PREVALENCE OF DEMENTIA ALTERED WITH AGE AND EDUCATION IN AN ELDERLY POPULATION OF VARANASI

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ABSTRACT

A later age at onset of Alzheimer's disease (AD) was found to be related to diminished semantic memory performance in fifteen mildly demented (Aged 62-72yrs, mean = 68.40yrs, SD = 3.68) and ten moderately demented patients (Aged 65-80yrs., mean = 69.50, SD = 4.28yrs.) screened on the basis of HMMSE, HMDRS, HWMS and on the NINCDS – ADRDA criteria (McKhann et al. 1984). 80 Pictures were used in this study which is belonging to 8 semantic categories. Three types of test materials were generated from these stimuli. Subjects were tested individually for Word Picture Matching Mixed Categories (WPM-MC), Word Picture Matching Same Categories (WPM-SC) and Picture Naming (PN). The finding of study indicated that the onset of dementia was related to the advancing years of age and moderately demented patient have performed less on all three subtask than mildly demented and control subjects. These finding extend the hypothesis that with an advancing age there is gradual decline in cognitive capabilities of demented patients. The result of this study have also showed that only few years of schooling does not exert any remarkable and noticeable effect on the cognitive domain of aged subjects.

Key words: Dementia, Elderly person, Age, Education, Semantic Memory

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Introduction

The size of elderly population is increasing all over the world including India. It is estimated that figure would rise to 180 million by 2025AD. This drastic rise in the number is passing many a challenge to India. India has already reached significant increase in life expectancy. WHO states that longer life can be both a penalty and a prize. According to 2001 census of India, the every age life expectancy is 64 in women and 62 in men older person do not enjoy a decent status in the Indian society[1]. Due to the rapidly aging population and the consequent increase in dementia patients, dementia has become a major public health problem in India. Prevalence study's although valuable in estimating the service need, one inevitably affected by the onset of disorder, its persistence, and patient survival. A number of community surveys on the prevalence of dementia have reported that education exerts some protective effect against the development of the symptom of dementia[2-6]. In this regard Mortimer (1989)[7] has hypothesized that education provides same protection against dementia. According to Mortimer, Psychosocial factors act primarily to reduce margin of intellectual reserve to a level where a more modest level of brain pathology results in a diagnosable dementia (p.39). Even though it has been well-established that otherwise normal subjects with low education may do poorly on mental status test [8-11]. It is still not clear whether lack of or low education is a confounder or whether education actually delays the onset or prevalence of dementia. Hill, Klauber et. al. (1993)[12] examined the relationship of culturally adapted Chinese version of the mini-mental status examination (CMMS) and several functional measures to the effect of education on the clinical diagnosis of dementia in 554 subjects, who had undergone intensive evaluation during, the Shanghai survey of dementia. Low education was associated with increased prevalence of clinically diagnosed dementia.

Zhang et al.[6] (1990) reported the prevalence rates for dementia and Alzheimer's disease on a probability sample survey of 5,055 non-institutionalized older persons in Shanghai, China. A two stage procedure was used for case finding and case identification. Three different cut off points on the Chinese version of mini-mental status test were used depending on the respondents of dementia and Alzheimer disease were done following the D.S.M. III and NINCDS-ADRDA criteria. The prevalence rate of dementia in 65 years and older persons was 4.60% and it was found that clinically diagnosed Alzheimer's disease accounted for 65% of the demented patients.

Bonaito (1990)[13] also reported that 73% subjects with low education showed a higher prevalence of DAT. (Dementia of the Alzheimer's type)

Indian studies conducted in Tamilnadu and Kerla[14-16] have also reported higher prevalence of dementia in the illiterates. However, contrary findings have also been reported in a recent Indo-Us survey conducted on 5000 rural elderly in Ballabgarh, Haryana[17]. DAT was not found associated either with gender or literacy, though increased age was significantly associated with its higher prevalence in a editorial (Times of India, 1999) Indians were reported to be less susceptible to Alzheimer's disease that those in the west, presumably because of their lower cholesterol levels. Unverzagt, Hui, Fallow, Halland and Hendrie (1998)[18] also reported lesser cognitive declines in their low educated demented group.

