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**Original Research Article**

# Screening for dementia using picture memory impairment screen among older adults in an urban underprivileged area of Bangalore city, India

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## ABSTRACT

**Background:** Under detection of dementia is a major challenge in low and middle income countries with 90% of dementia cases remaining unidentified in India. The objective of the study was to assess the prevalence and risk factors of dementia among older adults living in an urban underprivileged area of Bangalore city, India using the picture memory impairment screen (PMIS).
**Methods:** This community based cross sectional study was conducted between September and November 2013 among 202 elderly people in an underprivileged area of Bangalore city. Dementia was defined using a validated cut-off score on the PMIS.
**Results:** The mean age of the participants was 68 years and 65% were illiterate. The overall prevalence of dementia using the screen among elderly people was 15.3%. Age specific prevalence rates were 7.8% (60 to 70), 30.6% (71 to 80) and 61.5% (>80 years) respectively. Increasing age, family history, lower educational and functional status were significantly associated ($p<0.05$) with dementia.
**Conclusions:** High prevalence of dementia was identified among an urban underprivileged elderly population. The PMIS can be used to triage older adults for further evaluation and management.

**Keywords:** Dementia, Picture memory impairment screen, Elderly, Underprivileged area

## INTRODUCTION

Cognitive screening is an integral part of assessing the health care needs of the elderly.[1,2] Dementia is an acquired syndrome of decline in cognition including memory sufficient to interfere with social or occupational functioning in an alert person. Early recognition of significant memory loss may result in potential benefit using preventive strategies.[3] Evidence suggests that elderly people with dementia in developing countries under-utilize health care services.[4]

The proportion of elderly people in India has increased from 6.9% (2001) to 8.3% (2011).[5] Around 3.7 million people were affected by dementia in 2010 and this is expected to double by 2030.[6,7] Even in high income countries only 20% to 50% of elderly persons with dementia are recognized in primary care, with the situation being worse in low and middle income countries.[7-10] Effective primary care screening could potentially double the number of elderly persons who could benefit from careful planning of potential interventions.[1]

Very few community based studies have been done to explore this problem in developing countries like India especially in urban underprivileged areas.[11-13] A major limiting factor in identifying dementia is the lack of cognitive screens that account for cultural differences and variable literacy rates. Also, many cognitive screens are lengthy and not designed for non-specialist use.[14-17] Recently, investigators from the Kerala-Einstein study developed a picture based cognitive screening tool to overcome such limitations.

### *Objectives*

To assess the prevalence and factors associated with dementia among older adults in an urban underprivileged area using the picture memory impairment screen (PMIS).

## METHODS

A cross-sectional study was conducted in an urban underprivileged area of Bangalore with a population of around 5000 between September and November, 2013. Previous community-based studies estimate the prevalence of dementia among the elderly to range from 1.5% to 14.89%.[7,9,10,18-21,23] Considering a prevalence of 5% with 3% absolute precision at 95% confidence interval our sample size was calculated to be 202.[20] We included all older adults above 60 years who were permanent residents of the area (at least one year of residence). A house-to-house survey was conducted in the study area and 437 elderly people were identified, with 426 fulfilling the inclusion criteria. People who were unable to answer due to illness other than dementia, including severe visual impairment, hearing impairment and those with a known psychiatric illness were excluded. 7 people refused to participate and 4 were uncontactable. Systematic random sampling with a sampling interval of 2 was done to select study subjects. If there were more than 1 elderly person in the same house the participant was selected by lottery technique.

The study tool included a structured interview schedule which had three parts.

A) Demographic details and variables like morbidity, habits and family history of dementia

B) Activities of daily living (ADL) using the Barthel index. The score ranges from 0 to 20 with lower scores indicating increased disability.[18]

C) PMIS–The PMIS is a screening tool with four pictures from different categories. The pictures are first learned by identifying each item when its category cue is presented. Memory is tested by free recall after a 2-3 minute delay with interference. If any items are not retrieved by free recall, the category cues for those items are provided to elicit cued recall of those items. The PMIS has been validated in India with a specificity of 99.2% and sensitivity of 95.4% at a cut-off score of 5 out of 8.[10]

Institutional ethical committee approval was taken for the study. The study tool was translated into the local language (Kannada) and back translated to ensure quality. A pilot study was conducted in a non-study area and suitable modifications were incorporated. After taking written informed consent from patients and proxy written consent from caretakers (if patient was not able to give consent), data was collected from 202 elderly people.

