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ORIGINAL ARTICLE

A Cross Sectional Study on Assessment of Cognitive Impairment and Behavioural Risk Factors among Senior Citizens Living in Old Age Homes in Chengalpattu District, Tamilnadu

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ABSTRACT
Ageing is an irreversible, unavoidable, universal phenomenon accompanied by gradual reduction in functional capacity of the elderly, both physically and mentally. The number of elderly population in India is expected to triple reaching 2 billion.1, As per data by Ministry of statistics and programme implementation , India has 103.9 ,million elderly, above the age of 60 years, which is approximately 8.5% of Indian population.2The rising burden of cognitive impairment among the geriatric age group can be paused and reduced if we focus on various risk factors associated with them.This study aims to estimate the prevalence of cognitive impairment and evaluate the association between various socio demographic factors and behavioral risk factors risk factors with it. This descriptive cross-sectional study was carried among 330 senior citizens living in old age homes by using a two-stage multistage sampling method. Study participants above age of 60 and those who were willing to participate after giving informed consent were included in the study. A standardized pretested structured questionnaire containing Brief Interview for Mental Status (BIMS) scale was used. Data was analysed using SPSS (Version 22). Among 330 study respondents, around 44% had mild -to- moderate cognitive impairment and 36% had severe cognitive impairment. Nearly 74.8% have their habit of regular physical activity. Among the study subjects approximately 4% of them were current smokers, 5.2% had the habit of regular alcohol consumption previously. Currently, both geriatric health and mental health are two important pillars of public health importance. National health Programmes are providing services at all the levels of healthcare for both the groups, through National Programmes for Health Care of Elderly and National Mental Health Program.But, their strategies do not specifically address mild cognitive impairment. Integration of these programs and early diagnosis of mild cognitive impairment during weekly op visits at primary level can be made mandatory. Level of attention given towards Alzheimer's disease is more when compared to screening for cognitive impairment which is an early precursor for Alzheimer's Disease.
***Keywords**: Cognition, retirement homes, BMI.*

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INTRODUCTION

Ageing being inevitable is associated with cognitive decline. Cognitive impairment is a slowly progressive condition which if diagnosed and treated earlier can be prevented from rapid progression. Delay in diagnosis might lead to dementia and Alzheimer which are major neuro psychiatric disorders among the elderly. Various risk factors for early development of cognitive impairment are discussed, of which most of them are modifiable and preventable. By preventing these risk factors, impairment of cognition can be postponed with advancing age. Left undiagnosed and untreated, mild cognitive impairment may progress to dementia and Alzheimer's which in turn affects the quality of life of elderly. Various complications due to these conditions have negative effects over individuals' health. Burden of impaired cognition among elderly population affects them in physical, social and financial aspects. Cognitive impairment is an

incipient neurodegenerative disorder which leads to dementia and might coexist with systemic, neurogenic or psychiatric disorders that may cause diminish cognitive functions. Generally cognitive impairment t is found to be associated with various co morbidities [1-3]. Urbanization, industrialization, education & exposure to western life styles have modified the social values towards elderly and have led to rapid breakdown from joint family support system to nuclear family system. Due to this, problems like economic insecurity, loneliness, lack of emotional support, lack of protection for their lives and property and dependency have raised. These socio-economic problems of elderly are also aggravated by factors such as the lack of social security and inadequate facilities for health care rehabilitation and recreation. In the recent times the necessity of traditional role of the family is being provided by institutions such as old age homes. Old age home is not usually a retirement home or place to relish; it is the hardship in the community life, maltreatment or sometimes abuse which drives them to these old age homes to seek solace in the twilight stages of their life. India is thus facing a unique situation in providing care for its elderly, as the existing old age support structures in the form of family, kith and kin are fast eroding, elderly are unable to cope alone with their lives in the face of illnesses and disability. The responsibility of caring for the elderly is therefore now more on the state than the family and to necessitate the creation of adequate institutional support. As a result of this, many older adults are forced to shift to old age homes where their daily needs can be met [8]. Old age homes have various facilities provided within a building for elderly. Old age homes include facilities for food, stay, recreation and health care. Elderly are admitted to old age homes for care, support of the elderly, food, shelter for destitute and abandoned, recreational activities etc [4-6]. In view of this background, this study was planned with the aim to determine the prevalence of cognitive impairment among elderly living in old age homes and assess behavioural risk factors associated with it.