Qui et al., (2007)[19] found that with the ageing of the population worldwide, dementia is a real public health priority. In 2010, the estimated number of dementia cases was 35.5 million people representing 0.4% of the worldwide population and this number will be 65.7 million in 2030 and 115.4 million in 2050. More or less, 2/3 of the cases lived in developing countries[20] According to an estimate in India there are over six million elderly with dementia. Age is clearly on the most important risk factors for DAT (Lobo et al., 2000).

Aforementioned investigations found a relationship between age & Education of Alzheimer's patients and cognitive performance. None of them employed methodology whereby each subjects naming scores was controlled for the effect of dementia severity, a necessary control because of the well-documented relationship between dementia severity and picture naming & matching score. Besides the Ballabgarh (Haryana) study no other studies of dementia in India have been reported.

Following hypotheses were framed for the present study:

(1) There would be higher prevalence rats of Dementia of Alzheimer's type (DAT) in the more elderly subjects.

(2) A few years of schooling is not likely to have any noticeable effect on the prevalence of dementia which remains almost similar for such schooling.

Method:

Subject:

200 elderly subjects above 60 years of age were individually tested in the first phase of the study on the Hindi version of Folstein, Folstein and McHugh's Mini-mental Status Examination (HMMS), Mattis Dementia Rating Scale (HMDRS) and Wechsler Memory Scale (HWMS). Fifteen mildly demented (aged 62 to 72 years, M = 68.40 years, SD = 3.68 years) and ten moderately demented patients (aged 65 to 80 years, M = 69.50, SD = 4.28 years), screened on the basis of HMMS, HMDS, HWMS and on the NINCDS – ADRDA criteria[21] and fifteen matched control subjects (age 60 to 72 years, M = 64.00 years, SD = 3.11 years) performed word to picture matching (mixed and same categories), picture naming.

Sampling of Subjects:

In the first phase of this study a sample of 800 adults above 60 years of age, born in the year 1938 or before, living in Varanasi, and not institutionalized in shelter homes, served as subjects. The majority of them followed agricultural occupation. All older individuals live with family members, usually in the home of a son or other male relative. Because of the lower average life expectancy of the rural Indian population. Each of these individuals was visited at home by the researcher, who confirmed the subject's age as previously described, as well as ascertained address, next of kin, and other identifying information. Of the 800 individuals identified in the census, 300 were found to be younger than 60 years, 150 had died, 85 had relocated outside the study area, and 65 were duplicate listing. The study population described in this research consists of remaining 200 individuals.

After obtaining informed consent by the researcher, they were administered a scripted, completely standardized screening interview with the following components.

1. Demographic/identifying information.
2. Screening of vision and hearing to determine whether subjects could be cognitively tested.
3. Blood pressure, height and weight measurements.
4. Cognitive screening battery (described later)
5. Activities of daily living.

6. Exposure/risk factor profile – a standardized protocol that addresses diet smoking, alcohol use, history of head trauma, exposure to potential toxins (organic solvents, pesticides, heavy metals found in many indigenous medicines and tonics), history of selected neurological symptoms, and family history of dementia and neurologic illnesses.

Tools:

The following three screening tools were adapted and standardized for the first phase of this study. The standard psychometric adaptation and standardization procedure was followed for each tool.

[1] Hindi version of Mini-Mental Status Examination (HMMS):

Folstein, Folstein & Mc Hugh's (1975)[22] MMSE was translated into Hindi. The experimental format of the HMMS[23], as described above, was used for ascertaining its psychometric properties. This test has 11 contextual areas with time orientation, place orientation, registration, attention and calculation, recall of previously registered 3 items, naming of two objects, repetition of 5 words in a row, following the 3 stage command, reading and writing of a sentence, and copying of a figure showing 2 pentagons crossing each other. Thus, the total score range from 0 to 30. The lower scores denote greater degree of cognitive impairment and possibility of presence of dementia in an aged person.

