Prevalence and correlates of cognitive impairment among an urban geriatric population of Haryana

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Abstract

Background: Severe Cognitive Impairment (CI) is a major cause of disability and dependency among the elderly worldwide, and it has a significant impact not only on individuals but also on families, communities, and societies. Early identification and management of CI are critical in geriatric medicine. Prevalence data is often scarce, and this hinders the ground-level implementation of preventive health programs. **Objectives:** The objective was to find the prevalence of CI and its covariates among the urban geriatric population of Haryana. **Materials and Methods:** This was a community-based cross-sectional study conducted among 300 geriatric participants residing in an urban area of Rohtak district, Haryana. Hindi Mental State Examination (HMSE) tool was used to assess CI. Data were analyzed using IBM Corp, released 2020, IBM SPSS statistics for windows Ver 20, Armonk, NY. **Results:** The prevalence of geriatric CI was found to be 27.3% and was found to be significantly associated with age, female gender, scheduled and backward caste (BC), widowhood, and low educational status and is not engaged in any occupation, low socioeconomic status, teetotalism, economic dependency, physical dependency on others, and chronic morbidity. **Conclusion:** Age, female gender, scheduled and backward caste, widowhood, low educational status, nil employment status, low socioeconomic status, teetotalism, economic dependency, physical dependency on others, and chronic morbidity were found to be important correlates of CI. Further analytical studies can focus on these aspects for an early targeted preventive approach.

Keywords: Cognitive dysfunction cognitive impairment, geriatric assessment, geroscience, neurological impairment

Introduction

The population demographics of the world are changing rapidly due to an increase in life expectancy as a result of advances in health care. In developing countries like India, there is a gradual shift with an increase in the elderly population.[1] In the context of Haryana, the elderly population (>60 years) is expected to constitute up to 12.3% of the total population by 2031.[2]

The elderly population has its own unique set of health problems that require special focus, both in the context of individual care as well as programmatically. One such issue that requires special attention is loss of cognition or CI. Cognitive impairment may be defined as "pathological decay of cognitive function of brain such as memory, attention or learning ability, is normally the result of a pathological event: injury, disease, or increased levels of cognitive decline. It is not associated with the normal ageing process."[3]

Multiple studies conducted in the past decade indicate the prevalence of CI in the elderly to be between 3.5% to 86.5% (Median = 30.1%).[4] This is alarming as CI contributes to widespread disability and dependency for the elderly and

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Access this article online

Quick Response Code:

Website:
http://journals.lww.com/JFMPC

DOI:
10.4103/jfmpc.jfmpc_497_23

How to cite this article: Kumar N, Kumar M, Vinay, Saha A, Rathee M, Jyotsana, *et al*. Prevalence and correlates of cognitive impairment among an urban geriatric population of Haryana. J Family Med Prim Care 2024;13:2221-6.

poses a challenge for primary care physicians who are often the first contact for such patients. Effects of severe CI are multidimensional with ripples affecting the society as a whole. Worldwide CI contributes to 11.9% of years lived with disability (YLD) due to a noncommunicable disease. This leads to an increased financial burden on the individuals and their families.[5-7]

With an increase in the elderly population, India also faces the challenge of rising elderly dependency ratio (EDR), which is defined as "the ratio of the number of dependent elderly people at an age when they are generally economically inactive." EDR is expected to rise dramatically from 0.12 to 0.31 in the coming decade, putting a burden on the overly strained economy. Traditionally, in India, the family serves as the primary support for the elderly; however, this is gradually changing in the urban settings, due to the shifting of joint family to nuclear family structure, having fewer offsprings, migration of children due to education, occupation, or marriage. These factors culminate in social isolation, making the urban elderly more prone to CI and in need of an exhaustive evaluation to prevent subsequent morbidity.[8]

Even though CI is a very relevant topic in geriatrics still there is a paucity of studies on the prevalence and correlates of CI among the urban geriatric population in Haryana and none in Rohtak district. The current study was planned to fulfill this lacuna by exploring the hidden burden of CI in urban Rohtak.

Materials and Methods

Setting and study design

A community-based cross-sectional study was conducted among 300 geriatric volunteers residing in the urban Rohtak, Haryana during a period of 1 year between July 2020 to June 2021. The health needs of the area are catered to by three urban health, which were the nodal sites for line listing of eligible participants. The study was conducted after approval from the Institutional Ethics Committee (BREC/19/154 dated 12. 26. 19).

Inclusion criteria

The geriatric population (≥60 years) in the study area willing to participate/give informed consent were included in the study.