### *Statistics and analysis of the data*

The data was coded and entered in Microsoft Excel and statistical analysis was performed using SPSS. Sample characteristics were described by mean (SD) and percentage (N) for continuous and categorical variables respectively. Pearson's chi-square test and Fisher's exact test were used to find association between categorical variables. Spearman correlation coefficient and Mann Whitney U test were used when appropriate. A $p<0.05$ was considered to indicate statistical significance.

## RESULTS

Out of the 202 participants interviewed, 75.74% (153) were in the age group of 60–70 years with a mean age of 68.01 years (SD 8.18 years). Educational status of the participants was low with nearly 65% (130) being illiterate. The mean years of schooling were 2.2±3.5 years. Nearly 71% (144) of participants belonged to below poverty line and 83% (168) of the elderly people were not currently working. Majority of the subjects 56% (114) were widows or widowers. The socio-demographic profile is shown in Table 1.

The prevalence of self reported tobacco and alcohol use was 52.9% (107) and 13.36% (27) respectively. Nearly 9% (19) people used both tobacco and alcohol. 52% (105) of the subjects reported having an illness at the time of the interview (either acute or chronic illness). Chronic illnesses included hypertension (36.1%), diabetes mellitus (22.3%), musculoskeletal pain (8.4%), asthma (1%), ischemic heart disease (1%) and others (4%). Acute illness included upper respiratory tract infections, viral fever and acute gastroenteritis.

As assessed by the Barthel ADL scale, only 36.1% (73) were functionally completely independent (score=20). The mean and median score in ADL were 18.01±3.43 and 19 (18, 20) respectively.

Using PMIS, 15.3% (31) of the elderly people screened positive for dementia. The mean and median scores in PMIS were 6.6±1.9 and 7 (6, 8) respectively. There was statistically significant positive correlation between PMIS scores and ADL scores (Spearman correlation coefficient ($\rho=0.38$; $p<0.001$) and a significant negative correlation between PMIS scores and age ($\rho=0.32$; $p<0.001$). The age specific prevalence rates were 7.8%, 30.6% and 61.5% for dementia among the age groups of 60 to 70, 71 to 80 and above 80 years respectively. 84.6% (22) of the people who had a family history of dementia and 20%

(26) of the uneducated screened positive for dementia. Among males and females the prevalence rates were 11.5% (7) and 17% (24) respectively. Statistically significant associations were found between the prevalence of dementia and age, family history of dementia, educational status and functional status of the participants.

**Table 1: Socio-demographic profile of the study population (N=202).**

| Sl. No. | Variables | | Percentage (no) |
|---|---|---|---|
| **1** | Age (in years) | 60-70 | 75.7 (153) |
| | | 71-80 | 17.8 (36) |
| | | >80 | 6.4 (13) |
| **2** | Education (Highest education attained) | Uneducated | 64.4 (130) |
| | | Class (1-7) | 21.8 (44) |
| | | Class 8 and above | 13.8 (28) |
| **3** | Gender | Males | 30.2 (61) |
| | | Females | 69.8 (141) |
| **4** | Religion | Hindu | 62.4 (126) |
| | | Muslim | 12.9 (26) |
| | | Christian | 24.8 (50) |
| **5** | Type of family | Nuclear | 43.6 (88) |
| | | Joint | 10.9 (22) |
| | | Three generation | 45.5 (92) |
| **6** | Socioeconomic status | Above poverty line card | 14.4 (29) |
| | | Below poverty line card | 71.3 (144) |
| | | No card | 14.4 (29) |
| **7** | Current occupation | Not working | 83.2 (168) |
| | | Daily wage laborer | 13.4 (27) |
| | | Others | 3.4 (7) |
| **8** | Financial dependence | Fully dependent | 75.2 (152) |
| | | Fully independent | 20.3 (41) |
| | | Partially dependent | 4.5 (9) |
| **9** | Currently living | Alone | 9.9 (20) |
| | | Spouse/Children/Both | 88.1 (178) |
| | | Others | 2 (4) |

