A study of dementia in old age homes

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ABSTRACT

Background: By 2040, dementia is projected to rise exponentially by 300\% in India. Studies addressing the need for psychiatric care in the community being few and those focusing in old age homes even fewer, a study was undertaken to study the prevalence of dementia and the association with sociodemographic factors and psychiatric morbidity. Materials and Methods: A total of 558 elderly aged 60 years and above, residing in old age homes in Pune were studied. 179 inmates were included based on the inclusion and exclusion criteria. Those who scored a predetermined cut-off score on the screening tool were included to undergo a detailed physical and neurological examination, cognitive profile using subtests from the cognitive test (community screening instrument for Dementia of 10/66 group). Results: Mean age of the sample was 75.02 years majority (39.7\%) was in the 60–70 years group. Males 25.7\% versus females 74.3\%. The sample consisted of the following socioeconomic groups: 40.2\% middle, 26.3\% low middle, 24\% high middle, 8.4\% high income, and 1.1\% in low income. 60.3\% widow/widower category, 36.3\% never married, 4.5\% had family history of dementia. Mean scores of mini mental state examination in the overall sample was 26.02 compared to 18.02 in those cut-off point of 23. The prevalence of dementia in the sample was 22.9\%. There was the high prevalence of psychiatric symptoms and psychiatric morbidity in the dementia group than the rest. Frontal lobe dysfunction and impairment of orientation with increasing severity of dementia were observed. Conclusions: Sociodemographic factors, which were considered protective against the prevalence of dementia, identified were less restriction in physical activity and having fish in the diet regularly.

Keywords: Co-morbidity, dementia, old age homes

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here is no greater certainty in life than death. The biological process of aging is steady and unidirectional. With decreasing mortality and people living to a riper age, dementia is projected to reach epidemic proportions.\cite{1} Alzheimer’s disease (AD) together with Parkinson’s disease and brain injury in strokes, is a threat to the wellbeing of the elderly.\cite{2} Currently, 24·3 million people have dementia and with 4·6 million new cases added every year the number affected would double every 20 years, expected to increase 81.1 million by 2040 which is a 100\% between 2001 and 2040 and more than 300\% in India, China, and their South Asian Pacific neighbors.\cite{1} In poor countries, the extended family can no longer act as a safety net for the elderly. Old age homes have shown more rates of depression and generalized anxiety disorder.\cite{3} Since epidemiological reports in old age homes from India are few\cite{4} the present work was undertaken to study the prevalence of dementia in old age homes in the city of Pune.

MATERIALS AND METHODS

The study was carried out in 12 old age homes in Pune. Institutional Ethical Clearance was obtained before starting the study. All the subjects gave written informed consent. The diagnosis was made based on ICD-10 diagnostic research criteria.
Sample
A total of 558 elderly aged 60 years and above in 12 old age homes in Pune were studied.

Out of them, 179 inmates were included based on inclusion and exclusion criteria.

Inclusion criteria
1. Age >60 years
2. Resident of “old age home”
3. Willingness to participate.

Exclusion criteria
1. Inability to follow the instruction in Hindi/English
2. Physical disability/medical illness.

Methods
Data were collected on a structured pro forma, sociodemographic, and geriatric mental state (GMS) questionnaire. After a brief mental state examination, they were screened by mini-mental state examination (MMSE) and a cut-off score of 23 and below were made to undergo a detailed cognitive profile using subtests from “cognitive test” (community screening instrument for dementia [CSI-D] of 10/66 group).[5] i.e. CSI-D, “Consortium to Establish a Registry for Alzheimer’s disease” (CERAD) 10-word list (CWL), the delayed recall test and a verbal fluency test.

i. CWL test ten words (culturally appropriate) were read out to the participants, and were asked to recall the words, the process repeated three times.
ii. “Animal naming verbal fluency task:” participants were asked to name as many different animals as they can in 1 min
iii. “Delayed recall of word list” to recall the 10 words (in any sequence) which was presented earlier. The evaluation was aimed at obtaining a cognitive profile for each subject.

The questionnaire of “sociodemographic and risk factor” and “GMS AGECAT ‘B’ package” were used to collect data on psychiatric morbidity and demographic data.

Statistical analysis
Data were analyzed using SPSS Version 16 (IBM, Chicago, USA) using appropriate statistical tests.