Exclusion criteria

Elderly individuals having a history of neurological disorders (stroke, Parkinson's disease, severe head injury, or brain neoplasm), having a gross visual, hearing, and/or speech impairment; having diagnosed psychiatric illness (schizophrenia and mental retardation); and severe illness at the time of the study were excluded.

Sample size calculation

The sample size of the present study was calculated using the formulae $N = 4PQ/L^2$. 26.06% was taken as the prevalence of CI among the elderly.[9] The maximum allowable error was taken as 20% of the prevalence. The minimum sample size was calculated to be 284. Totally 300 participants were recruited for the study (100 from each of the three urban health posts.)

Sampling technique and data collection

Survey registers from all the three health posts were utilized for line listing of the elderly subjects (≥60 years). 100 elderly individuals were selected from each health post using simple random sampling by lottery method. Selected elderly subjects were visited at their residence, and the required data was collected. The age of subjects was ascertained by Matriculation certificate/Driving License/Voter ID Card/Old Age Pension. If neither of these was available, age was calculated using some past significant national event. All selected persons ≥60 years not found at home, were visited again at an interval of 1 week and at least three times before labeling them as nonresponders, subjects were again selected by lottery method without replacement from the elderly who were left after the first round of sampling. After a brief rapport-building session, explaining the purpose of the study, and obtaining written informed consent, data were collected from the subjects using a pre-tested pre-validated interview schedule after administering the subject information sheet and obtaining consent.

Study tool

The study tool was a pretested pre-validated interview schedule consisting of 2 parts i) sociodemographic details, socio-economic details and factors which may correlate with CI and ii) the Hindi Mental State Examination scale (a modified and validated version of the Mini-Mental State Examination tool in vernacular language).[10] It is a 22-item scale with a maximum score of 30 assessing varying functions including orientation, registration, and recall information, attention and calculation, language, and visuospatial construction. MMSE scores are categorized as: i) 24–30 indicating normal cognition, ii) 18–23 indicating mild CI, and iii) 0–17 indicating severe CI. The socio-economic status of the individual was assessed using the Modified Kuppuswamy socio-economic scale.

Operational definitions

- Economically independent: If the subject was leading an economically productive life or getting any pension (in the case of retired employees or their widowed spouses) or living alone but getting a small amount like an old-age pension.
- Partially dependent economically: If the subject was having a small income like an old-age pension and was partially dependent on other family members for his/her livelihood.
- Totally dependent economically: If the subject was not getting any income and was totally dependent on other family members for his/her livelihood.
- Physically active: If the subject was able to do household work regularly or was involved in agriculture/labor or any such outdoor occupation.
- Physically inactive or lack of physical activity: If the

subject was able to do daily living activities on his/her own without requiring any sort of help from others but did not do household work regularly or was not involved in any occupation.

- Physically dependent on others for day-to-day activities: If the subject required any sort of help from others for activities of daily living (ADLs) like brushing, bathing, rising from bed, going to the bathroom/toilet, dressing, and undressing his/herself.
- Chronically morbid: if the subject was already diagnosed with him/herself reported one or more chronic morbidities. Using medication currently: if the subject was taking medication for the last 1 week.
- Current smoker: If the subject had smoked 100 cigarettes/bidis in his/her lifetime and currently smokes cigarettes/bidis.
- Past smoker: If the subject had smoked 100 cigarettes/bidis in his/her lifetime but had quit smoking at the time of the interview.
- Never smoker: If the subject had never smoked or smoked for less than 100 cigarettes/bidis in his/her lifetime.
- Habitual drinker: if the subject was consuming an average of >2 drinks/day given that the drinker was drinking on all or most days. For females, the average is more than 1 drink/day. Here drink was considered a standard beer or a standard glass of wine.
- Social drinker: if the subject only drank occasionally and did not feel the need to drink alcohol in order to have a good time with the recommendation that men between the ages of 21 and 65 should not consume >2 drinks/day and for women the limit is of 1 drink/day.

Statistical analysis

Data were compiled using MS Excel (MS Office ver. 2010) and analyzed using IBM Corp. released 2020, IBM SPSS statistics for windows ver. 20, Armonk, NY for Windows. Categorical data are presented as percentages (%). Pearson's Chi-Square test was applied to test the significance of differences between two or more proportions for categorized variables. In case, the expected cell count was less than 5 in more than 20% of cells, Fisher's Exact test's *P* value was applied. Binary logistic regression analysis (stepwise method) was used to evaluate the independent associations of various factors with the prevalence of geriatric CI. The variables having $P < 0.05$ (considered statistically significant) were reported as individual risk factors for CI. The results of logistic regression were reported as odds ratio (OR) with 95% confidence intervals (95% CI).