MATERIAL AND METHODS

This Cross Sectional descriptive study was carried out in old age homes located in Northern zone of Chengalpattu District, Tamil Nadu. Senior citizens residing in old age homes were selected.

Sample size and sampling technique

Sample size was calculated based on the prevalence of a study done by Rakesh M. Patel et al., in 2012 in Gujarat. From the above study, prevalence of 25%. 5 was taken to calculate the sample size for our study.
Using the formula $N = Z\acute{\alpha}^2pq/ [L] 2$, the sample size was calculated as follows.
Using the formula,
$N = Z\acute{\alpha}^2pq/ [L] 2$
Where, Z = 1.96 at 95% confidence interval
p = Prevalence of disease taking from previous study
q = 100 – P
L = allowable error 5 %
Substituting it in the formula,
[Z = 1.96, p = 25%, q =75(100-25), L = 5]

$$N = \frac{1.96 \times 1.96 \times 25 \times 75}{5*5} = 300$$

Accounting for 10% non-response, the final sample size was calculated as 330 [N = 330]

Inclusion and exclusion criteria

Study participants were included based o their age above 60 and stay at old age homes. Those willing to participate after giving informed consent were included in the study. Those who werechronically ill and those suffering from psychiatry problems were excluded from this study.

Sampling method

Out of 32 old age homes, permission was obtained from 10 of them.
Multistage sampling method was used.
Stage 1: Probability Proportional to Size [PPS] sampling method was used. Here sample size of 330 was proportionately divided among the selected 10 old age homes based on the inmate's population size.
The population of subjects selected in each old age home was based on the given formula:

$$\frac{\text{Total number of elderly in each old age home}}{\text{Total number of elderly in selected 10 old age homes}} * \text{Sample size}$$

Stage 2- Simple Random Sampling was done to select the subjects from each of the old age homes.

IEC approval

The proposal for this study was presented before the Institutional Ethics Committee, Sree Balaji Medical College and Hospital and approval was obtained before beginning the study was carried out.

Data collection method

Data collection was collected using standardized, pretested, structured questionnaire. Information regarding socio demographic characteristics, physical activity and behavioral risk factors like alcohol consumption, smoking werecollected. BIMS scale was used in assessing the cognitive impairment under three main domains. By this a person's attention, orientation and ability to register and recall were assessed. Total score of 13 – 15 meant intact cognition, 08-12 meant moderate impairment and less than 7 was severe cognitive impairment.

Statistical analysis

Data collected was entered in Microsoft excel and was analyzed using SPSS software, version 22. The statistical analysis of the data was done using descriptive and analytical statistics. The descriptive statistics analyzed were presented as frequency distribution and percentage. The analytical statistics used were Chi – square test, Odds ratio (OR), 95% Confidence Interval (CI). The association of socio demographic characters and otherbehavioral risk factors with cognitive impairment was assessed with p value < 0.05 being considered statistically significant.

RESULTS

This study was conducted among senior citizens living at selected old age homes across Chengalpattu District, Tamil Nadu, to assess the Cognitive Impairment and its associated behavioural risk factors, which are presented below as tables and graphs.Around 330 elderly living in retirement homes were included in the study. Socio demographic determinants, behavioural risk factors and their association with cognitive impairment were analysed.

Socio-demographic characteristics of the study participants

Nearly 27% of the study population belonged to age group 71-75 years, 24% to 60-65years of age. About 52% were females and the remaining 48% were male. Almost 90% of the subjects were Hindus by religion. Details regarding the other sociodemographic characteristics are presented in Table 1.

Table 1 Socio demographic characteristics of the respondents

S.No	Socio demographic variable	Frequency (n= 330)	Percentage (%)
1	Age		
	60-65	80	24.2
	66-70	42	12.6
	71-75	90	27.2
	76-80	43	13.3
	81-85	75	22.7
2	Sex		
	Female	172	52.1
	Male	158	47.9
3	Previous Occupation		
	Technician/skilled worker	63	19.1
	Clerks/shopkeepers/semi skilled worker	91	27.6
	Unskilled worker	47	14.2
	Unemployed	129	39.1
4	Education status		
	Graduate / diploma	47	14.2
	High school	52	15.8
	Middle school	121	36.7
	Primary school	52	15.8
	Illiterate	58	17.5
5	Marital status		
	Married	26	7.9
	Not married/single	143	43.3
	Widowed	161	48.8
6	Type of Family		
	Nuclear	53	16.1
	Joint	14	4.2

	Destitute	145	43.9
	Abandoned	118	35.8
7	No. of children		
	No	222	67.4
	1	16	4.8
	2	69	20.9
	3	23	6.9
8	Religion		
	Hindu	300	90.9
	Christian	19	5.7
	Muslim	11	3.4

Prevalence of various behavioural factors among study participants

Behavioural risk factors of the study participants were analysed and tabulated in Table 2. Majority of the study participants (74.8%) have their habit of regular physical activity. Among the study subjects 3.9% of them were current smokers, 5.2% had the habit of regular alcohol consumption previously.

