Prevalence Study of Cognitive Impairment and its Associated Sociodemographic Variables using Mini-Mental Status Examination among Elderly Population Residing in Field Practice Areas of a Medical College

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Abstract

Context: The world is aging rapidly through “demographic transition.” The aging leads to CI Refers as Cognitive Impairment (CI) – a risk factor for dementia. A community-based cross-sectional study was conducted among the elderly aged ≥50 years. Objectives: The objective of the study is to estimate the prevalence of cognitive dysfunction among the elderly and to identify the associated sociodemographic variables. Settings and Design: This was a community-based cross-sectional study in rural and urban field areas of a medical college. Subjects and Methods: Participants aged ≥50 years were interviewed using a structured questionnaire and screened for cognitive dysfunction using Gujarati version of Mini-Mental Status Examination. A score of 23 out of 30 was taken as the cutoff. Written informed consent was obtained from participants. Statistical Analysis Used: Univariate and multivariate analyses were done using SPSS version 17 and Epi Info version 6 to identify significant variables. Results: Of 560 participants, 140 (25%) had CI. Rural (27.6%) and female (29.8%) prevalence was higher than urban (18.5%) and male (19.1%) prevalence. On multivariate analysis, age ≥60 years (odds ratio [OR]: 2.98) and illiteracy (OR: 39.8) had significant positive association with outcome; being employed (OR: 0.18), living with spouse (OR: 0.07), and living with spouse and children (OR: 0.08) had significant negative association with outcome. Conclusions: CI – a precursor of dementia – has serious clinical and public health consequences. Awareness generation and capacity building of primary health-care workers and family caregivers are core control strategies.

Keywords: CI Refers as Cognitive Impairment, elderly, mini-mental status examination, prevalence study

Introduction

The world is aging rapidly through “demographic transition.” In 2011, 11% global[1] and 8% Indian population is >60 years and would reach 19% by 2050.[3] The aging leads to CI Refers as Cognitive Impairment (CI) – a risk factor for dementia.[3,4] CI defines a transitional stage between normal aging and dementia and reflects the clinical situation where a person has memory complaints and objective evidence of CI but no evidence of dementia.[3] Although CI is not uncommon in late life and may be due to the normal process of aging, neuropathological changes of Alzheimer’s disease (AD) begin in the brain in the fifth decade of life years before clinical symptoms become evident.[4] AD pathology is more common in individuals with memory impairment who are not demented. Elderly individuals with memory impairment also have a rapid rate of conversion to AD.[4] Annual rates of conversion of mild CI Refers as Cognitive Impairment to dementia were found to be 5%–15%.[3] Considering usefulness of early screening (in 50s) in extending appropriate care to those at risk, the present study included participants in their 50s.

Studies in Taiwan[5] and India[6] reported a prevalence of 18.03% and 22.2%, respectively. No study on dementia or CI in the elderly could be identified from Gujarat. Hence, a
community-based cross-sectional study was conducted among the elderly aged ≥50 years with the following objectives:
1. To estimate the prevalence of cognitive dysfunction among people aged ≥50 years
2. To identify the associated sociodemographic variables.

Subjects and Methods
The community-based cross-sectional study was conducted in the rural and urban (three slums) field practice areas of medical college of Gujarat between March 2012 and August 2013. Individuals aged ≥50 years formed the study population.

Participant selection and recruitment
All individuals aged 50 years and above in rural and three out of six urban slum areas were line-listed from family records of the Department of Community Medicine and contacted through house-to-house visit by knocking each house with elderly once. Those who were willing to participate were evaluated for exclusion criteria. Those without exclusion criteria were asked to provide written informed consent and then interviewed. Uncooperative, terminally ill, and bedridden persons without dementia and persons with severe speech, visual, and hearing impairment were excluded from the study as they would be difficult to test for cognitive performance.

Study tools
Interviews were carried out using structured, coded questionnaires, and Mini-Mental Status Examination (MMSE) was used as screening tool for CI.

MMSE contains 22 items which test various areas of cognitive functions. Hindi MMSE (HMSE) was thought to be an appropriate screening tool considering lower literacy level among participants. English version of HMSE was translated into Gujarati and back-translated into English by two bilingual experts (percentage correlation = 87%). The score of 23 of 30 on Gujarati version of MMSE was selected as a cutoff value with sensitivity and specificity of 88% and 82%, respectively.

Sample size
The minimum sample size was estimated based on preliminary survey of randomly selected 39 participants, residing in the study area, using Epi Info (version 6) stat calculator using population survey command. Parameters entered were total population: 5500, acceptable error: 3% on either side, alpha error: 0.1, and prevalence on pretest: 28.2%. Calculated minimum sample size was 546 at 90% confidence level.

Data management and statistical analysis
Data entry was done in MS Excel 2007. Data analysis was done using SPSS software version 17.0 (SPSS Inc., Chicago) and Epi info version 6.0 (Centers for disease control and prevention: Atlanta) association between outcome, and independent variables were explored by univariate analysis. Significant variables on univariate analysis were fitted into step-wise multiple logistic regression model and adjusted prevalence odds ratios (ORs) were calculated.