[2] Hindi version of modified Wechsler Memory Scale (HWMS):

The HWMS[24] comprises logical memory and Visual reproduction subtests of the original WMS[25]. The logical memory subtest comprises 2 new Hindi stories having 12 logical components on the pattern of the original WMS. Each of the 2 stories is presented for 5 minutes after which immediate recall is separately taken. This is followed by the presentation of visual reproduction component in which 3 cards are singly displayed. The first 2 cards comprise a geometrical pattern while the third card consists of two geometrical patterns. The subject is required to reproduce for memory the displayed geometrical patterns. The delayed reproductions as well as recognition of geometrical patterns are taken. Higher score on this scale denote normal memory.

[3] The Hindi version of Mattis Dementia Rating Scale (HMDRS):

The HMDS[26] consists of 5 components which are attention, initiation and perseveration, construction, conceptualization and memory. Lower scores denote more pronounced dementia.[27-29]

Material:

A total of 80 pictures were prepared on 3 x 5 inch having concrete picturable nouns belonging to 8 semantic categories, viz, vegetable, body part, animal, fruit, vehicle, tools, furniture and clothing[30]. Three types of test materials were generated from these stimuli which meant for picture naming in which one single picture line was drawn on a card. Subjects were presented these stimuli one by one and asked to name them. In the second type of the picture stimuli, each card in this set contained five items. Pictures were presented from within the same semantic category arranged vertically in a column. The third type of task was generated in a similar manner but items on each card belonged to a different semantic category instead of the same category.

Procedure:

Subjects were tested individually for picture naming. The subjects were asked to name each of the line drawn eighty pictures without the aid of semantic or phonemic cueing. The pictures were presented as single stimulus drawn on 3 x 5 inch cards and the subjects were instructed to name each picture as quickly as possible.

The procedure for word to picture matching same category comprised a set of cards containing five items on each card (from within the same semantic category) which were arranged vertically in a column. Their names were written in a different manner other than that of the object. However for illiterate subjects these were similarly pronouns. In this manner all 80 objects belonging to eight categories was displayed in sixteen cards at the rate of 5 objects per card. Their responses were noted verbatim without offering any comment what so ever.

Finally the third phase of this experiments namely, word to picture matching mixed category was taken. This phase was similar to word to picture matching same category accept that 5 objects displayed in a card belong to different category.

RESULTS

This experiment was conducted on 40 subjects, aged 60-80 years, who were drawn from a large sample on the basis of screening test comprising the HMMS, HMDRS and HWMS. The purpose of the present study was to examine the role of psycho-social risk factor of age and education in semantic memory impairment in mildly and moderately patients of probable Alzheimer's disease, for studying impairment in semantic memory impairment, three model of processing were employed viz; picture naming and word to picture matching (mixed and same categories). Table 1 shows the means and SDs of the three groups of subject along with their age range.

Table-1 Mean age and SDs along with age range of the normal controls, mildly and moderately demented patients.

Group	Normal (n=15)	Mild (n=15)	Moderate (n=10)
Mean age	64.00	68.40	69.30
SD	3.11	3.68	4.28
Age range	60-72	62-72	65-80

The age of mildly demented patients ranged between 62 to 72 years, with a mean of 68.40 and SD 3.68. The age of moderately demented patients ranged between 65 to 80 years (mean = 69.50, SD = 4.28). On the other hand, the range of normal matched controls ranged between 60 to 72 years with a mean of 64.00 years and SD of 3.11. The differences between age and incidence of dementia were analyzed by calculating one way ANOVA between the three groups of subject, summary of ANOVA is presented in Table 2.

