

## STUDY OF CORRELATION OF COGNITIVE STATUS AND QUALITY OF LIFE (QOL) IN ELDERLY RESIDENTS OF OLD AGE HOMES

### Authors:

**Radhika Vishveshwar<sup>1</sup>, Bharat Dhareshwar<sup>2</sup>, Sucheeth Avanti<sup>3</sup>**  
Geriatric Medicine resident<sup>1</sup>, HOD Geriatrics<sup>2</sup>, Assistant Professor Geriatrics<sup>3</sup>  
MGM Medical College and Hospital Navi Mumbai

### Corresponding Author:

Bharat Dhareshwar  
HOD Geriatrics<sup>2</sup>  
MGM Medical College and Hospital Navi Mumbai

Article Received: 01-01-2023 Revised: 12-01-2023 Accepted: 24-01-2023

### **ABSTRACT:**

**Objectives:** This study aims to analyze the contributing factors affecting the decline in cognition and the effect of cognitive impairment on quality of life in residents of old age home. **Methods:** This community-based cross-sectional study was carried out among 50 elderly citizens who were 60 and above years of age living in old age homes at Navi Mumbai, Maharashtra. A standardized mini-mental scale examination tool (MMSE) containing a total score of 30 and covers 5 domains was used; based on the score, they were classified into mild, moderate, and severe cognitive impairment. The same study subjects were scored for quality of life (QOL) using Barthel Index of daily living scale, lower score indicating dependency. Data regarding the history of factors including gender, marital status, literacy level, co-morbidities, psychological disease, and reason for stay in Ashram were collected. **Results:** The average age of the 50 participants in the study was  $70.66 \pm 8.75$  years. Of the participants, 23 (or 46%) had finished primary schooling. Co-morbidities were present in 34(68%) participants, and cerebrovascular accident (CVA) in 8 (16%) participants. The most common reason for being in Ashram was 12(24%) participants had no family. The findings showed a moderate, positive, and significant correlation between QOL and MMSE ( $r=0.569$ ,  $p=0.001$ ). The mean MMSE scores were higher in participants who had depression in the family and who were divorced and had left the family (29) Progressive age was not correlated with lower MMSE scores but affected quality of life. Residents with higher education status, possibly with better coping up skills had a higher MMSE. Two residents with chronic kidney disease had mild cognitive impairment with profound lower QOL score. Mean MMSE scores were higher in participants who had no CVA -  $24.83 \pm 3.32$  as compared to participants who had CVA-  $21.62 \pm 2.44$ . Comorbidities like T2DM, Hypertension, hypothyroidism, peripheral vascular disease, IHD, cancer and COPD did not show direct correlation with MMSE score but physical performance of basic activities were affected. **Conclusion:** Lack of psychosocial support was one of the independent predictors of cognitive decline in residents of old age care centres. It was inferred that MMSE and QOL had a strong association indicating level of cognition affected their daily basic activities. The results of the current study also showed a significant relationship between cognitive impairment with gender, educational status, co-morbidities and past emotional trauma of inmates. Gradual cognitive deterioration in elderly with multiple risk factors is an imminent process. In order to repress the deterioration, early identification through screening scales and medical management supported with psychological counselling and coping skills should be encouraged.

**Keywords:** Cognition, Old age homes, MMSE, QOL, Education.

### **INTRODUCTION:**

The inevitable process of aging is associated with normal and gradual cognitive decline. Early recognition of severity of impairment and prompt diagnosis into reversible causes can prevent an elderly from rapid progression. Mild to severe forms of cognitive dysfunction are seen in vascular dementia and Alzheimer's and neuropsychiatric disorders amongst elderly. It is essential to differentiate between

physiological cognitive decline in geriatric population with pathological cognitive disturbances in which mostly there is a definitive cause or multifactorial. The burden of impaired cognition among the elderly population affects them in physical, social, and financial aspects. Urbanization, industrialization, education & exposure to western lifestyles have modified the social values towards the elderly and have led to a rapid break-down from a joint family