Results

The study was conducted on 300 participants (100 from each of the three urban health posts). 49.33% of the subjects were males and 50.66% were females. The mean age of the study participants was 69.81 ± 7.41 years. 53.33% of

subjects were aged between 60–69 years, 30.66% were aged between 70–79 years, and, 16% subjects were 80 years and above. 47.33% of the participants in the study belonged to backward caste (BC), 46.66% to general caste, and 6% to the scheduled caste (SC).

The majority (62%) of the subjects were married. About 49.33% of the elderly were educated up to secondary school and above, and 32% were illiterate. 41.33% of participants had already retired from active service, whereas, 26.66% of subjects were unemployed. The majority (74%) of them belonged to nuclear or three-generation families with 99.33% of them living with their families. A large proportion of the study population was in middle socio-economic strata: upper middle (46.66%) and lower middle (28%).

10.66% of the elderly smoked tobacco and 8% consumed alcohol. The proportion of elderly who were totally independent and those who were partially dependent economically were similar, with only 12.66% who were totally economically dependent. 69.33% were physically active with only 6.66% of subjects dependent on others for day-to-day activities.

65.33% had pre-existing chronic comorbidity, 44.66% were using prescribed medications, whereas 2% of subjects had a family history of neurocognitive disorders.

Figure 1 gives the prevalence of CI in the study population. 10.60% of subjects had severe CI, 16.7% had mild CI, whereas 72.70% had no CI. The overall prevalence was 27.3%.

Table 1 shows the association of various sociodemographic and socioeconomic variables with CI. The variables which had a statistically significant association were age groups, gender, caste, marital status, education, occupation, socio-economic status, alcohol use, economic dependency, physical activity, and chronic comorbidities ($P < 0.05$). Whereas, type of family, living arrangement, smoking history, current use of any medication, and family history of neurocognitive disorder didn't have any significant association with CI ($P > 0.05$)

Table 2 shows a multivariate logistic regression analysis of the various correlates of CI. Only statistically significant correlates
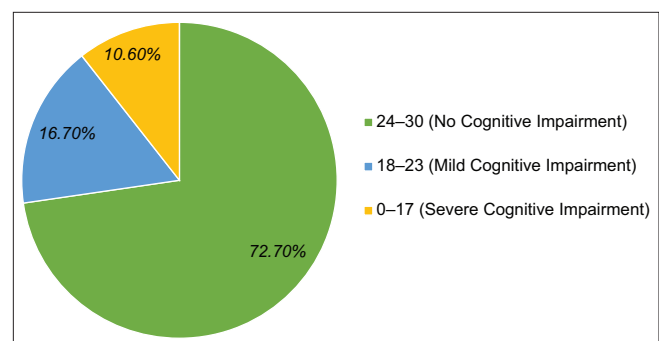
Figure 1: Distribution of study subjects according to HMSE Score (*n* = 300)

Table 1: Association of cognitive impairment with socio-demographic variables			
Variables	Frequency, n (%)	Cognitive Impairment, n (%)	P
Age Groups (Years)			
60–69	160 (53.33)	30 (36.5)	<0.001
70–79	92 (30.66)	24 (29.2)	
80 and above	48 (16)	28 (34.14)	
Gender			
Male	148 (49.33)	12 (14.63)	<0.001
Female	152 (50.66)	70 (85.36)	
Caste			
General	140 (46.66)	20 (6.66)	<0.001
SC	18 (6)	14 (4.66)	
BC	142 (47.33)	48 (16)	
Marital Status			
Currently in a Marital Union	186 (62)	32 (39.02)	<0.001
Not in Marital Union (Widow/Widower)	114 (38)	50 (60.97)	
Education			
Illiterate	96 (32)	68 (82.92)	<0.001
Primary	32 (10.66)	6 (7.31)	
Middle	24 (8)	4 (4.87)	
Secondary and above	148 (49.33)	4 (4.87)	
Occupation			
Unemployed	80 (26.66)	48 (58.53)	<0.001
Working Outdoors*	30 (10)	2 (2.43)	
Home Makers	64 (21.33)	24 (29.26)	
Retired from Service	124 (41.33)	8 (9.75)	
Type of Family			
Nuclear or Three Generation	222 (74)	64 (78.04)	=0.327
Joint	78 (26)	18 (21.9)	
Living Arrangement			
Alone	2 (0.66)	2 (2.43)	=0.074#
With Family	298 (99.33)	80 (97.50)	
Socio-economic Status			
Upper	24 (8)	0 (0)	<0.001
Upper Middle	140 (46.66)	16 (19.51)	
Lower Middle	84 (28)	36 (43.90)	
Upper Lower	50 (16.6)	28 (34.14)	
Lower	2 (0.66)	2 (0.66)	
Smoking History			
Current or Past Smokers	32 (10.66)	8 (9.75)	=0.745
NonSmokers	268 (89.33)	74 (90.24)	
Alcohol Use			
Habitual or Social Drinkers	24 (8)	0	=0.002
Never Drank	276 (92)	82 (100)	
Economic Dependency			
Independent	130 (43.33)	14 (17.07)	<0.001
Partially Dependent	132 (44)	52 (63.41)	
Totally Dependent	38 (12.66)	16 (19.51)	
Physical Activity			
Physically Active	208 (69.33)	44 (53.65)	<0.001
Lack of Physical Activity	72 (24)	24 (29.26)	
Dependent on Others for Day-to-day Activity	20 (6.66)	14 (17.07)	