Table-2 Summary of ANOVA for the three groups of subjects across the three age range

Source of Variation	SS	df	MS	F-ratio
Between groups	327.00	2	163.50	15.55**

Within groups (error)	390.10	37	10.54	

*p < .001

The obtained F-value for the three groups of subjects across the three age range showed a significant F-value (F2, 37 = 15.50, P < 0.001) which supports most of the theories concerning the onset of dementia related to the advancing years of age.

Table-3 Mean scores for three subtasks and SDs as a function of age of mildly demented, moderately demented and matched control subjects

Group	Age	N	w-p-m		w-p-m		pH	
			Mean	SD	Mean	SD	Mean	SD
Moderately demented (N=10)	65	2	58.00	-	51.00	-	47.00	0.50
	68	3	58.33	0.47	50.33	0.47	47.00	1.41
	69	1	56.00	-	50.00	-	42.00	-
	70	2	57.00	-	49.50	0.50	44.50	3.50
	72	1	57.00	-	48.00	-	42.00	-
	80	1	57.00	-	42.00	-	40.00	-
Mildly demented (N=15)	62	2	63.50	1.50	56.00	-	52.00	1.00
	63	1	61.00	-	56.00	-	53.00	-
	68	4	59.75	1.48	54.50	0.87	50.50	0.87
	69	2	59.00	-	55.00	-	50.50	0.50
	70	3	58.66	0.47	53.00	0.82	49.67	0.47
	72	2	57.00	-	52.00	-	50.00	1.00
	75	1	58.00	-	51.00	-	49.00	-
Normal Control	60	1	72.00	-	69.00	-	73.00	-
	62	6	72.50	1.88	70.66	3.53	57.80	2.98
	63	1	75.00	-	73.00	-	71.00	-
	64	3	71.33	0.47	71.00	0.81	70.00	0.82

(N=15)	65	1	73.00	-	70.00	-	73.00	-
	66	1	74.00	-	71.00	-	73.00	-
	70	1	71.00	-	70.00	-	73.00	-
	72	1	70.00	-	74.00	-	68.00	-

Table 3 shows mean and SDs for three dependent variables of the present experiment namely, word to picture matching mixed category [W-P-M (MC)], word to picture matching same category [W-P-M (SC)] and picture naming (PN) as a function of age across three groups of subject. It is apparent from a perusal of table 3 that the moderately demented subjects have scored lesser on all the three subtasks. These mean scores extend a gradient for each subtask with normal subjects eliciting the highest scores and moderates evincing the lowest scores with mild demented subjects occupying an intermediary position.

Table-4 Summary of one way analysis of variance following the factor of age across three subjects subgroups for three response measures

Source of variation	**Wpm (mc)**			**Wpm (sc)**			**PN**		
	SS	**MS**	**F**	**SS**	**MS**	**F**	**SS**	**MS**	**F**
Between groups	1443.55	131.23	7.43*	2646.08	240.55	6.55*	3408.94	309.90*	6.12*
Within groups	494.63	17.67		1029.02	36.75		1418.84	50.67	

In order to see difference between various groups across three subtasks, separate analyses of variance following the factor of age across three subgroups of subject. These ANOVAs appear in Table 4 which shows summary of one way ANOVAs for these measures. The F-value are statistically significant ($F_{11, 28} = 7.3$, 6.55 and 6.12, $P < 0.01$ for W-P-M (MC), W-P-M (SC) and PN subtasks, respectively) which support the hypothesis one and extends the theory that with advancing age there is a gradual decline in cognitive capabilities of demented patients.

In order to ascertain the role of education in the performance of demented patients, the data were tabulated according to the year of schooling of these subjects' subgroups. Table 5 presents the mean and SDs of three subgroups as a function of year of schooling.