support system to a nuclear family system, creating a unique predicament when it comes to providing care for the elderly. As a result, many elderly people end up in moving to old-age homes or ashrams where their basic requirements are provided. <sup>(4)</sup> Elderly care facilities are attached to medical services are mostly funded by NGOs and donations. Reasons of ashram stay include medical care, psychological support, food, housing for the homeless and abandoned, and recreational activities. <sup>(5)</sup> Due to lack of emotional, financial support by family, residents are prone for developing depression and behavioural changes. Declining physical abilities, medications and chronic diseases adds to the psychosocial imbalance resulting in cognitive impairment. Severe cognitive impairment individuals, lose the capability to carry out even basic daily activities and require more attention and help. This causes dependency on care givers increases care giver burden and neglect. In view of the foregoing, this study's objectives were to evaluate the prevalence of cognitive impairment among elderly residents of old age homes, identify the contributing factors influencing the deterioration of cognition, evaluate the severity and establish a link between cognitive impairment and health-related quality of life (QOL).

#### **METHODOLOGY:**

Seal Ashram, Paramshantidham Ashram, and Baithi Ashram associated with MGM medical college and hospital in Navi Mumbai, Maharashtra were the sites of this community-based cross-sectional descriptive study. They chose older individuals who were 60 years of age or older.

#### **Sample size and sampling technique:**

Using the formula  $N = Z^2 P(1-P)/d^2$  with a 1% absolute error, the sample size was determined. 50 was the estimated sample size.

#### **Inclusion and exclusion criteria:**

Participants in the study were chosen based on their stay in old age homes, age greater than 60 years, and knowledge of their educational background. After receiving informed consent, those who were willing to participate were enrolled in the study. The study eliminated people who were deaf, mute, illiterate, blind, severely ill, or uncooperative.

**Sampling method:** Three ashrams granted permission. Here, a sample size of 50 ashram residents was chosen, 20 from the Seal Ashram, 26 from the Paramshanti Ashram, and 4 from the Baithi Ashram.

**IEC approval:** The Mahatma Gandhi Mission (MGM), Navi Mumbai Hospital's Institutional Ethics Committee received the proposal for this study, and clearance was acquired prior to the study's execution.

#### **Data collection method:**

A structured, pretested, standardized questionnaire was used to obtain the data. Detailed history regarding age, gender, marital status, literacy status, comorbidities, psychological illness, and reason for ashram stay was collected and correlated. Cognitive impairment was evaluated using the MMSE scale - Mini Mental Scale Examination. The scale covers 5 major domains and has a total score of 30. They were divided into three categories based on the score: mild, moderate, and severe impairment. Participants were screened for quality of life using the Barthel index of activities of daily living. Scores range from 0-20, with lower scores indicating disability.

#### **Statistical analysis:**

SPSS software, version 20, was used to evaluate the data that was gathered after being entered into Microsoft Excel. The descriptive, explanatory, and outcome variables were calculated by frequency as well as proportion for qualitative variables, mean and standard deviation for quantitative variables, during the statistical analysis of the data. To correlate QOL with MMSE, inferential statistics like Pearson's correlation were used. The cut-off for significance was 5%.

#### **RESULTS:**

In order to evaluate elderly cognitive impairment, a study was done among elderly individuals staying in particular old age homes throughout Navi Mumbai, Maharashtra. The results are displayed below as tables and graphs. The study comprised about 50 elderly individuals who resided in ashrams. The relationship between sociodemographic factors and cognitive impairment was examined. Sociodemographic characteristics of the study participants: The mean age of the individuals was  $70.66 \pm 8.75$  years, with a minimum age of 60 years and a maximum age of 92 years. Out of 50 (100%) participants, nearly 28 (56%) participants belonged to the age group between 60-70 years, 15(30%) participants to 71-80 years, and 7(14%) participants belonged to the age above 80 years. An approximately equal proportion of participants were present in both genders. About 24(48%) were females, and the remaining 26 (52%) were male. 23 (46%) participants had completed primary education, 18 (36%) participants had completed secondary education, and 9(18%) participants had completed graduation. Details regarding the other sociodemographic characteristics are presented in Table 1. **MMSE scores and QOL among the study participants: Of the study participants, the mean MMSE score was  $24.32 \pm 3.40$ , and the mean QOL score was  $14.42 \pm 2.30$ . (Table 1)**