Contd...

Table 1: Contd...			
Variables	Frequency, n (%)	Cognitive Impairment, n (%)	P
Chronic Comorbidities			
Yes	196 (65.33)	62 (75.60)	0.02
No	104 (34.66)	20 (24.39)	
Current Use of Any Medication			
Yes	134 (44.66)	44 (53.65)	0.055
No	166 (55.33)	38 (46.34)	
Family History of any Neurocognitive Disorder			
Yes	6 (2)	4 (4.87)	0.050
No	294 (98)	78 (92.85)	

#Fischers Exact Test; *Farmer/Labourer/Government Job/Private Job/Business

and their adjusted OR have been reported. The model is able to predict CI with an accuracy of 51% (Nagelkerke R^2 = 0.59).

Geriatric CI was 17 times more likely to occur in oldest-olds (80+ years) (aOR: 17.025, CI: 4.031–71.910, P = 0.000) and 5 times more in old-olds (70–79 years) (aOR: 4.526, CI: 1.311–15.625, P = 0.017) than young-olds (60–69 years); 648 times more in SCs (aOR: 647.816, CI: 28.938–14502.172, P < 0.000) and 5 times more in BCs (aOR: 5.170, CI: 1.350–19.799, P = 0.016) than general caste: 1,278 times more in illiterates (aOR: 1277.964, CI: (44.441–36749.524, P < 0.000), 33 times more in primary educated (aOR: 33.195, CI: 1.895–581.593, P = 0.017), and 26 times more in middle educated (aOR: 25.856, CI: 2.601–257.061, P = 0.006) than secondary educated and above; 143 times more likely to occur in those who were retired from service than those who were currently working outdoors (aOR: 0.007, CI: 0.000–0.911, P = 0.046); and 5 times more in those lacking in physically activity (aOR: 5.293, CI: 1.407–19.909, P = 0.014) than those who were physically active. Other variables were not found to be independently associated with geriatric CI.

Discussion

The prevalence of CI in the current study was found to be 27.3% in the urban geriatric population of Haryana. Nearly similar prevalence of CI was reported by Verma M *et al.* (2020), Jindal HA *et al.* (2019), and Bhatia MS *et al.* (2020),[11-13] whereas, Muhammed T *et al.* (2021) reported a lower prevalence of 13.7% in their data-based study, using data from the Longitudinal Ageing Study in India (LASI) Wave 1 (2017–18).[4] This could be due to the much larger sample size (n = 31,464) and usage of different study tools [cognitive module of the Health and Retirement Study (HRS)]. Similarly, Patel M *et al.* (2020) reported a higher prevalence of 51.2% in their mixed-method study in rural as well as urban areas of Jodhpur, Rajasthan.[14] This could be due to a higher proportion of females (59.4%) and a higher rate of illiteracy (53.6%) in their study as compared to ours.

In the current study, the prevalence of geriatric CI was found to be lowest among 60–69-year-olds (P < 0.001). Logistic regression

Table 2: Multivariate logistic regression table showing association of variables with geriatric cognitive impairment		
Variable	aOR (95% confidence intervals)	*P*
Age Groups (Years) 60–69	Reference	Reference
70–79	4.526 (1.311–15.625)	0.017
80 and above	17.025 (4.031–71.910)	0.000
Caste General	Reference	Reference
SC	647.816 (28.938–14502.172)	0.000
BC	5.170 (1.350—19.799)	0.016
Education Illiterate	1277.964 (44.441–36749.524)	0.000
Primary	33.195 (1.895–581.593)	0.017
Middle	25.856 (2.601–257.061)	0.006
Secondary and above	Reference	Reference
Occupation Retired from service	Reference	Reference
Working outdoors	0.007 (0.000–0.911)	0.046
Physical Activity Physically active	Reference	Reference
Lack of physical activity	5.293 (1.407–19.909)	0.014

analysis showed that CI was 17 times more likely to occur in the 80+ years age group and 5 times more in the 70–79-year age group as compared to 60–69 years. Similarly, Verma M *et al.* (2020), Dasgupta A *et al.* (2020), and Khanna AB *et al.* (2020) also noticed a similar higher prevalence of geriatric CI with advancing age.[11,15,16]