Table 5- Mean scores and SDs for different response measures as a function of year of schooling of three subgroups

Group	Education	N	w-p-m		w-p-m		pH	
			Mean	SD	Mean	SD	Mean	SD
Moderately demented (N=10)	0	6	57.16	0.88	48.16	2.85	43.00	2.71
	3	1	58.00	-	51.00	-	47.00	-
	4	2	58.00	-	50.50	0.50	48.00	-
	5	1	58.00	-	51.00	-	48.00	-
Mildly demented (N=15)	0	9	58.22	0.92	53.22	1.47	49.77	0.78
	3	2	60.50	1.50	55.00	-	51.00	-
	4	2	60.50	1.50	54.50	1.50	51.00	-
	5	1	60.80	-	56.00	-	53.00	-
	6	1	64.80	-	56.00	-	53.00	-
Normal Control (N=15)	0	5	71.40	1.49	70.40	3.00	69.20	2.13
	3	1	74.00	-	76.00	-	70.00	-
	4	3	72.33	1.24	70.00	0.82	72.33	0.94
	5	2	72.00	2.00	71.50	2.50	69.50	4.50
	6	2	74.00	1.00	71.50	1.50	70.00	1.00
	8	2	72.00	1.00	70.00	1.00	69.00	1.00

Table 6 -Summary of one way analysis of variance following the factor of years of schooling across three subjects subgroups for three response measures

Source of	WPM(MC)			WPM(SC)			PN		
	SS	MS	F	SS	MS	F	SS	MS	F

variation									
Between groups	446.71	89.34	2.04 (NS)	438.68	127.74	1.43 (NS)	916.13	183.23	1.59 (NS)
Within groups	1491.47	43.87		3036.42	89.31		3911.65	115.05	

df for all tasks 5, 34

It is apparent from a perusal of Table 6 there is more rapid decline in performance of moderately demented subjects than is observed for mildly demented and matched controls. Separate analysis of variance was computed for the response measures, W-P-M (MC), W-P-M (SC) and P.N. after classifying subjects according to their years of schooling. Inasmuch as the years of schooling was found unevenly distributed the grouping of demented as well as matched controls was done separately for each of the three response measures for the purpose of calculating ANOVAs for these three measures. The obtained F-values are statistically not significant (F=2.04, 1.43 and 1.59, df = 5, 34 for w-p-m (MC), w-p-m (SC) and PN subtasks respectively). These finding attest hypothesis to which states that only a few years of schooling does not exert any remarkable and noticeable effect on the cognitive domain of aged subject.

DISCUSSION

The subjects of the present study were drawn from homogenous age groups and on the basis of screening tools as well as medical indices this fact emerge that most of the aged subject has prevalently shown the dementia of the Alzheimer's type. These findings are supported to most of the theories related with age as a risk factor causation of dementia of the Alzheimer's type. Though normal aging is also possible and so far no specific age related change has been established which could be identified as the determining factor in causation of DAT. Aging in itself is related with several factors which are upon the developmental aspect food intake, socioeconomic condition, occupation and education among other things and their individual contribution to aging is difficult to be established decisively.

The present result support the finding of Zhang et al. (1990)[6] who have reported the increased age was a highly significant and independent risk factor for dementia. These findings have

indicated that age specific prevalence curve climbs after the age of 75 and increases geometrically after 80 years of age.

In the present study rate of the progress of dementia was found to be more rapid (mean age = 69.50 years) in the moderately demented group which extent support to Evans et al. 1959[3]. Even though most elders adults the worsening of their memory as the advance in age, the differences in normal aging and clinical aging as evidence in dementia is not the same. The present findings extend the result of Chandra et al. (1998)[17, 14, 31, 32] who have found greater age as significant associated with higher prevalence of DAT. Age decrement in word to picture matching in mixed and same category and picture naming extend the theory that the demented subject have greater difficulty in identifying an object or remembering names that they had come across a short while back chain do a normal aged individual. It appears that in normal aged individual the degeneration of the cell is relatively slower while due to some other reason it is much rapid rate in the demented patients.

