non-academic research around the world. The tool is highly sensitive (90%) and specific (87%). It is available in more than 200 languages, including Hindi, which is validated. The MoCA-B was developed to facilitate the detection of mild cognitive impairment in illiterate persons and persons with low literacy status. Like MoCA, MoCA-B also assesses similar cognitive domains such as executive functions, short-term memory, visuospatial abilities, attention, concentration, working memory, language, and orientation to time and place. It is scored on 30 points and completed in 15 to 30 minutes. The minimum score is zero, and the maximum is 30. Scores of 26 and above are considered normal, scores between 18-25 are considered mild cognitive impairment, 10-17 are considered moderate and ≤ 9 are considered severe impairment.

Methodology

Prior permission to conduct the study was obtained from the institutional ethical committee. The purpose of the study was explained to the study participants and their caregivers. Written informed consent was obtained from the study participants. Only those who agreed to participate were included in this study.

The study population were elderly (≥ 60 years) with NCDs, attending the non-communicable diseases clinic in urban health centre, Kalyanpuri. A total of 278 participants were approached, 15 participants were ruled out in the screening test, 4 participants refused to give consent, and 3 participants walked out midway during the interview. Thus, a total of 256 participants were enrolled in the study.

Data collection

Pilot testing was done in the month of June 2024. Data collection was done by face-to-face interviews from July 2024 to May 2025. First, the patients were screened for locomotor, visual, hearing, and speech and checked for eligibility. Informed consent was obtained. Those who agreed were enrolled in the study. Data about identification details and sociodemographic profiles, lifestyle factors, clinical profile, activities of daily living, instrumental activities of daily living, and medication adherence were collected. Anthropometric measurements like height, weight, waist circumference, blood pressure, and cognitive assessment and scoring were carried out at UHTC, Kalyanpuri, through face-to-face interviews using the Montreal cognitive assessment in a well-lit room with minimal distractions, and a comfortable and supportive environment was provided for the participant's comfort and ability to focus to enable accurate results. All the study subjects having deranged cognitive function requiring referral and treatment were counselled and referred to the department of psychiatry, LHMC for further management.

Data analysis

Statistical analysis was carried out with the help of SPSS version 25.0. Variables were entered and coded first, and then the analysis was carried out after data cleaning. Quantitative variables were measured in terms of mean and standard deviation; qualitative data were measured in terms of percentage or proportion. For quantitative data, the Chi-square and Fisher's Exact test were used as tests of significance, and P value of <0.05 was considered statistically significant.

Ethical issues

Permission to conduct the study was obtained from the institutional ethics committee (LHMC/IEC/2024/PG Thesis/15). All participants were recruited after informing them about the purpose of the study and obtaining written

consent. In case of illiterate participants, their thumb impressions were taken in the presence of a neutral witness. Confidentiality and privacy of the study participants were maintained. Any study subjects with severe cognitive impairment, as noted by the researcher during data collection, were referred to a higher referral centre for further assessment and management.

RESULTS

From Table 1 it is shown that the mean age of the study participants was 65.82 ± 5.67 years (range 60-82 years). The mean age of the males was found to be 68.1 ± 6.19 years (range 60-82 years), and the mean age of females was 65.7 ± 4.88 years (range 60-82 years). Approximately half (49.6%) of the participants belonged to the 60-64 age group. About three-fifths (59.8%) of the participants were women.

From Figure 1, more than half (55.1%) of the study participants showed some degree of cognitive impairment (mild to severe). Normal cognition was seen in less than half (44.9%) of the study participants.

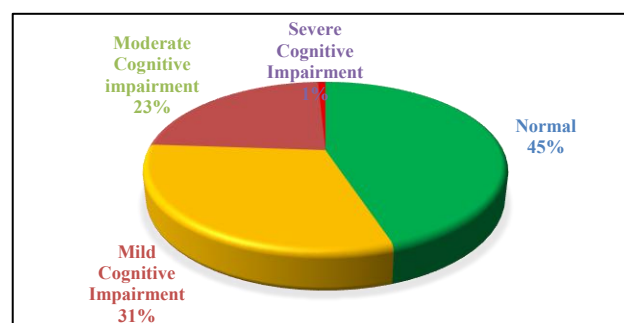


Figure 1: Distribution of study participants according to magnitude of cognitive impairment.