Ethical issues
The study was approved from Human Research Ethics Committee of the institute. Informed written consent was obtained from all participants in the local language.

Results
A total of 560 (male – 251, 44.8% and female – 309, 55.2%) individuals were screened with MMSE (response rate = 64.9%). Rural (69.7%) and female (70.5%) response rates were greater than urban (55.6%) and male participants (59.1%). Distribution and prevalence of CI among study participants according to sociodemographic, education, occupation, and economic independent variables are detailed in Table 1.

The overall prevalence of CI was 25%. Of various independent variables mentioned in Table 1, age ≥60 years ($\chi^2 = 100.89$, $P = 0.000$), female gender ($\chi^2 = 8.37$, $P = 0.04$), rural residence ($\chi^2 = 5.10$, $P = 0.02$), not having life partner ($\chi^2 = 27.07$, $P = 0.000$), living with spouse and living with spouse and children ($\chi^2 = 38.9$, $P = 0.000$), being educated ($\chi^2 = 34.5$, $P = 0.000$), being employed ($\chi^2 = 54.8$, $P = 0.000$), and belonging to upper economic class ($\chi^2 = 9.2$, $P = 0.02$) were significantly associated with CI. Type of family was not significantly associated with CI ($\chi^2 = 2.69$, $P = 0.26$) [Table 1]. Table 2 details significant independent variables on multivariate analysis along with respective adjusted ORs. Age ≥60 years (OR: 2.98; $P = 0.018$) and illiteracy (OR: 39.81; $P = 0.017$) have significant positive and being employed (OR: 0.18; $P = 0.005$), living with spouse (OR: 0.07, $P = 0.032$), and living with spouse and children (OR: 0.08, $P = 0.02$) have significant negative association with CI on multivariate analysis [Table 2].

Discussion
In this study, the prevalence of CI was 25% with higher prevalence in rural and male participants. Poddar et al. and Sharma et al. also reported higher rural prevalence in North India. Goswami et al. reported greater prevalence in females (Female: 23.7% vs. Male: 12.2%) in Haryana. The prevalence of CI increases with age in both genders. A study reported 15% prevalence in aged >80 years as to 2.6% in aged <60 years. Age-related decreased brain volume, loss of myelin integrity, cortical thinning, and impaired secretion of neurotransmitters such as serotonin are attributed to CI.

Education and employment have strong negative and independent association with cognitive dysfunction. Participants with high school or higher (8.2%) and primary education had one-fifth and one-fourth likelihood of CI than illiterates (39.6%). Schmand et al. reported consistent decline in CI prevalence as level of employment increased from unskilled (39.3%) to professional (1.3%). According to cognitive reserve (CR) hypothesis, individuals with more CR (higher education, intelligence, and occupational attainment) are more successful at coping with brain damage and remain clinically intact for a longer period.
Social support in the form of living with spouse with/without children had protective association with CI on logistic regression. Fratiglioni et al.\(^\text{[15]}\) found that being single (OR: 1.5; 95% CI: 0.9–2.5) and living alone (OR: 1.5; 95% CI: 1.0–2.1) had negative association with cognitive problems among Swedish elderly.

Our study makes significant contribution by screening older adults for the condition. It also investigates related