**Table 2: Association of factors with dementia.**

| Variables | | Dementia positive (n=31) | Dementia negative (n=171) | Total (n=202) | P value |
|---|---|---|---|---|---|
| | | % (N) | % (N) | % (N) | |
| **Gender** | Male | 11.5 (7) | 88.5 (54) | 100 (61) | 0.315 |
| | Female | 17 (24) | 83 (117) | 100 (141) | |
| **Age (years)** | 60 - 70 | 7.8 (12) | 92.2 (141) | 100 (153) | <0.001 |
| | 71 - 80 | 30.6 (11) | 69.4 (25) | 100 (36) | |
| | >80 | 61.5 (8) | 36.5 (5) | 100 (13) | |
| **Family history of dementia** | Yes | 84.6 (22) | 15.4 (4) | 100 (26) | <0.001 |
| | No | 5.1 (9) | 94.9 (167) | 100 (176) | |
| **Educational status** | Uneducated | 20 (26) | 80 (104) | 100 (130) | 0.014 |
| | Educated | 6.9 (5) | 93.1 (67) | 100 (72) | |
| **Hypertension** | Yes | 13.7 (10) | 86.3 (63) | 100 (73) | 0.625 |
| | No | 16.3 (21) | 83.7 (108) | 100 (129) | |
| **Diabetes mellitus** | Yes | 8.9 (4) | 91.9 (41) | 100 (45) | 0.173 |
| | No | 17.2 (27) | 82.8 (130) | 100 (157) | |
| **Tobacco use** | Yes | 18.7 (20) | 81.3 (87) | 100 (107) | 0.162 |
| | No | 11.6 (11) | 88.4 (84) | 100 (95) | |
| **Alcohol use** | Yes | 18.5 (5) | 81.5 (22) | 100 (27) | 0.575 |
| | No | 14.9 (26) | 85.1 (149) | 100 (175) | |

There were no significant associations found between dementia and gender, tobacco or alcohol use, hypertension, diabetes mellitus and any socio-demographic variable (p>0.05).

## DISCUSSION

A total of 202 elderly people were included in the study. As the study was done in an underprivileged area, most of our study population were uneducated (65%) and belonged to low socioeconomic class compared to reports of prevalence studies done among other elderly populations.[13,19,20] The prevalence of self-reported hypertension and diabetes mellitus among the population were 36.1% and 22.3% which were similar to other studies where the prevalence of hypertension ranged between 30% and 59% and that of diabetes ranging from 12% to 36%.[21,22]

The prevalence of dementia in our study population using PMIS was 15.3%. A hospital based study by Dr Joe Varghese et al in Kerala for the validation of PMIS showed a prevalence of 21.3% among the elderly in 2010.[10] The fact that elderly persons with visual and hearing impairment were excluded could have led to a slightly higher estimate. Even so, the prevalence obtained in the study is within the range of prevalence rates reported from other studies conducted in India.[12,15,16,22,23,26] Increasing age, family history, lower educational and functional status were factors significantly associated with dementia. The functional status of the elderly people as assessed by ADL was poor among the subjects who screened positive for dementia. Several studies have also shown the same results.[24,25]

There were only few community based studies conducted in India for screening of dementia. One of those screening studies conducted in an urban population in Kerala using Mini Mental Scale Examination showed a prevalence of 33.6 per 1000 elderly population and the factors associated were family history and hypertension.[19] Another community based study done by Das et al in Kolkata to screen for cognitive impairment showed the prevalence of 14.89% which is similar to our finding.[12] The prevalence rate of dementia was 3.39% among elderly people and factors associated were female gender, smoking, family history and hypertension in a rural community based study in Kerala by Shaji et al.[13] Even though our study also showed significant association of dementia with factors like family history, increasing age and educational status, we did not find any significant associations with hypertension or diabetes, habits or any other socio demographic variables.

Considering the burden of the disease and scarcity of specialized care givers in our country, a screening tool like PMIS can help to screen for dementia at the primary care level, where health workers can be trained to use this tool effectively in areas where specialist services are not available.

The strengths of the study were that it was a community-based study, done on a vulnerable population of elderly persons living in an urban underprivileged area using random sampling. Limitations could include the fact that exclusion of psychiatric illness was based on self-report, and not on a detailed evaluation. Also, exclusion of possibly cognitively unimpaired subjects with visual and hearing impairment could have increased the estimate of prevalence.

## CONCLUSION

The presence of dementia using the screening tool of the PMIS is high among urban elderly subjects residing in an underprivileged area. This implies a need for readiness to deal with this problem, especially at primary care level.

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