Level of literacy and dementia: A secondary post-hoc analysis from North-West India

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ABSTRACT

Introduction: A relation between literacy and dementia has been studied in past and an association has been documented. However till now investigations of the influence of literacy on dementia have primarily focused on African Americans. The current study was aimed at investigating the influence of level of literacy on dementia in a sample stratified by geography (Migrant, Urban, Rural and Tribal areas of sub-Himalayan state of Himachal Pradesh, India). Materials and Methods: The study was based on post-hoc analysis of data obtained from a study conducted on elderly population (60 years and above) from selected geographical areas (Migrant, Urban, Rural and Tribal) of Himachal Pradesh state in North-west India. Results: Analysis of variance revealed an effect of education on cognitive scores \( F = 2.823, P = 0.01 \), however, post-hoc Tukey’s HSD test did not reveal any significant pairwise comparisons. Discussion: The possibility that education effects dementia needs further evaluation, more so in Indian context.

Key words: Dementia, literacy, North-West India, post-hoc

Introduction

A relation between literacy and dementia has been studied in past and an association has been documented. However till now investigations of the influence of literacy on dementia have primarily focused on African Americans. The current study was aimed at investigating the influence of level of literacy on dementia in a sample stratified by geography (Migrant, Urban, Rural and Tribal areas of sub-Himalayan state of Himachal Pradesh, India). This study extends our previous works in Himachal Pradesh by examining the influence of literacy, post-hoc, on dementia. The study was based on the hypothesis that level of literacy does not influence dementia. The reason for this hypothesis lay in the understanding that if lack of literacy was a risk factor for dementia, then one would expect to find higher prevalence rates of dementia in societies with lower educational levels, perhaps in pandemic proportions in subgroups with no formal education.

Materials and Methods

Data for the present study was obtained from a study conducted on elderly population (60 years and above) from selected geographical areas (Migrant, Urban, Rural and Tribal) of Himachal Pradesh state in North-west India. A brief description of the source study is given here. A total of 500 individuals above 60 years of age were included from each geographical site giving us a target sample size of 2000. The study was a cross-sectional study conducted in two phases: (1) A screening phase and (2) a clinical phase. The screening also involved a detail of the socio-demographic profile of study population.

Screening

All subjects were screened, and a subset identified for the detailed clinical evaluation after screening. Trained interviewers administered a standardized Hindi cognitive screening battery, used in a previous study on largely illiterate elderly population in India. This Hindi version of cognitive screen (HMSE) was used in urban, rural and migrant population. For the tribal population, a modified version of cognitive screen was used. The screen used on tribal population, had to be reliable and valid and as comparable as possible in content, format, and relative level of difficulty to the cognitive screen (HMSE) used in urban, rural and migrant populations. For this
A detailed history of the socio-demographic profile of study population was enquired into.

Clinical evaluation and diagnosis
A score below 24 (out of a possible score of 30) on cognitive screen was considered as a suspect case of dementia and was evaluated for clinical diagnosis. Further 10% of non-demented individuals were also evaluated clinically. The selection of 10% non-demented individuals for clinical evaluation was similar to the process carried out for the purpose of screening for the presence of dementia. In this way every 10th elderly individual was included for clinical evaluation.

The clinical evaluation was carried out by a psychiatrist with the help from an internist and two public health specialists. The subjects were examined for three categories of symptoms: (1) Cognitive or intellectual, (2) functional, and (3) psychiatric or behavioral. An individual was to be confirmed as a case of dementia only after clinical evaluation. The clinical evaluation also meant a revisit to the cognitive screen scores by the clinical team and wherever a difference in scores between the field investigator and the clinical team was noted, the score by the clinical team was taken as final.

For the purpose of this post-hoc analysis, the data of all 2000 participants (total sample) available with us was used. The extraction of data was conducted by another public health expert not involved with the collection of the data. Data on level of literacy and cognitive test were extracted from the total sample. A summary of participant socio-demographic information used in the sample is presented in Table 1.

Results
It is seen that the majority (440/500) individuals in tribal area were illiterate. This was followed by migrant and rural elderly (migrant 373/500; 254/500 rural). [Table 1]. The least number of elderly illiterates (89/500) was found in urban population. A post-hoc Tukey’s HSD test did not reveal any significant pairwise comparisons [Table 2]. As expected, groups differed in years of education with post-hoc tests revealing no significant differences for all education group comparisons.