The present study was conducted on those subjects who belong to lower socio-economic status and who were residing on the outskirts of Varanasi with more exposure to rural way of life. Many subjects were also residing in remote villages were limited excess to modern amenities were possible. A major chunk of subjects' population was illiterate and even those who had expensed some schooling, the effect of schooling had hardly made any noticeable difference in their cognitive make-up. The education received by them was almost forgotten and they very scheldome made use of the education received by them during their early years of life. The findings of the present study received their education had not made any significant difference in the onset of dementia which extend support to the Ballabhgarh survey the screening instrument were trailer according to specifically not required literacy. Chandra et.al.[17] had contended that they were perhaps less likely than other groups to have overestimated the prevalence of cognitive impairment because of confounding by education and literacy.[17] In the present study also the screening instruments as well as experimental materials were such which did not required any education input (since pictorial stimulus materials alone were used). The education received by the subject was less likely to affect their cognitive performance. The intellectual reserve hypothesis proposed by Mortimer (1988)[33] and support by Callahan et al. (1996)[34] and

others[2,6,35-38] may at best be of only limited generality. It appears that education renders intellectual reserve only when the education so received is put to active use in own occupation and daily life. Nearly being literate can hardly create any intellectual reserve.

Education was found to shape the cognitive behaviour pattern of moderately and mildly demented patient and illiterate subjects performed poorly than did the subject who had attained some schooling. Though the education did not materially affect matching or naming performance, it did show some effect. Inasmuch as the maximum years of schooling for the moderately and mildly demented patient were up to five years. Six years respectively, reliability of any cognitive reserve due to schooling was not supported by the present study. These findings support the pre study of Chandra et al. (1998)[17] who also have failed to find any association of DAT with literacy. It is pertinent to point out that schooling up to five years or six years remains unutilized later on and the maximum use made of such an education is merely for the sake of knowing how to write ones name only.

The cognitive reserve hypothesis suggests that education brings about a remarkable difference in the patients because they constantly rehearse and reproduce the available information. This result is available only in those cases whose total number of schooling remains at least that are up to fifteen years, that is up to a bachelor's degree. The non significant effect of education observed on this present study supports the hypothesis that only a few years of schooling without attendance use of such education are almost similar to having no education. This findings support the result of Callahan et al.[34] and others[6, 33-38]. The deleterious effect of no education or only few years of education could to be due to other related factors, present during childhood. Among these other factors socioeconomic status, experiential factors and the neighborhood and locale of the patients could be considered as a important contributors. In order to control these factors selection of patients was restricted to those belonging to low socio-economic status or to lower middle class socioeconomic status only. This allowed us to balance the factor of environmental exposure, deprivation and neighbourhood.

Present findings corroborate the result of the Shanghai survey of dementia in which no education or 6 years or less of education had a greater risk of developing dementia. Most of the patients of

present study had education up to 6 years or less and along with other contributory environmental factors low education appears to have affected onset of dementia in them.

Impact of socio-demographic factor has been a matter of consistent concern of the researches[17, 38] and uniformly highlights the importance of education in the prevalence of dementia. Liu et al.[39] have reported adjusted relative risk using the Cox proportional hazard model and shown that illiteracy has a higher risk for the incidence of dementia. Apparently education provides a protection against the onset of dementia. Ronchi[38] have reported that the first decade of life in which education start works as critical period for the onset of dementia during later decades. The present findings are in consonance with the contention that the cognitive inputs attend in the process of education during the first decade of a person's life.

REFERENCES

1. Rammurty,P.V. Psychological and social aspect of ageing in India. P.V.Rammurty and D.Jamuna(Eds). *Hand book of Indian gerontology*, 2004, 268-327 New Delhi: Serial Publications.

2. Dartigues, J.F.; Gagnon, M.; Michel, P. et al. Le programme de recherché paquid sur 1 epidemiologic dela demence methods et resultants initiaux. *Review of Neurology* (Paris), 1991, 147 & 225-230.

3. Evans, D.A. Estimated prevalence of Alzheimer's disease in the United States, Milbank,1990, *Q*. 60, 267-289.

4. Rocca, W.A.; Banaiuto, S.; Lippi, A. et al. Prevalence of clinically diagnosed Alzheimer's disease and others dementing disorders : a door to door survey in Appignano, Macerata province, Italy, *Neurology,1990*, 626-631.