	N	Minimum	Maximum	Mean	SD
Age	50	60.0	92.0	70.66	8.75
<b>Distribution of the participants based on age groups</b>					
<b>Age groups</b>	<b>Frequency</b>		<b>Percent</b>		
60 to 70 years	28		56.0		
71 to 80 years	15		30.0		
> 80 years	7		14.0		
Total	50		100.0		
<b>Distribution of the participants based on gender</b>					
<b>Gender</b>	<b>Frequency</b>		<b>Percent</b>		
Females	24		48.0		
Males	26		52.0		
Total	50		100.0		
<b>Distribution of the participants based on literacy</b>					
Primary Education	23		46.0		
Secondary Education	18		36.0		
Graduate	9		18.0		
<b>Mean MMSE and QOL scores</b>					
	N	Minimum	Maximum	Mean	SD
MMSE	50	19.0	30.0	24.32	3.40
QOL	50	8.0	19.0	14.42	2.30
<b>Table 1: Distribution of the participants based on mean age, age groups, and gender and mean MMSE and QOL score</b>					

Co-morbidities were present in 34(68%) participants, and cerebrovascular accident (CVA) in 8 (16%) participants. The most common reason for being in Ashram is 12(24%) participants have no family, 10(20%) participants have left their family, and 6(12%) participants were divorced. (Table 2)

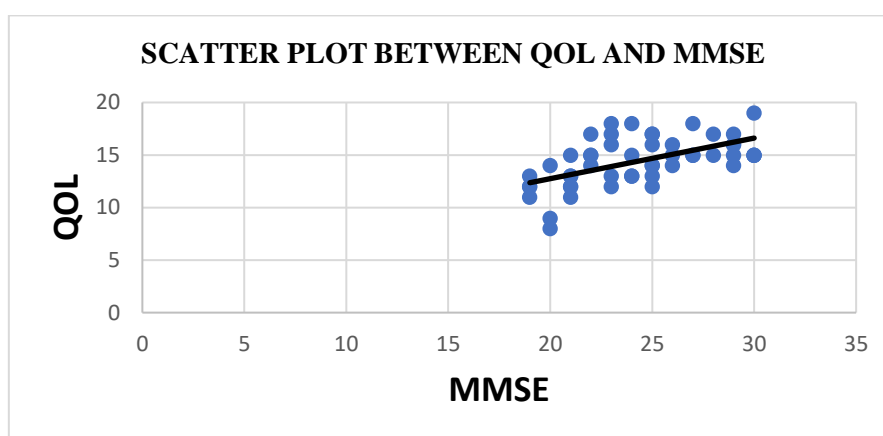
**Comparison of MMSE scores and also QOL among the study participants with literacy:** Individuals who received their graduation had better average MMSE ( $27.78 \pm 2.95$ ) and QOL ( $15.33 \pm 1.58$ ) scores than participants who had completed their secondary education - MMSE ( $24.44 \pm 2.87$ ) and QOL ( $15.11 \pm 1.45$ ) and primary education - MMSE ( $22.87 \pm 3.00$ ) and QOL ( $13.52 \pm 2.78$ ). (Table 2)

Parameters	Present / Absent	N	Percent
Comorbidities T2DM, HTN, IHD	Absent	16	32.0
	Present	34	68.0
CVA	Absent	42	84.0
	Present	8	16.0
Reason for being in Ashram	Depression in family	1	2.0
	Abuse	3	6.0
	Depression	5	10.0
	Divorce	6	12.0
	Divorce +left family	1	2.0
	Family in Ashram	2	4.0
	Illness	3	6.0
	Left family	10	20.0
	No family	12	24.0