Table 1: Sociodemographic and clinical characteristics of study participants (n=256).

Sociodemographic characteristics	Male (%) n=103 (40.2)	Female (%) n=153 (59.8)	Total (%) n=256
Age (in completed years)			
60-64	42 (40.8)	85 (55.6)	127 (49.6)
65-69	18 (17.5)	35 (22.8)	53 (20.7)
70-74	27 (26.2)	25 (16.3)	52 (20.3)
75-79	10 (9.7)	05 (3.3)	15 (5.9)
≥80	06 (5.8)	03 (2.0)	09 (3.5)
Educational Status			
Illiterate	27 (26.2)	107 (69.9)	134 (52.3)
Primary school	33 (32.0)	32 (20.9)	65 (25.4)
Middle school	19 (18.4)	07 (4.6)	26 (10.2)
High school	21 (20.5)	02 (1.3)	23 (9.0)
Intermediate/diploma and above	03 (2.9)	05 (3.3)	08 (3.1)
Socioeconomic status #			
Upper middle	03 (2.9)	05 (3.3)	08 (3.1)
Lower middle	25 (24.3)	34 (22.2)	59 (23.1)
Upper lower	72 (69.9)	100 (65.4)	172 (67.2)
Lower	03 (2.9)	14 (9.1)	17 (6.6)
Clinical characteristic non-communicable diseases*			
Hypertension	79 (40.7)	115 (59.3)	194 (75.8)
Diabetes	50 (34.0)	97 (66.0)	147 (57.4)
Thyroid disorder	08 (23.5)	26 (76.5)	34 (13.3)
Chronic respiratory disease	09 (64.3)	05 (35.7)	14 (5.5)
Dyslipidemia	07 (53.8)	06 (46.2)	13 (5.1)
Coronary artery diseases	09 (75.0)	03 (25.0)	12 (4.7)
Others	03 (60.0)	02 (40.0)	05 (2.0)
Number of morbidities			
Mono morbidity	54 (52.4)	71 (46.4)	125 (48.8)
Bi morbidity	40 (38.8)	66 (43.1)	106 (41.4)
Tri morbidities	07 (6.8)	12 (7.9)	19 (7.4)
Poly morbidities	02 (2.0)	04 (2.6)	06 (2.4)

*Multiple response table, # According to Modified Kuppasamy scale (CPI 2025).

Table 2: Relationship between NCDs and cognitive impairment among study participants (n=256).

NCDs		Cognitive impairment		Test of significance χ^2	P value
		Normal N (%)	Impaired N (%)		
Hypertension (n=194)		83 (42.8)	111 (57.2)	0.853	0.356
Diabetes (n=147)		58 (39.5)	89 (60.5)	5.271	0.021
Thyroid disorder (n=34)		19 (55.9)	15 (44.1)	1.904	0.168
Dyslipidemia and others (n=18)		11 (61.1)	07 (38.9)	2.051	0.152
Chronic respiratory disease (n=14)		05 (35.7)	09 (64.3)	0.507	0.476
Coronary artery disease (n=12)		06 (50.0)	06 (50.0)	0.131	0.717
Morbidity					
Mono morbidity (n=125)		63 (50.4)	62 (49.6)	2.964	0.227
Bi morbidity (n=106)		42 (39.6)	64 (60.4)		
Poly morbidities (n=25)		10 (40.0)	15 (60.0)		
Duration of illness					
Hypertension	0-5 years	50 (54.9)	41 (45.1)	9.472	0.009
	6-10 years	19 (32.8)	39 (67.2)		
	>10 years	15 (33.3)	30 (66.7)		
Diabetes	0-5 years	30 (54.5)	22 (45.5)	12.247	0.002
	6-10 years	17 (29.8)	40 (70.2)		
	>10 years	10 (26.3)	28 (73.7)		
Thyroid disorder	0-5 years	09 (69.2)	04 (30.8)		0.306
	6-10 years	05 (38.5)	08 (61.5)		
	>10 years	05 (62.5)	03 (37.5)		
COPD	0-5 years	03 (75.0)	01 (25.0)		0.133#
	6-10 years	01 (33.3)	02 (66.7)		
	>10 years	01 (14.3)	06 (85.7)		
CAD	0-5 years	06 (66.7)	03 (33.3)		0.182#
	6-10 years	0	02 (100.0)		
	>10 years	0	01 (100.0)		
Dyslipidemia and others	1-5 years	06 (66.7)	03 (33.3)		0.674#
	6-10 years	0	02 (100.0)		

*Multiple response table, # - Fischer's exact test is used.