### Table 1: Sociodemographic, education, occupation, and economic profile of participants (n=560)

| Variables                                         | Frequency (%) | Cognitive impairment (MMSE score <24) | $\chi^2$ (P) | OR (95% CI) |
|---------------------------------------------------|---------------|---------------------------------------|--------------|-------------|
| **Age groups**                                    |               |                                       |              |             |
| 50-54                                             | 175 (31.3)    | 12 (6.9)                              | 100.89* (0.000) | -           |
| 55-59                                             | 101 (18)      | 9 (8.9)                               | 1.33 (0.54-3.27) | -           |
| 60-64                                             | 118 (21.1)    | 35 (29.7)                             | 5.73 (2.82-11.61) | -           |
| 65-69                                             | 74 (13.2)     | 34 (45.9)                             | 11.54 (5.49-24.28) | -           |
| 70-74                                             | 52 (9.3)      | 24 (46.2)                             | 11.64 (5.22-25.93) | -           |
| 75-79                                             | 14 (2.5)      | 7 (50.0)                              | 13.58 (4.09-45.12) | -           |
| ≥80                                               | 26 (4.6)      | 15 (73.1)                             | 40.75 (12.65-131.25) | -           |
| **Sex**                                           |               |                                       |              |             |
| Male                                              | 251 (44.8)    | 48 (19.1)                             | 8.37 (0.04)  | -           |
| Female                                            | 309 (55.2)    | 92 (29.8)                             | 1.79 (1.20-2.67) | -           |
| **Residence**                                     |               |                                       |              |             |
| Urban                                             | 162 (28.9)    | 30 (18.5)                             | 5.10 (0.02)  | -           |
| Rural                                             | 398 (71.1)    | 110 (27.6)                            | 1.68 (1.07-2.64) | -           |
| **Marriage status**                               |               |                                       |              |             |
| Married                                           | 329 (58.8)    | 56 (17.0)                             | 27.07 (0.000) | -           |
| Widower/widower/divorced/separated (includes 1 unmarried) | 230 (41.2) | 84 (36.4)                             | 2.79 (1.88-4.13) | -           |
| **Type of family**                                |               |                                       |              |             |
| Joint                                             | 46 (8.2)      | 7 (15.2)                              | 2.69 (0.26)  | -           |
| Nuclear                                           | 198 (35.3)    | 53 (26.8)                             | 2.04 (0.86-4.83) | -           |
| Three generation                                   | 316 (56.4)    | 80 (25.3)                             | 1.89 (0.81-4.39) | -           |
| **Living arrangements**                           |               |                                       |              |             |
| Alone                                             | 41 (7.3)      | 18 (43.9)                             | 38.95 (0.000) | -           |
| With spouse only                                   | 58 (10.3)     | 15 (25.9)                             | 0.44 (0.19-1.04) | -           |
| With spouse and children                          | 260 (46.4)    | 36 (13.8)                             | 0.20 (0.10-0.41) | -           |
| With children only                                | 177 (31.6)    | 65 (36.7)                             | 0.74 (0.37-1.47) | -           |
| With siblings or relatives                        | 12 (2.1)      | 2 (16.7)                              | 0.25 (0.05-1.31) | -           |
| With spouse, relatives, and/or children           | 12 (2.1)      | 4 (33.3)                              | 0.63 (0.16-2.46) | -           |
| **Education**                                     |               |                                       |              |             |
| Illiterate                                        | 282 (50.4)    | 99 (35.1)                             | 34.56 (0.000) | -           |
| Primary                                           | 205 (36.6)    | 37 (18.0)                             | 0.41 (0.26-0.63) | -           |
| Secondary                                         | 53 (9.5)      | 4 (7.5)                               | 0.15 (0.05-0.43) | -           |
| Diploma/graduate/postgraduate and above           | 20 (3.6)      | 0                                     | 0.00 (0.00-0.00) | -           |
| **Occupation**                                    |               |                                       |              |             |
| Unemployed                                        | 5 (0.9)       | 2 (40.0)                              | 54.81 (0.000) | -           |
| Employed                                          | 263 (47.0)    | 30 (11.4)                             | 0.19 (0.03-1.20) | -           |
| Homemaker                                         | 212 (37.9)    | 67 (31.6)                             | 0.69 (0.11-4.24) | -           |
| Retired                                           | 80 (14.3)     | 41 (51.3)                             | 1.57 (0.25-9.95) | -           |
| **Economic class**                                |               |                                       |              |             |
| Upper                                             | 44 (7.8)      | 5 (11.4)                              | 9.20 (0.002)  | 0.31 (0.11-0.87) |
| Upper middle                                      | 124 (22.1)    | 23 (18.5)                             | 0.55 (0.28-1.05) | -           |
| Lower middle                                      | 136 (24.2)    | 35 (25.7)                             | 0.83 (0.45-1.52) | -           |
| Upper lower                                       | 171 (30.5)    | 52 (30.4)                             | 1.05 (0.59-1.85) | -           |
| Lower                                             | 85 (15.1)     | 25 (29.4)                             | -             | -           |

*Primary: 1st-8th standards, Secondary: 9th-12th standards, **Modified Prasad scale was used to determine income class using CPI of 221 of January 2013, $\chi^2$ for trend was used for education, occupation, and economic class. MMSE: Mini Mental Status Examination, CPI: Community Periodontal Index, CI: Confidence interval, OR: Odds ratio
sociodemographic factors. In our knowledge, no such study has attempted similar inquiry in the region. However, considering cross-sectional design, making causal inferences should exercise some caution and needs to be confirmed with more robust study design.

**Conclusion**

Serious clinical and public health consequences of CI refer as Cognitive Impairment and thus dementia demands awareness generation, capacity building of primary care workers in screening and community-based care and education of family care givers for dementia prevention and control.

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**Conflicts of interest**

There are no conflicts of interest.

**Table 2: Determinants of cognitive defect by step-wise logistic regression**

| Variables                     | Adjusted OR | 95% CI     | P       |
|-------------------------------|-------------|------------|---------|
| Age ≥60 years                 | 2.98        | 1.20-7.38  | 0.018   |
| Illiterate                    | 39.81       | 1.95-812.99| 0.017   |
| Employed                      | 0.18        | 0.05-0.60  | 0.005   |
| Living with spouse            | 0.07        | 0.01-0.80  | 0.032   |
| Living with spouse and children| 0.08        | 0.01-0.67  | 0.020   |

CI: Confidence interval, OR: Odds ratio

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