Table 2: Behavioural risk factors among the study subjects

S.No	Behavioural Risk factors*	Frequency (n = 330)	Percentage (%)
1	Smoking	13	3.9
2	Alcohol	17	5.2
3	Physical activity	247	74.8

*multiple responses considered

Physical status of the study respondents

BMI status of the study population

BMI status of the study subjects using Asian Classification of BMI is listed in Table 3. From the table, we can observe that 46.7% of them belonged to normal weight category. Among the respondents around 14.2% were underweight, 19.1% were overweight, 16.9% were obese and 3.1% were extremely obese.

Table 3: BMI of study respondents

BMI	Frequency (n = 330)	Percentage (%)
<18.49 – underweight	47	14.2
18.5-22.9 – normal	154	46.7
23-24.9 – over weight	63	19.1
25-29.9 – obese	56	16.9
>- 30 – extreme obesity	10	3.1

Prevalence of Cognitive impairment among the study respondents

Prevalence of impaired cognition among subjects is presented in Figure 1.Of them nearly 44% had mild - moderate cognitive impairment, 36% had severe cognitive impairment. Only 20% of the respondents had intact cognitive levels.

Figure 1: Prevalence of cognitive impairment among the study population

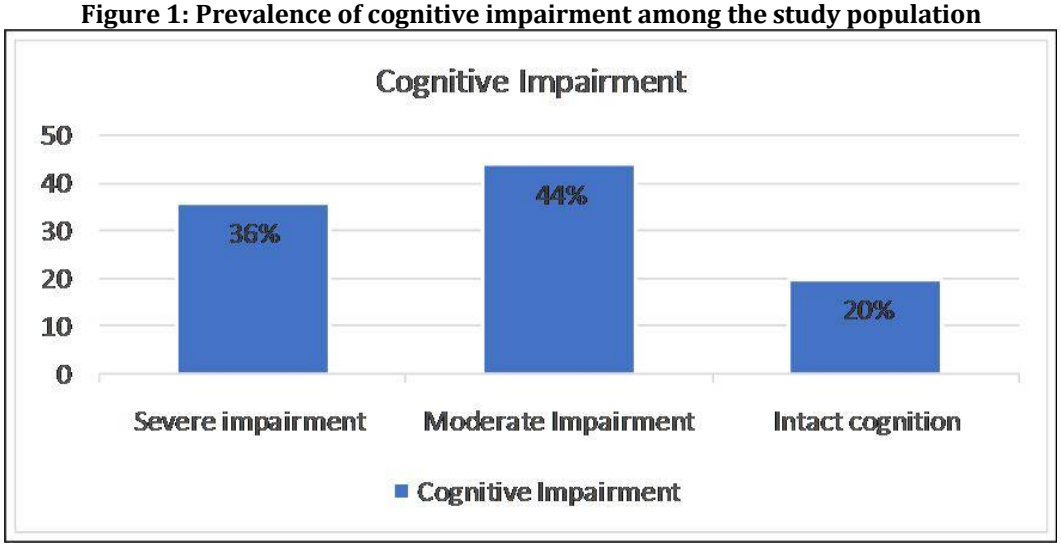

Table 4: Univariate analysis of socio demographic characteristics with cognitive impairment among the study population