RESULTS AND DISCUSSION

Based on the findings of the epidemiological study which reported an average of 20.5% psychiatric morbidity in older adults, it is estimated that 17.13 million older adults (total population, 83.58 million) may be suffering from psychiatric disorders in India.[6]

Sociodemographic risk factors

Age
179 residents above the age of 60 years completed the study. The mean age was 75.02 ± 8.78 years. The majority of the sample fell into the age group of 66–70 (24%). In the number of elderly 39.7% was below 71 years, 36.3% in 71–80 age group, and 24% in 80 + age group. The mean age in this sample is lower when compared to the mean from the care facilities from developed countries (83.9 years).[7] The mean age of the residents without dementia/with dementia was 73.06 years (standard deviation [SD] = 7.6)/81.06 years (SD = 9.1) (odds ratio [OR] = 3.73 (95% confidence interval [CI] = 2.27–6.16, \( P \leq 0.001 \)). As in the present study increasing prevalence of dementia with age has been reported from the Indian community.[8]

Prevalence of dementia
The prevalence of dementia varies higher in the developed than in the developing countries. Indian studies have reported a prevalence rate of 1.3–3.6 from rural areas and 2.4–2.7 in urban areas.[9] This association of increase in proportion of people with dementia with increasing age was statistically significant (OR = 8.73, 95% CI = 3–27.21) \( \chi^2 \) = 23.529 \( P < 0.001 \); Table 1.

Gender
Most studies have found that the risk of AD is greater in women. Although studies show the presence of estrogen as a protective factor,[10] higher survival rates in women than men, could also be a reason.[11] The proportion of males to females who are likely to have dementia was 12/46 (26.1%) as opposed to 29/133 (21.8%). The risk of dementia was higher in men (OR = 1.27, 95% CI = 0.7–2.25, \( P > 0.551 \)), but the difference is not statistically significant.

Socioeconomic status and education
Socioeconomic status also influences the various available health facilities. When the data was compressed into two groups, with the first group comprising of those from high to the middle group and the second low middle and low group, the association was worked out to be significant. The study compared the effect of education on cognitive decline. Some studies show no relation to the age of onset or rate of progression but others find a positive correlation to increased incidence of dementia.[12] The study reflects the latter [Table 2].

Religion
Representation by religion among those with dementia revealed that the majority of them were Hindus, followed by Christians, Buddhist, and Muslims. Though the association seems to be lower in the Christians, statistically not relevant.
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Marital status
Marital status showed a higher number of people with dementia among the “never married” group (29.2%) as compared to the “widow/widower” group (20.4%). The risk of dementia in the “never married” is higher than widowed but statistically not relevant. OR = 1.36, (95% CI = 0.6–3.01, P > 0.414).

Family history
Genetic factors, notably the ApoE4 gene may be responsible for late-and early-onset cases. In this study, those with family history of dementia 75% (6/8) had dementia. There was an increased association of dementia in those with family history than those without [Table 3 and Figure 1].

Co-morbidity
Co-morbidity with diseases like diabetes and hypertension and Stroke is common in the aged. The observed association between stroke and AD might relate to an underlying systemic vascular disease process. Increase in risk of dementia is independently associated with stroke, diabetes, and HIV.[13-15] In this study, the risk of dementia in those with diabetes mellitus or stroke, independently is not statistically significant. When combining the factors of hypertension and stroke together in this study the risk increases significantly [Table 4].

Restriction in activity, poor vision, and hearing loss
“Staying active is important to healthy aging.” In the aged “communication” is the most affected. Sensory loss (visual and/or hearing loss) is prevalent in older adults. People with sensory loss frequently experience communication breakdown.[16] There were 31.8% of residents of old age homes who had restricted physical activity. With decreasing mobility, there is an increase in risk of dementia. The risk of dementia is less in those with less restriction in physical activity [Table 5]. With poor vision/hearing and attendant restricted activity, there is an increased percentage of people with dementia. The risk of having dementia increases with increasing disability [Tables 6 and 7].

Nutrition
Nutrition plays an important role in the process of aging. One study showed that having fish >3 times/week increases the availability of docosahexaenoic acid which is found to be lower in the brain of people with dementia.[17] Analyzing the study group for intake of fish it was found that of all surveyed 62.6% did not take fish and the prevalence of dementia in those who did not take fish as against those who did was significantly higher [Table 8].