	Physical abuse	1	2.0			
	Poor finance	2	4.0			
	Widow	4	8.0			
<b>Mean MMSE and QOL based on literacy</b>						
<b>Parameters</b>	<b>Literacy</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
MMSE	Primary Education	23	19.0	29.0	22.87	3.00
	Secondary Education	18	20.0	29.0	24.44	2.87
	Graduate	9	22.0	30.0	27.78	2.95
QOL	Primary Education	23	8.0	18.0	13.52	2.78
	Secondary Education	18	12.0	17.0	15.11	1.45
	Graduate	9	13.0	19.0	15.33	1.58

**Table 2:** Distribution of the participants based on co-morbidities, CVA, and reasons for being in the Ashram and mean MMSE and QOL based on literacy

Pearson's correlation showed a moderate, positive, and significant correlation between QOL and MMSE ( $r=0.569$ ,  $p=0.001$ ). (Figure 1)



**Figure 1: Pearson's correlation between QOL and MMSE**

**MMSE scores among the study participants based on reasons for being in Ashram:** The mean MMSE scores were higher in participants who had depression in the family and who were divorced and had left the family (29), followed by participants who were widow-  $26.50 \pm 3$  and had no family -  $26 \pm 2.52$ . (Table 3)

**MMSE scores among the study participants based on gender, comorbidities, and CVA**

Mean MMSE scores of Males were higher-  $24.5 \pm 3.31$  as compared to Females-  $24.12 \pm 3.54$ . Mean MMSE scores were higher in participants who had no comorbidities-  $24.43 \pm 2.988$  as compared to participants who had comorbidities-  $24.26 \pm 3.612$ . Mean MMSE scores were higher in participants who had no CVA -  $24.83 \pm 3.32$  as compared to participants who had CVA-  $21.62 \pm 2.44$ . (Table 3)

Reasons for being in Ashram	N	Minimum	Maximum	Mean	SD
Depression in family	1	29.0	29.0	29.00	-
Abuse	3	21.0	29.0	25.00	4.00
Diagnosed Depression	5	19.0	28.0	22.00	3.54
Divorce	6	22.0	26.0	24.00	1.41
Divorce +left family	1	29.0	29.0	29.00	-
Family in Ashram	2	19.0	23.0	21.00	2.83
Illness	3	20.0	25.0	22.00	2.65
Left family	10	19.0	30.0	24.10	3.96
No family	12	22.0	30.0	26.00	2.52

Physical abuse	1	20.0	20.0	20.00	-
Poor finance	2	19.0	23.0	21.00	2.83
Widow	4	23.0	29.0	26.50	3.00
<b>Mean MMSE scores based on gender</b>					
	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
Females	24	19.0	30.0	24.125	3.5424
Males	26	19.0	30.0	24.500	3.3136
<b>Mean MMSE scores based on comorbidities</b>					
	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
Absent	16	20.0	30.0	24.43	2.988
Present	34	19.0	30.0	24.26	3.612
<b>Mean MMSE scores based on CVA</b>					
	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
Absent	42	19.0	30.0	24.83	3.32
Present	8	19.0	25.0	21.62	244
<b>Table 3: Mean MMSE scores based on reasons for being in Ashram and mean MMSE score based on gender, comorbidities and CVA</b>					