Discussion
The aim of this study was to examine the influence of level of literacy on dementia in a sample stratified by geography. Results confirmed our hypotheses. Consistent with our previous work, literacy does not seem to be a strong predictor of dementia in our set up. Studies in past suggest a higher prevalence of dementia in groups with less education. But this does not appear

Table 1: Socio-demographic profile of the study population

| Residence          | Male (%) | Female (%) | Total (%) |
|--------------------|----------|------------|-----------|
| Urban              | 258 (12.9) | 242 (12.1) | 500 (25.0) |
| Rural              | 266 (13.3) | 234 (11.7) | 500 (25.0) |
| Tribal             | 257 (12.9) | 243 (12.2) | 500 (25.0) |
| Migrant            | 237 (11.9) | 263 (13.2) | 500 (25.0) |
| Total              | 1018 (50.9) | 982 (49.1) | 2000 (100.0) |

| Religion           | Male (%) | Female (%) | Total (%) |
|--------------------|----------|------------|-----------|
| Hindu              | 951 (49.6) | 964 (48.2) | 1955 (97.8) |
| Muslim             | 15 (0.8)  | 12 (0.6)   | 27 (1.4)   |
| Sikh               | 10 (0.5)  | 6 (0.3)    | 16 (0.8)   |
| Christian          | 2 (0.1)   | -          | 2 (0.1)    |

| Type of family     | Male (%) | Female (%) | Total (%) |
|--------------------|----------|------------|-----------|
| Nuclear            | 118 (5.9) | 104 (5.2)  | 222 (11.1) |
| Joint              | 838 (41.9) | 817 (40.9) | 1655 (82.8) |
| Other              | 62 (3.1)  | 61 (3.1)   | 123 (6.2)  |

| Occupation         | Male (%) | Female (%) | Total (%) |
|--------------------|----------|------------|-----------|
| Unemployed         | 46 (2.3)  | 72 (3.6)   | 117 (5.9)  |
| Unskilled worker   | 55 (2.8)  | 5 (0.3)    | 60 (3.0)   |
| Skilled worker     | 33 (1.7)  | 3 (0.2)    | 36 (1.8)   |
| Retired from employment | 380 (19.0) | 80 (4.0) | 460 (23.0) |
| Business           | 121 (6.1) | 7 (0.4)    | 128 (6.4)  |
| Other              | 383 (19.2) | 814 (40.7) | 1197 (59.9) |

| Current marital status | Male (%) | Female (%) | Total (%) |
|------------------------|----------|------------|-----------|
| Unmarried              | 4 (0.2)  | 5 (0.3)    | 9 (0.5)   |
| Currently married      | 862 (43.1) | 486 (24.3) | 1348 (67.4) |
| Widowed/widower        | 144 (7.2) | 489 (24.5) | 633 (31.7) |
| Separated              | 8 (0.4)  | 2 (0.1)    | 10 (0.5)  |

| Educational status     | Male (%) | Female (%) | Total (%) |
|------------------------|----------|------------|-----------|
| Illiterate             | 455 (22.8) | 701 (35.1) | 1156 (57.8) |
| Up to middle school    | 190 (9.5)  | 138 (6.9)  | 328 (16.4) |
| High school            | 219 (11.0) | 91 (4.6)   | 310 (15.0) |
| Graduation             | 83 (4.2)   | 35 (1.8)   | 118 (5.9)  |
| Post-graduation        | 33 (1.7)   | 7 (0.4)    | 40 (2.0)   |
| Professional           | 38 (1.9)   | 10 (0.5)   | 48 (2.4)   |

Table 2: Tukey HSD test showing effect of level of literacy on cognitive scores

| Education status        | n=2000 (%) | Subset for alpha=0.05 |
|-------------------------|------------|-----------------------|
| Illiterate              | 1156 (57.8)| 28.595                |
| Up to middle school     | 328 (16.4)| 28.596                |
| High school             | 310 (15)  | 28.958                |
| Graduation              | 118 (5.9) | 28.974                |
| Post-graduation         | 40 (2)    | 28.975                |
| Professional            | 48 (2.9)  | 29.169                |

P=0.479 (Non-significant). Means for groups in homogenous subsets are displayed (a. Uses harmonic mean sample size=97.644. b. The group sizes are unequal. The harmonic mean of the group sizes is used). HSD - Honest significant difference
to be so in our study. The reasons for overestimating dementia in less educated could be because of an education effect, which leads to a diagnostic bias, more so in case of mild dementia. Further usage of mini mental state examination without cultural and linguistically appropriate modification may not be the ideal test for diagnosing dementia. This had a bearing in one of the study conducted by us on a tribal elderly population.[7] This assumes importance in a largely illiterate elderly population in India. Studies also point to education effect on vascular dementia. This led the observers to consider whether the association of education with dementia might be due to confounding by cardiovascular disease. This could be a possible explanation, as cardiovascular disease is associated with both education and dementia. Vascular dementia as also Alzheimer’s disease is associated with cardiovascular disease.[12,13] Studies also suggest that cardiovascular disease is more prevalent in people with less education.[14,15] However, these explanations do not seem to work in our settings. If we follow the epidemiological transition model in India, cardiovascular diseases are more common in urban India and urban India is more literate than rural India. Furthermore, dementia in India is more prevalent in urban areas than in rural areas.

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