5. Sulkava, R.; Wikstrom, J.; Aroma, A. et al. Prevalence of Severe dementia in Finland. *Neurology*, 1985, 35, 1025-1029.

6. Zhang, M., Katzman, R.; Salmon, D.; Jin, H.; Cai, G.; Wang, Z.; Qu, G.; Grant, L.; yu, E.; Levy, P.; Klauber, M. & Liu, W. The prevalence of dementia and Alzheimer's disease in Sanghai: impact of age,gender and education.Ann neurol, 1990,27: 428-37

7. Mortimer, J.A. Do psychosocial risk factors contribute to Alzheimer's disease? In: Henderson, A.S.; Henderson, J.H. eds. *Etiology of dementia of Alzheimer's type*. Chichester : John Willey & Sons, 1988, 39-52.

8. Fillenbaum, G.G.; Hughes, D.C.; Heyman, A.; George, L.K.; Blazer, D.G. Relationship of health and demographic characteristics among community residents. *Psychological Medicines*, 1988, 18, 719-726.

9. Folstein, M.; Anthony, J.C.; Parhad, I.; Duffix, B. & Gruenberg, E.M. The meaning of cognitive impairment in the elderly. *Journal of American Geriatric Society*, 1985, 33, 228-235.

10. Gurland, B.J. The borderlands of dementia: the influence of socio-cultural characteristics on rates of dementia occurring in the senium. In : Miller N.E., Cohen, G.D. eds. *Clinical aspects of Alzheimer's disease and senile dementia*.1981, New York : Raven Press, 61-84.

11. Jorm, A.F.; Scott, R.; Henderson, A.S.; Ray, D.W.K. Educational level differences on the mini-mental state : The role of test bias. *Psychological Medicine*, 1988, 18, 727-731.

12. Hill, L.R.; Klauber, M.R.; Salmon, D.P. et al. Functional status education and the diagnosis of dementia in the Shanghai Survey, *Neurology*, 1993, 43, 138-145. disease in Shanghai, China : Impact of age, gender and education. *Annals of Neurology*, 27, 428-437.

13. Bonaito, S.; Rocca, E. & Lippi, A. Impact of education and occupation on the prevalence of Alzheimer's disease and Multi-infract dementia in Appignano, Macerata province, Italy, *Neurology*,1990, 40(Suppl. 1): 346.

14. Rajkumar, S. & Kumar, S. Prevalence of dementia in the community: A rural-urban comparison from Madras, India, Australian, *Journal of Aging*, 1996, 15, 9-13.

15. Rajkumar, S.; Kumar, S. & Thara, R. Prevalence of dementia in a rural setting: a report from India. *International Journal of Geriatric Psychiatry*, 1997, 12, 702-707.

16. Shaji, S.; Promodu, K.; Abraham, T.; Roy, K.J. & Verghese, A. An epidemiological study of dementia in a rural community in Karala, India, *British Journal of Psychiatry*, 1996, 168, 745-749.

17. Chandra, V.; Ganguli, M.; Pandav, R.; Johnston, J.; Belle, S. & Dekosky, S.T. Prevalence of Alzheimer's disease and other dementia's in rural India: The Indo-US study. *Neurology*, 1998, 51, 1000-1008.

18. Unverzagt, P.W.; Hui, S.L.; Farlow, M.R.; Hall, K.S. & Hendric, H.C. Cognitive decline and education in mild dementia. *Neurology*, 1998, 50, 181-185.

19. Qui C, De Ronchi D, Fratiglioni L. The epidemiology of the dementias: An update. *Curr. Opin. Psychiatry*, 2007, 20(4): 380-385.

20. Wimo A, Prince MJ . World Alzheimer Report 2010. The Global Economic Impact of Dementia. *Alzheimer's Disease International*.

21. McKhann, G.; Drachman, D.; Folstein, M.; Katzman, R.; Prince, D. & Stradlan, E.M. .Clinical diagnosis of Alzheimer's disease, *Neurology*, 1984, 34, 939-944.