## **DISCUSSION:**

### **Sociodemographic characteristics of the study**

**participants:** The mean age of the participants was  $70.66 \pm 8.75$  years, with a minimum age of 60 years and a maximum age of 92 years. Out of 50 (100%) participants, nearly 28 (56%) participants belonged to the age group between 60-70 years, 15(30%) participants to 71-80 years, and 7(14%) participants belonged to the age above 80 years. An approximately equal proportion of participants were present in both genders. About 24(48%) 48 were females, and the remaining 26 (52%) were male. 23 (46%) participants had completed primary education, 18 (36%) participants had completed secondary education, and 9(18%) participants had completed graduation. A study by Andrews S estimated that the global prevalence of cognitive impairment is approximately 15-20% among those above 65 years of age.<sup>(6)</sup> According to Qiu C et al, developed countries are showing a decline in cognitive impairment, which could be due to increased awareness, better education status, screening, and early diagnosis.<sup>(4)</sup> Whereas in developing countries, the prevalence is on the rise due to epidemiological transition increase in behavioural risk factors such as smoking and inadequate physical activity.<sup>(4)</sup> Gamage et al conducted a descriptive cross-sectional study on the associated factors for the cognition of physically independent elderly people. The results showed that 42.8% of participants were under the age of 70, with a mean age of  $71.9 + 6.7$  years, which was in accordance with the results of the current study.<sup>(7)</sup> Decreased psychological well-being was more common among free-home dwellers than those in paid homes and community-based homes. We understand that both dementia and cognitive impairment reduces QOL.<sup>(8)</sup> Cognitive impairment

effects health-related QOL independent of age, gender, education, chronic illness, and dwelling type. Preceding age causes brain volume shrinkage, loss of myelin sheath integrity, thin cortex, and the release of neurotransmitters like serotonin and acetylcholine are compromised. These changes lead to decreased ability to concentrate and decreased recalling capacity.<sup>(9,10)</sup> Various studies in the past showed a positive association between increasing age and cognitive decline.<sup>(8-12)</sup> We found moderate, positive, and significant Pearson's correlation community-based between QOL and MMSE ( $r=0.569$ ,  $p=0.001$ ). In relation with old-age homes, Samuel et al discovered a greater correlation between cognitive impairment and QOL among senior people living in community-based homes.<sup>(13)</sup>

### **Comparison of MMSE scores and QOL among the study participants with literacy:**

Cognitive impairment has a high negative and independent correlation with both education and employment.<sup>(14,15)</sup> In contrast to people with education levels up to middle school, those with higher levels of education were found to be connected with cognitive impairment in this study. Lower levels of schooling were found to significantly affect cognitive performance in the study by Del Pozo et al<sup>(16)</sup> Less education was discovered to be a risk factor for cognitive impairment in a similar study in West Bengal.<sup>(17)</sup> There could be a variety of reasons for the link between education and cognitive performance. Adults with higher education levels can do better on tests for cognition. Education also reflects an individual's innate level of cognitive ability. In addition to improve the cognitive reserve and the efficient processing of cognitive information, reading and writing result in the enhancement of neural networks.<sup>(18)</sup> Participants with at least a primary

education (8.2%) and a high school diploma (40.6%) had lower odds of CI than illiterates (39.6%).<sup>(19,20)</sup> Schmand et al reported a consistent decline in CI prevalence as the level of employment increased from unskilled (39.3%) to professional (1.3%).<sup>(21)</sup> According to the cognitive reserve (CR) hypothesis,<sup>(22)</sup> 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. However, Patel and Singh, in their study among the elderly in Gujarat, reported that higher education levels had a significant association with cognitive impairment.<sup>(8)</sup>