Screening instrument scores
The mean MMSE found in our study sample was 26.02 (SD = 3.98) and those with dementia were 18.02 (SD = 5.81). A cut-off score of 23 on MMSE was taken for dementia and 41 (22.9%) of the study sample

Table 1: Prevalence of dementia stratified according to age

| Age group | Dementia | χ² | P   |
|-----------|----------|----|-----|
|Absent, n (%) | Present, n (%) |     |     |
| 60-70 | 64 (90.1) | 7 (9.9) | 23.529 (df 2) | P<0.001 significant |
| 71-80 | 52 (80.0) | 13 (20.0) |     |     |
| 81 and above | 22 (53.2) | 41 (48.8) |     |     |
| Total | 138 | 41 |     |     |

Table 2: Educational status of the study group cross tabulated with dementia

| Education | Total | Dementia | Fisher’s exact test |
|-----------|-------|----------|-------------------|
| Absent, | Present | | |
| Illiterate (n) | 35 | 14 | 21 | P<0.000 |
| Middle school or lower (n) | 93 | 76 | 17 |
| Higher secondary (n) | 34 | 34 | None |
| Graduation or higher (n) | 17 | 14 | 3 |
| Total (n) | 179 | 138 | 41 |

Table 3: Family history of dementia cross-tabulated prevalence of dementia

| Family history of dementia | Dementia | Total |
|---------------------------|----------|-------|
| Absent, n (%) | Present, n (%) | | |
| No, | 136 (79.5) | 35 (20.5) | 171 (100.0) |
| Yes (n) | 2 | 6 | 8 |

OR was 0.09 (95% CI=0.01-0.52, P<0.002). OR – Odds ratio; CI – Confidence interval

Table 4: Composite table depicting association of dementia and group with hypertension/DM/stroke

| Hypertension/DM/stroke | Dementia | Absent |
|------------------------|----------|--------|
| Present | 14 | 28 |
| With a history of diabetes (on OHA) | 3 | 22 |
| With a history of stroke | 2 | 4 |

OR=3.67 (95% CI=0.8-21.62, P<0.05). OR – Odds ratio; CI – Confidence interval, AHA – Anti-hypertensive agents, OHA – Oral hypoglycemic agents
In our study, the mean score was 26.50 (SD 3.50) in those with dementia, which is statistically significant [Table 5]. The mean score of 26.50 in this category is quite similar to those without depression (25.96) and in the total sample (26.02) [Table 9].** The mean score of 26.50 in this category is quite similar to those without depression (25.96) and in the total sample (26.02) [Table 9].** Table 10 shows a trend of decreasing MMSE scores for more severe grade of dementia, which is statistically significant [Table 10].

**Consortium to establish a Registry of Alzheimer’s Disease Word List**

Consortium to Establish a Registry for AD (CERAD) is a widely used test that has shown high accuracy in dementia. Predetermined cut-off “13” has been found to have specificity of “96%” and sensitivity of “91%.”** In our study, the mean was 8.10 (SD 3.7) and differentially across the grades of dementia they were 9.61 (SD 3.5), 6.29 (SD 3.3) and 5.75 (SD 2.5) in mild, moderate, and severe dementia, respectively, which was statistically significant [Table 11].

**Word fluency**

Word fluency test has been used in a few studies and a predetermined cut off “11” was found to be having a sensitivity of “73.8%” and specificity of “87.1%.”** The mean scores for word fluency, among the participants with dementia, in our study, were 5.49 (SD = 2.2), and differentially across the grades of dementia were 6.2 (SD = 2.5), 4.6 (SD = 1.2), and 3.6 (SD = 0.5) in mild, moderate and severe dementia which was statistically significant [Table 11].

**Delayed word list recall**

Delayed recall tests have high accuracy for dementia diagnosis, especially for AD.** In an American study, the cut-off to determine dementia was “3” with a sensitivity of “74.2%” and specificity of “82.4%.”** In our study, the mean value of delayed recall was 1.4 (SD 1.4), and tabulated across the grades of dementia it was found to decrease from 1.96 (SD 1.6), 1 (SD 0.8) to 0.5 (SD 1.4) [Table 11]. The study found statistically significant deterioration in cognitive profile with increasing severity of dementia.

**Prevalence of psychiatric morbidity**

The prevalence of depression ranges from 13% to 14%. Higher prevalence rates of depression have been found in females.** Psychomotor retardation to aggressive stance was found to have a more male preponderance

had dementia. To remove the effect of depression on cognitive score a subcategory of depression was analyzed.