22. Folstein, M.F.; Folstein, S.E. & McHugh, P.R. Mini-mental state: A practical guide for the clinician, *Journal of Psychiatric Research* , 1975, 12, 189-198.

23. Dwivedi, C.B.; Pandey, R. & Gopal Jee, S. Hindi Adaptation of Folstein Folstein & McHugh's Mini Mental Status Examination, Varanasi: *Rupa Psychological centre*,Varanasi. 1996

24. Gopal Jee ,S; Dwivedi, C.B.; Pandey, R.; Pathak, K.S. & Mandal, M.K. Hindi adaptation of two subscale of Wechster memory scale. Unpublished manuscript, *Department of Psychology*, B.H.U. 1997

25. Wechsler, D. A standardized memory scale for clinical use. *Journal of Psychology* , 1945, 19, 87-95.

26. Gopal Jee, S; Dwivedi, C.B. & Pandey, R. Hindi adaptation of Mattis dementia Rating Scale, Varanasi. *Rupa Psychological centre*,Varanasi, 1998.

27. Mattis, S. *Dementia rating scale*, Odessa, F.L. Psychological assessment resources, 1989.

28. Mattis, S. *Dementia Rating Scale*. NFER Nelson, 1992, Windsor.

29. Matts, S. Mental status examination for organic mental syndrome in the elderly patient. M.L. Bellak & T.B. Karasu (Eds.) *geriatric psychiatry : A hand book for psychiatrist and primary care physicians*, 1976, 77-121, New York, Gurune & Stratton.

30. Snodgrass,J.G. and Vanderwart,M.A. A standardized set of 260 pictures :norms for name agreement, familiarity and visual complexity. *Journal of Experimental Psychology: 1980, General,* 6,174-215.

31. Lobo, A., Launer, L.J., Fratiglioni, L., Andersen, K., Di Carlo, A., Breteler, M.M., Copeland, J.R., Dartigues, J.F., Jagger, C., Martinez-Lage, J., Soininen, H., Hofman, A., Neurology, 2000, 54, S4 – S9.

32. Touré K., Coumé M., Sow P. G. et. al. Prevalence of dementia varied With age, education and social network in a Senegalese elderly Population of patients utilizing Journal of Medicine and Medical Sciences. 2012, Vol. 4(2), pp. 33 – 38 the Medico-Social and University Center of IPRES,Dakar- Senegal. International

33. Mortimer, J.A. Do psychosocial risk factors contribute to Alzheimer's disease? In : Henderson, A.S.; Henderson, J.H. eds. *Etiology of dementia of Alzheimer's type*. Chichester : John Willey & Sons, 1988, 39-52.

34. Callahan, C.M.; Hall, K.S.; Hui, S.L.; Musick, B.S.; Unverzagt, F.W. & Hendric, H.D. Relationship of age, education and occupation with dementia among a community based sample of African Americans. *Archives of Neurology*, 1996, 53, 134-140.

35. Katzman, R. Education and the prevalence of dementia and Alzheimer's disease, *Neurology*, 1993, 43, 13-20.

36. Orell, M. & Sahakian, B. Education and dementia : research evidence supports the concept "use it or lose it". *British Journal of Medicine*, 1995, 310, 951-952.

37. Ott, A.; Breteler, M.M.; Van Harskamp, F. et al. Prevalence of Alzheimer disease and vascular dementia : association with education. The Rotterdam study. British, *Journal of Medicine*, 1995, 310, 970-973.

38. Ronchi,D.D., Fratiglioni,L., Rucci,P. et.al. The effect of education on dementia occurrence in an Italian population with middle to high Socio-economic status.*Neorology*, 1998, 50, 1231-1238.

39. Liu CK, Lai CL, Tai CT, et al. Incidence and subtypes of dementia in southern Taiwan: impact of sociodemographic factors. Neurology. 1998; 50:1572–1579.