### **MMSE scores among the study participants based on reasons for being in Ashram:**

The mean MMSE scores were higher in participants who had depression in the family and who were divorced and had left the family - 29, followed by participants who were widow -  $26.50 \pm 3$  and had no family -  $26 \pm 2.52$ . Poddar et al conducted a cross-sectional epidemiological study of dementia among the habitants of Eastern Uttar Pradesh, India. The study findings revealed that Widows/widowers/unmarried had a double prevalence (9.3%) as compared with married (4.3%) people.<sup>(20)</sup> Elderly people with weak social support were more likely to experience cognitive impairment than older people with effective social support. This is consistent with research done in Spain<sup>(23)</sup> and Japan.<sup>(24)</sup> Both physical and mental health are influenced by social support. The loss of hippocampal neurons over time is thought to be caused by corticosterone hypersecretion, which is thought to be caused by insufficient social support coupled with stress.<sup>(25)</sup> From the data collected by Kathari et al, it was found that out of 280 people examined, 168 (60%) were cast down, and the citizenry who were depressed had higher cognition impairment of 80% with p value=0.000 and was found statistically significant.<sup>(26)</sup> Depression is thus one of the initiating factors in cognitive impairment. Our findings are similar to Senugupata et al<sup>(27)</sup> and Barnes et al<sup>(28)</sup>

### **MMSE scores among the study participants based on AGE, T2DM, HYPERTENSION**

**CKD and CVA:** Mean MMSE scores were higher in participants who had no co-morbidities-  $24.43 \pm 2.988$  as compared to participants who had co-morbidities-  $24.26 \pm 3.612$ . Mean MMSE scores were higher in participants who had no CVA -  $24.83 \pm 3.32$  as compared to participants who had CVA-  $21.62 \pm 2.44$ . According to this study, men are more likely than women to experience cognitive impairment. The findings reported in research by Ramachandran et al, Samuel et al, and Khanna et al are in contradiction to this.<sup>(13,29,30)</sup> According to the research by Kumar et al, the majority of respondents, or (89.18% of female respondents and 81.57% of male respondents), had

chronic conditions. Patients with stroke and neurological deficits had moderate cognitive impairment due to residual disability and resultant white matter changes. As a known correlation, onset of vascular dementia and emotional liability occurs in certain percentage of post stroke patients. Multifactorial risk aetiologies for CVA like hypertension, diabetes, cardiovascular diseases themselves contribute to mild cognitive issues. When compared to nondiabetic subjects, individuals with type II DM are at accelerated rate of developing cognitive disturbances due to prolonged high blood sugars and insulin resistance by brain tissue. Numerous factors are responsible for poor cognition in patients with heart failure, atrial fibrillation and impaired dynamics combinedly causing cerebral hypoperfusion. These patients were also found to have limited physical capacity. Majority of participants in the study reported having chronic illnesses, such as hypertension (40.0%), diabetes mellitus (10%), or other ailments (15.6%).<sup>(31)</sup> Contrary to what was observed in earlier research, chronic disorders like diabetes, heart disease, and stroke, as well as high blood pressure, obesity, and smoking have all been indicated to have an impact on cognitive performance.<sup>(9,32-34)</sup> There needs to be more study done in this area. It was observed in our study that the old age care facility with good financial source and care givers, cognition of inmates was better, compared to centres with less number of care givers. Recreational activities, personal care of inmates and friendly environment had a strong positive correlation in residents' wellbeing which was directly reflected on their mental health and quality of life.

### **RESULTS:**

In the present study amongst 50 residents, MMSE was normal with no cognitive dysfunction in 56% (28), 22 (44%) had mild and no residents with moderate and severe cognitive impairment was found. Progressive age was not correlated with lower MMSE scores but affected quality of life. Residents with higher education status, possibly with better coping up skills had a higher MMSE. The mean MMSE scores were higher in participants who had depression in the family and who were divorced and had left the family (29), followed by participants who were widow-  $26.50 \pm 3$  and had no family -  $26 \pm 2.52$ . Two residents with chronic kidney disease had mild cognitive impairment with profound lower QOL score. History of cerebrovascular diseases in ashram inmates significantly affected cognition and quality of life. Mean MMSE scores were higher in participants who had no CVA -  $24.83 \pm 3.32$  as compared to participants who had CVA-  $21.62 \pm 2.44$ . Comorbidities like T2DM, Hypertension, hypothyroidism, peripheral vascular disease, IHD, cancer and COPD did not show direct correlation with MMSE score but physical performance of basic activities were affected.