### Table 5: Age wise decrease in mobility

| Age group | None | Mild | Moderate | Severe | Total |
|-----------|------|------|----------|--------|-------|
| 60-70 (n) | 61   | 7    | 2        | 1      | 71    |
| 71-80 (n) | 44   | 13   | 7        | 1      | 65    |
| 81 and above (n) | 17 | 11   | 13       | 2      | 43    |
| Total, n (%) | 122 | 31   | 22       | 4      | 179   |

Mean±SD: 26.50±3.50

### Table 6: Decreased mobility cross-tabulated with dementia (n=179)

| Restriction in activity due to visual impairment | Dementia Present | Absent (n) | Total (n) |
|------------------------------------------------|-----------------|------------|-----------|
| Visual/hearing problem                          | 116/134         | 4/16       | 120/150   |
| No interference                                 | 4               | 24         | 28        |
| Interferes a little                             | 14/2            | 8/3        | 22/5      |
| Interferes a lot                                | 4/0             | 9/7        | 9/7       |
| Total, n (%)                                    | 138 (77.1)      | 41 (22.9)  | 179 (100.0)|

OR=3.10, 95% CI=1.2-7.5, P<0.005. OR – Odds ratio; CI – Confidence interval

### Table 7: Correlation of restricted activity due to visual/hearing impairment with dementia

| Frequency of eating fish | Dementia Present | Absent (n) | Total (n) |
|--------------------------|-----------------|------------|-----------|
| Never                    | 76              | 36         | 112       |
| Some days                | 24              | 4          | 28        |
| Most days                | 38              | 1          | 39        |
| Total                    | 138             | 41         | 179       |

OR=4.89 (95% CI=1.86-15.03, P<0.003). OR – Odds ratio; CI – Confidence interval

### Table 8: Fish in diet cross-tabulated with the prevalence of dementia

| MMSE scores | Minimum | Maximum | Mean±SD |
|-------------|---------|---------|---------|
| MMSE scores in those with dementia (n=43) | 2       | 23      | 18.02±5.81 |
| MMSE scores in those with depression (n=16) | 17      | 29      | 26.50±3.50 |
| MMSE scores in those without depression (n=163) | 2       | 30      | 25.96±4.04 |
| MMSE scores (n=179) | 2       | 30      | 26.02±3.98 |

MMSE – Mini-Mental State Examination; SD – Standard deviation

The mean score was 26.50 (SD 3.50) in those with dementia, which is statistically significant [Table 5]. The mean score of 26.50 in this category is quite similar to those without depression (25.96) and in the total sample (26.02) [Table 9].** Table 10 shows a trend of decreasing MMSE scores for more severe grade of dementia, which is statistically significant [Table 10].

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**Delayed word list recall**

Delayed recall tests have high accuracy for dementia diagnosis, especially for AD.** In an American study, the cut-off to determine dementia was “3” with a sensitivity of “74.2%” and specificity of “82.4%.”** In our study, the mean value of delayed recall was 1.4 (SD 1.4), and tabulated across the grades of dementia it was found to decrease from 1.96 (SD 1.6), 1 (SD 0.8) to 0.5 (SD 1.4) [Table 11]. The study found statistically significant deterioration in cognitive profile with increasing severity of dementia.

**Prevalence of psychiatric morbidity**

The prevalence of depression ranges from 13% to 14%. Higher prevalence rates of depression have been found in females.** Psychomotor retardation to aggressive stance was found to have a more male preponderance

### Table 9: Variation of mini-mental state examination scores in various subcategories

| MMSE scores | Minimum | Maximum | Mean±SD |
|-------------|---------|---------|---------|
| MMSE scores in those with dementia (n=43) | 2       | 23      | 18.02±5.81 |
| MMSE scores in those with depression (n=16) | 17      | 29      | 26.50±3.50 |
| MMSE scores in those without depression (n=163) | 2       | 30      | 25.96±4.04 |
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MMSE – Mini-Mental State Examination; SD – Standard deviation

had dementia. To remove the effect of depression on cognitive score a subcategory of depression was analyzed.
in Western studies.\[^{22}\] GMS AGECAT data showed that the commonest symptom was worry (38.5%) followed by depression (21.2%), generalized anxiety (16.7%), change in behavior (12.8%), change in affect (4.4%), problems with orientation (3.3%) and persecutory delusion (0.5%). Our findings are in agreement with studies from India that show a preponderance of depressive disorders (7%–13.4%) followed by dementia (6.7%), schizophrenia (3%), and generalized anxiety disorders (2%–8%).\[^{23}\]