The most common non-communicable disease was hypertension, affecting nearly three-quarters (75.8%) of the study participants, followed by diabetes in more than half (57.4%) of the study participants. Others included 2 cases of cancer, 2 cases of stroke, and 1 case of chronic kidney disease. Among hypertensive study participants, the proportion of women was more (59.3%) as compared to men (40.7%). Among diabetics, a higher proportion in women (65.8%) was observed as compared to men (34%). Thyroid disorders were seen more in females (75%), while COPD (64.3%) and coronary artery disease (75.0%) were more common in males (Table 2).

Among the various NCDs, participants with hypertension (n=194) were most in number, and also more than half (57.2%) of the study participants were cognitively impaired. In patients with diabetes, around 60.5% showed impairment. COPD had a very high impairment rate, with nearly two-fifths (64.3%) of participants with impairment. In thyroid disorder, less than half (44.1%) had impaired cognition. Participants with dyslipidemia and others had better cognition, with more than sixty

percent (61.1%) having better cognition. Among the various NCDs, diabetes mellitus showed a statistically significant relationship with cognitive impairment ($p=0.021$). Hypertension, thyroid, COPD, CAD, dyslipidemia, and others (2 cases of stroke, 2 cases of cancer, 1 case of CKD) did not show any significant association with MoCA score ($p>0.05$). In participants with hypertension, only 45.1% were impaired in patients with less than 5 years duration, but it rose to more than three-fifths (67.2% and 66.7%) in patients with more than 6 years and 10 years' duration. In diabetes, this trend is stronger, where cognitive impairment showed a progressive increase with disease duration, from 45.5% (0-5 years) to 70.2% (6-10 years) to 73.7% (more than 10 years). In patients with thyroid disorders, the impairment increased at 6 to 10 years (61.5%) duration. The percentage of cognitive impairment steadily increased in participants with COPD. The duration of the illness with cognitive impairment showed a highly statistically significant relationship in the hypertension ($p=0.009$) and diabetes group ($p=0.002$). Due to small sample sizes, Fisher's exact test was used for other groups, which did not show any statistical significance ($p>0.05$).

DISCUSSION

Cognitive impairment is increasingly recognised as a major public health challenge in ageing populations, with far-reaching implications for functional independence, quality of life, and burden on caregivers. The burden is especially pronounced in low- and middle-income countries like India, where demographic ageing is occurring alongside a rapid epidemiological transition towards non-communicable diseases (NCDs) such as hypertension, diabetes mellitus, cardiovascular disease, stroke, and chronic respiratory illness. These chronic conditions contribute to cognitive decline through multiple mechanisms- including cerebrovascular damage, metabolic dysregulation, chronic inflammation, and neurodegeneration- ultimately increasing the risk of mild cognitive impairment (MCI) and dementia.

Among the various NCDs, participants with hypertension (n=194) were most in number, and also more than half (57.2%) of the study participants were cognitively impaired. In patients with diabetes, around 60.5% showed impairment. COPD had a very high impairment rate, with nearly two-fifths (64.3%) participants with impairment. In thyroid disorder, less than half (44.1%) had impaired cognition. Participants with dyslipidaemia and others had better cognition, with more than sixty percent (61.1%) having better cognition. Among the various NCDs diabetes mellitus showed a statistically significant relationship with cognitive impairment ($p=0.021$). hypertension, thyroid disorders, COPD, CAD, dyslipidaemia and others (mention diseases) do not show any significant association with MoCA score ($p>0.05$).