## **CONCLUSION:**

Lack of psychosocial support was one of the independent predictors of cognitive decline in residents of old age care centres. It was inferred that MMSE and QOL had a strong association indicating level of cognition affected their daily basic activities. The results of the current study also showed a significant relationship between cognitive impairment with gender, educational status, co-morbidities and past emotional trauma of inmates. Gradual cognitive deterioration in elderly with multiple risk factors is an imminent process. In order to repress the deterioration, early identification through screening scales and medical management supported with psychological counselling and coping skills should be encouraged.

## **REFERENCES:**

1. Karmakar N, Datta A, Nag K, Tripura K. Quality of life among geriatric population: A cross-sectional study in a rural area of Sepahijala District, Tripura. *Indian Journal of Public Health*. 2018;62(2):95.
2. Ministry of Statistics and Program Implementation | Government Of India [Internet]. [cited 2020 Jun 1]. Available from: <http://www.mospi.gov.in/>
3. Eldercare: Demographic downside [Internet]. *India Today*. [cited 2020 Mar 21]. Available from: <https://www.indiatoday.in/magazine/nation/story/20180507-branded-corporate-elderly-care-old-age-homes-1221657-2018-04-26>.
4. Qiu C, Johansson G, Zhu F, Kivipelto M, Winblad B. Prevention of cognitive decline in old age—Varying effects of interventions in different populations. *Annals of Translational Medicine*. 2019;7(Suppl 3).
5. Ontario Seniors Secretariat - Retirement Homes [Internet]. 2014 [cited 2020 Mar 21]. Available from: [https://web.archive.org/web/20140222032259/http://www.seniors.gov.on.ca/en/retirement\\_homes/](https://web.archive.org/web/20140222032259/http://www.seniors.gov.on.ca/en/retirement_homes/)
6. Andrews SJ. Predicting Cognitive Decline: Genetic, Environmental and Lifestyle Risk Factors. 2017.
7. Gamage MWK, Hewage C, Pathirana KD. Associated factors for cognition of physically independent elderly people living in residential care facilities for the aged in Sri Lanka. *BMC Psychiatry*. 2019;19(10).
8. Patel RM, Singh US. Prevalence study of cognitive impairment and its associated socio-demographic variables using mini mental status examination among elderly population residing in field practice areas of a medical college. *Indian Journal of Community Medicine*. 2018; 43(2): 113 – 116.
9. Murman DL. The impact of age on cognition. *In Seminars in hearing* 2015;36(3):111-121.
10. Goel D. A Prospective Study on Prevalence of Depression Among Elderly Patients Attending the Psychiatry OPD of a Tertiary Care Hospital in North India. 2016.
11. Kumar DN, Sudhakar TP. Prevalence of cognitive impairment and depression among elderly patients attending the medicine outpatient of a tertiary care hospital in South India. 2013.
12. Gambhir IS, Khurana V, Kishore D, Sinha AK, Mohapatra SC. A clinico-epidemiological study of cognitive function status of community-dwelling elderly. *Indian journal of psychiatry*. 2014;56(4):365.
13. Samuel R, McLachlan CS, Mahadevan U, Isaac V. Cognitive impairment and reduced quality of life among old-age groups in Southern Urban India: home-based community residents, free and paid old-age home residents. *QJM: An International Journal of Medicine*. 2016;109(10):653-9.
14. Ngandu T, von Strauss E, Helkala EL, Winblad B, Nissinen A, Tuomilehto J, et al. Education and dementia: what lies behind the association?. *Neurology*. 2007;69(14):1442-50.
15. Schmand B, Smit JH, Geerlings MI, Lindeboom J. The effects of