Comorbidity in those with dementia (n = 41) and those without (n = 138) statistically relevant morbidity was highest with “generalized anxiety disorder,” and the risk is higher in dementia – OR = 2.95 (95% CI 1.21–7.02, P < 0.006). The risk for depression was found to be higher in those with dementia than in those without [Table 12]. Statistically significant increase in risk was seen in “generalized anxiety disorder” (OR = 2.95, P < 0.006).

### Neurological findings

**Frontal lobe dysfunction was seen in 22 cases (55%) [Table 13].** When cross-tabulated with the severity of dementia it was found that in mild dementia it was only in 43.5% of the total, whereas increased to 64.3% in those with moderate dementia and all the patients with severe dementia had frontal lobe dysfunction. This shows the trend that frontal lobe dysfunction increases with the severity of dementia and was nearing statistical significance (P < 0.08). 15% of the population with dementia had impaired orientation. People with impaired orientation are older, with more severe grades of dementia.

### CONCLUSIONS

The overall prevalence of dementia aged above 60 years was 22.9%. The prevalence of dementia increased with increasing age. Cognitive profile, represented by CERAD (word list), word fluency test, and delayed recall test, too showed a trend to decrease with increasing severity of dementia.

Sociodemographic factors protective against dementia were less restriction in physical mobility and having fish regularly and those considered a higher risk of dementia, were male and unmarried.

Psychiatric morbidity was higher in those with dementia with significant comorbidity of generalized anxiety disorder. There was a higher prevalence of frontal lobe dysfunctions and impairment in orientation with increasing severity of dementia.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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**Table 10: Mini-mental state examination scores in various grades of dementia**

| Grades of dementia     | Score of MMSE (mean±SD) |
|------------------------|--------------------------|
| Mild dementia (n=23)   | 21.30±1.893              |
| Moderate dementia (n=14) | 16.07±4.731            |
| Severe dementia (n=4)  | 6.00±5.831              |
| Total                  | 18.02±5.812             |

MMSE – Mini-mental state examination; SD – Standard deviation

**Table 11: Mean of delayed recall, word fluency with increasing grades of dementia**

| Grades of dementia     | CERAD word list | Word fluency | Delayed word list recall |
|------------------------|-----------------|--------------|-------------------------|
| Mild dementia (n=23)   | 9.61±3.577      | 6.27±2.511   | 1.96±1.609              |
| Moderate dementia (n=14) | 6.29±3.338    | 4.64±1.216   | 1.00±0.877              |
| Severe dementia (n=4)  | 5.75±2.500      | 3.57±0.577   | 0.50±1.000              |
| Total                  | 8.10±3.760      | 5.49±2.211   | 1.49±1.434              |

CERAD – Consortium to establish a registry of Alzheimer’s disease; SD – Standard deviation

**Table 12: Psychiatric co-morbidity in those with dementia**

|                      | General anxiety disorder | Depression | Delusional disorder |
|----------------------|--------------------------|------------|--------------------|
| In those with dementia (n=41), n (%) | 14 (35)                 | 10 (25)    | 1 (2.5)            |
| In those without dementia (n=138), n (%) | 16 (11.6)               | 18 (20)    | None               |
| OR                   | 2.95                     | 1.20       | Cannot be calculated |
| 95% CI               | 1.21–7.02                | 0.48–2.81  |                     |
| P                    | 0.006                    | 0.663      | 0.00               |

OR – Odds ratio; CI – Confidence interval

**Table 13: Description of neurological signs present in those with dementia (n=41)**

|                      | Frontal lobe function, n (%) | Parkinsonism, n (%) | Orientation, n (%) | Primitive reflex, n (%) | Gaze palsy |
|----------------------|-----------------------------|---------------------|--------------------|-------------------------|-----------|
| Number deranged      | 22 (55)                     | 3 (7.5)             | 6 (14.6)           | 1 (2.5)                 | None      |
| Number not deranged  | 19 (45)                     | 38 (92.5)           | 35 (85.3)          | 40 (97.5)               | None      |
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