Many Indian and International studies have shown similar findings with a higher proportion of impaired people with hypertension.^{6,10-14} Because hypertension is associated with several forms of small vessel diseases, silent brain infarcts, smaller total brain volume, lower pathological threshold at which sign and symptoms of cognitive impairment manifest, more beta-amyloid deposition in the brain and altered cerebral spinal fluid profiles of various bio-markers responsible for cognition and dementia.¹⁵ On the other hand, many studies did not find any significant association between hypertension and cognitive impairment.^{4,16-21} Lack of significant association may be due to better treatment coverage, variability in duration of disease, or the influence of confounding factors. In our study, diabetes is the only NCD which turns out to be significantly associated with cognition. A similar study by Griffiths et al showed that the diabetes mellitus patients (RR 1.19, 95% CI 1.04-1.36) have an increased risk of cognitive decline.²² A case control study by Mishra et al revealed the statistically significant association between DM and cognition.²³ This finding highlights that diabetes is an important determinant of cognitive impairment in the elderly, likely due to mechanisms such as chronic hyperglycemia, insulin resistance, microvascular complications, and increased

risk of cerebrovascular changes that adversely affect brain function.

The mono morbid group showed nearly equal proportions of normal and impairment (50.4% and 49.6%). As the number of morbidities increased, the proportion of cognitive impairment steadily increased. In people with Bi-morbid conditions, 60.4% had cognitive impairment. For those with polymorbidity, more than half (60.0%) showed cognitive impairment. However, the number of morbidity conditions and cognitive impairment do not show any significance with the cognitive impairment ($p>0.05$). But other Indian and International studies show a significant association with multimorbidity.^{6,24-29} The trend in morbidity profile shows that impairment increases with the number of morbidities, but the lack of statistical significance may be due to small numbers in the poly-morbidity group and overlapping effects of individual diseases, such as diabetes and hypertension. Elderly individuals with multiple chronic conditions are more vulnerable due to cumulative effects on vascular health, medication burden, reduced physical activity, and psychological stress, all of which may impact cognitive function.

Cognitive impairment increased with the duration of the disease. In participants with hypertension, only 45.1% were impaired in the less than 5 years duration, but the proportion rose to more than three-fifths (67.2% and 66.7%) in participants with more than 6 years and 10 years duration. In diabetes, this trend was stronger, where cognitive impairment showed a progressive increase with disease duration, from 45.5% (0-5 years) to 70.2% (6-10 years) to 73.7% (more than 10 years). In patients with thyroid disorders, the impairment increased at 6 to 10 years (61.5%) duration. The percentage of cognitive impairment steadily increased in participants with COPD. The duration of the illness with cognitive impairment showed a highly statistically significant in the hypertension ($p=0.009$) and diabetes group ($p=0.002$). Due to small samples, Fisher's exact test was used for other groups. Many studies suggest similar findings where the association between cognitive impairment and duration of illness is found to be statistically significant.^{6,23,30,31} This demonstrates a clear dose-response relationship, indicating that longer duration of hypertension and diabetes significantly increases the risk of cognitive impairment in the elderly.

For other NCDs such as thyroid disorders, COPD, CAD, and dyslipidaemia, no statistically significant association was found with duration of illness, possibly due to the smaller sample sizes in each subgroup, which limited statistical power. However, within COPD patients, a higher proportion of impairment was noted in those with an illness duration of more than 10 years (85.7%), suggesting a possible trend that could not reach significance because of small numbers. Overall, these findings highlight that the chronicity of vascular and metabolic conditions such as hypertension and diabetes

plays an important role in cognitive decline among the elderly. Prolonged exposure to risk factors like hyperglycemia, insulin resistance, and vascular damage over time likely accelerates neurodegeneration, while the lack of significance in other conditions may be attributed to lower prevalence and smaller sample size in the present study.

Cognitive impairment needs to be screened which will help in predicting the development of dementia in future, especially among NCD patients. Although diagnosis can be done in secondary or tertiary care setting, screening and appropriate referral services can be done at primary health care level itself. Training of health workers is necessary to carry out the screening activities.

The findings of this study will help policymakers to formulate strategies for an inclusive engagement of primary care providers to identify and refer the cases of cognitive impairment among NCD patients at the earliest.

CONCLUSION

The screening for cognitive impairment should be routinely carried out by all physicians providing care to the geriatric population, preferably on a yearly basis. Patients with suspected cognitive decline should be referred early for further evaluation, which will help in achieving an earlier diagnosis and preventing the development of complications and further deterioration.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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