- intelligence and education on the development of dementia. A test of the brain reserve hypothesis. *Psychological Medicine*. 1997;27:1337-44.
16. Del Pozo PH, Espinosa PS, Donadi EA, Martinez EZ, Salazar-Urbe JC, Guerrero MA, et al. Cognitive decline in adults aged 65 and older in Cumbayá, Quito, Ecuador: prevalence and risk factors. *Cureus*. 2018;10(9).
  17. Dasgupta A, Ghose S, Paul B, Bandyopadhyay L, Ghosh P, Yadav A. Cognitive impairment and its predictors: A cross-sectional study among the elderly in a rural community of West Bengal. *Journal of Family Medicine Primary Care*. 2020;9:4603-4612.
  18. Barnes DE, Tager IB, Satariano WA, Yaffe K. The relationship between literacy and cognition in well-educated elders. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*. 2004;59(4):M390-5.
  19. Wu MS, Lan TH, Chen CM, Chiu HC, Lan TY. Socio-demographic and health-related factors associated with cognitive impairment in the elderly in Taiwan. *BMC Public Health*. 2011;11:22.
  20. Poddar K, Kant S, Singh A, Singh TB. An epidemiological study of dementia among the habitants of eastern Uttar Pradesh, India. *Annals of Indian Academy of Neurology*. 2011;14:164-8.
  21. Schmand B, Smit JH, Geerlings MI, Lindeboom J. The effects of intelligence and education on the development of dementia. A test of the brain reserve hypothesis. *Psychological Medicine*. 1997;27:1337-44.
  22. Stern Y. Cognitive reserve and Alzheimer disease. *Alzheimer Disease Associated Disorders*. 2006;20:112-7.
  23. Millán-Calenti JC, Sánchez A, Lorenzo-López L, Cao R, Maseda A. Influence of social support on older adults with cognitive impairment, depressive symptoms, or both coexisting. *The International Journal of Aging and Human Development*. 2013;76(3):199-214.
  24. Murata C, Saito T, Saito M, Kondo K. The association between social support and incident dementia: a 10-year follow-up study in Japan. *International journal of environmental research and public health*. 2019;16(2):239.
  25. Rashid A, Manan AA, Rohana S. The influence of social support on cognitive impairment in the elderly. *Australasian Medical Journal*. 2016;9(8).
  26. AM BK, MR NG. Prevalence of cognitive impairment and depression among elderly population in urban Chitradurga. *Journal of Preventive Medicine and Holistic Health*. 2020;6(1):22-6.
  27. Sengupta P, Benjamin AI, Singh Y, Grover A. Prevalence and correlates of cognitive impairment in a north Indian elderly population. *WHO South-East Asia journal of public health*. 2014;3(2):135-43.
  28. Barnes DE, Alexopoulos GS, Lopez OL, Williamson JD, Yaffe K. Depressive symptoms, vascular disease, and mild cognitive impairment: findings from the Cardiovascular Health Study. *Archives of general psychiatry*. 2006;63(3):273-9.
  29. Ramachandran R, Mundodan JM, Saju CR, Joshy VM. Nutrition-al status and cognitive impairment in elderly population in a rural area of Thrissur district, Kerala. *International Journal of Community Medicine Public and Health*. 2018;5:1218-23.
  30. Khanna AB, Metgud CS. Prevalence of cognitive impairment in elderly population residing in an urban area of Bela-gavi. *Journal of Family Medicine Primary Care*. 2020;9:2699-2703.
  31. Kumar M, Modak S. Correlation between the Cognitive Impairment and the Performance of Activities of Daily Living among Elderly People Residing in Selected Old-Age Homes of West Bengal.



International Journal of Health Sciences and Research. 2022.

32. Dye L, Boyle NB, Champ C, Lawton C. The relationship between obesity and cognitive health and decline. *Proceedings of the Nutrition Society*. 2017;76(4):443-54.
33. Fitri FI, Rambe AS. Correlation between hypertension and cognitive function in elderly. *IOP Conference Series: Earth and Environ Science*. 2018;125:12177.
34. Mons U, Schöttker B, Müller H, Kliegel M, Brenner H. History of lifetime smoking, smoking cessation and cognitive function in the elderly population. *European Journal of Epidemiology*. 2013;28(10):823-31.