The prevalence of geriatric CI was found to be nearly 6 times higher in females (46.1%) as compared to males (8.1%) (*P* < 0.001). Patel M *et al.* (2020), Khanna AB *et al.* (2020), and Misra S *et al.* (2020) reported similar findings.[14,16,17] However, Verma M *et al.* (2020) observed that the prevalence of geriatric CI did not differ significantly among subjects of either gender. Significantly higher prevalence of geriatric CI among females can be attributed to the longer life expectancy in women.[11] Moreover, elderly females have to face triple jeopardy in old age, that is, of being old, of being female, and of being economically dependent.

A higher prevalence of geriatric CI was found among subjects not in a marital union (43.9%) (*P* < 0.001). Khanna AB *et al.* (2020) reported similar findings, whereas Verma M *et al.* (2020) observed that the prevalence of geriatric CI did not differ significantly with marital status.[11,16] A significantly higher prevalence of geriatric CI among subjects not in a marital union can be attributed to the fact that late-life support by a partner is a very positive attribute for the overall as well as cognitive health of the elderly whereas the reverse is an extremely negative life event, especially for females.

The majority of illiterate subjects (70.8%) were found cognitively impaired, followed by those who got primary education (18.8%). Prevalence of geriatric CI was found to be lowest among those who got secondary education or above (2.7%) (*P* < 0.001). Logistic regression analysis showed that there are higher odds of CI being present in individuals educated less than in secondary school. Educated elderly can easily remain engaged in some productive occupation in elderly ages, which itself has a protective role in neurocognitive disorders. Similar findings were reported by Dasgupta A *et al.* (2020), Khanna AB *et al.* (2020), and Kumari *et al.* (2021).[15,16,18] On the contrary, Verma M *et al.*

(2020) observed a significantly higher prevalence of geriatric CI among subjects with higher education status.[11] With respect to occupation, there were higher odds of CI being present in an individual who has retired from active service as compared to one who is working outdoors. Similar findings were also reported by Patel M *et al.* (2020) and Khanna AB *et al.* (2020).[14,16] A higher prevalence of geriatric CI among subjects not engaged in any occupation can be attributed to the fact that these subjects are generally confined to home with limited social interactions which is a negative influence on their cognitive health. CI was mainly seen in the middle (lower and upper) and lower socio-economic strata (*P* < 0.001). Similar findings were reported by Khanna AB *et al.* 2020,[16] whereas Verma M *et al.* (2020) observed a significantly higher prevalence of geriatric CI among subjects with higher per capita income.[11] The elderly with lower socioeconomic status are more likely to be less aware of their cognitive health, and only patients with major cognitive illnesses will access health care facilities.

The prevalence of CI was highest in the elderly who were totally or partially economically dependent. Similar findings were reported by Muhammad T *et al.* (2021).[4] This can be attributed to the fact that economically dependent elderly is considered a burden or liability in the majority of Indian families, hence given less care and support. With respect to physical activity, the lowest prevalence of geriatric CI was found among physically active subjects (*P* < 0.001) as regular physical activity may lead to higher levels of neuroprotective hormones such as endorphins in the nervous system thus maintaining good cognitive health.

The prevalence of geriatric CI was found to be 27.3% in an urban area of Haryana. Geriatric CI was found to be significantly associated with age, female gender, scheduled and BC, widowhood, low educational status, not engaged in any occupation, low socioeconomic status, teetotalism, economic dependency, physical dependency on others, and chronic morbidity. Logistic regression analysis found age ≥70 years, scheduled or BC, education below secondary, retirement from

service, and lack of physical activity as independent predictors of geriatric CI. The evidence generated suggests that it is important for primary care physicians to assess geriatric CI routinely as it may have varied implications on the treatment outcomes as well as on the quality of life.

This study being cross-sectional limits the exploration of causality of the different correlates listed. The true prevalence of chronic morbidities may be much higher than reported in the study. Moreover, CI itself can act as a correlate for various chronic morbidities. This inverse relationship was not assessed in our study.

Summary

The prevalence of geriatric CI was found to be 27.3% in an urban area of Haryana. It is important for primary care physicians to assess geriatric CI routinely as it may have varied implications on the treatment outcomes as well as on the quality of life.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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