S.No	Socio demographic variable	Frequency		Chi square	Odds ratio (95% CI)	p value 0.05*
		Yes	No			
1	Age					
	>75	103	15	6.08	2.08 (1.16-4.07)	0.01*
	≤75	161	51			
2	Sex					
	Female	146	26	5.36	1.90 (1.09-3.29)	0.02*
	Male	118	40			
3	Previous Occupation					
	Below semiskilled	151	25	7.89	2.19 (1.26-3.81)	0.005*
	Semiskilled and above	113	41			
4	Education status					
	Upto middle school	208	23	48.39	6.94 (3.86-12.48)	0.0001*
	Above middle school	56	43			
5	Marital status					
	Single	123	20	5.69	2.01 (1.13-3.58)	0.02*
	Married/ Widowed	141	46			
6	Type of Family					
	Destitute and abandoned	217	46	5.09	2.00 (1.08-3.7)	0.02*
	Nuclear and joint	47	20			
7	Religion					
	Hindu	240	60	0.03	0.78 (0.29-2.3)	0.63
	Christian/Muslims	24	6			
8.	BMI					
	Under weight	43	4	4.52	3.02 (1.04-8.73)	0.03*
	Others	221	62			

OR: odds ratio; CI: confidence interval; *p<0.05 statistically significant at 95% CI

Table 5: Association between behavioural risk factors with cognitive impairment

S.No	Behavioural Risk Factors	Frequency		Chi square	Odds ratio (95% CI)	P value <0.05 *
1	Smoking					
	Yes	8	5	2.89	0.35 (0.12-1.21)	0.09
	No	256	61			
2	Alcohol					
	Yes	9	8	8.2	0.26 (0.09-0.69)	0.004*
	No	255	58			
3	Physical activities					
	Yes	189	58	7.44	2.87 (1.31-6.31)	0.006*
	No	75	8			

OR: odds ratio; CI: confidence interval;*p<0.05 statistically significant at 95% CI

Association between various behavioural risk factors like alcohol, smoking and exercise was analysed and presented in Table 6. Out of these variables smoking was not having statistically significant association. The chances of developing cognitive impairment was 0.2 times higher among those who consumed alcohol. The odds of having cognitive impairment is nearly 3 times more among elderly who did not have regular physical activity when compared towards elderly who were doing regular physical activity.

DISCUSSION

Prevalence of cognitive impairment

In our study, nearly 44% had mild -to- moderate cognitive impairment and 36% had severe cognitive impairment. Study done by Andrews S, had estimated that the global prevalence of cognitive impairment is approximately 15-20% among those above 65 years of age [7]. According to Qiu C et. al, the developed countries are showing a decline in cognitive impairment, which could be due to increased awareness, screening and early diagnosis. Whereas in the developing countries, the prevalence is on the rise due to epidemiological transition, increase in behavioural risk factors such as smoking, inadequate physical activity [8]. Very few studies have been done in India on the prevalence of cognitive impairment among elderly living in old age homes. The prevalence varies from 3.5% to 11.5% across different states in India [9, 10]. In a similar study done by Samuel et al among the old age home residents in Chennai, the

prevalence was reported as 42.7% [11]. In a study done in a rural community of West Bengal, the proportion of cognitive impairment was noted as 48.1% [12]. Ramachandran *et al* in a study done in Kerala reported the prevalence as 55% [13]. In a hospital based study in Tirupati, Andhra Pradesh, the prevalence of cognitive impairment was noted to be 31% [14].

Prevalence of behavioural risk patterns

Among the respondents, around 14.2% were underweight, 19.1% were overweight, 16.9% were obese and 3.1% were extremely obese. Dasgupta *et al* in a similar study reported that 7.4% of elderly were malnourished and around 47% were at risk of developing malnutrition [12]. In the study by Santosh et al in Davengere, Karnataka, nearly 12% and 21% belonged to categories of overweight and obese respectively [15]. About 22% of elderly were undernourished. In the study by Sharma et al, about 19% of the study participants were alcohol consumers (present and past) and 35.3% were smokers (present and past). Nearly 4.5% of the elderly were under nourished [16]. In a study conducted by Katta A et al. (2011) from rural Tamil Nadu found that under nutrition was about 34.6% and obesity was found in about 17.4% of the study subjects [17]. A study done by Swami et al (2005) in Chandigarh found 14.36% elderly to be under nourished and obesity was found in 7.54% of the elderly. Overweight was found in 33.15% of the elderly [18]. In this study, around 25% of the elderly didn't have the habit of regular physical activity. Nearly 3.9% of them were current smokers and 5.2% were alcoholics. In the study by Espinosa et al, nearly 80% reported routine walking and 28.5% had the habit of exercising regularly. A very small proportion of the study participants were tobacco users (2.1%) [19]. In a study by Dasgupta *et al* in a rural community in West Bengal, tobacco smoking was noted among 34.8% and alcoholism among 11.1% of the study participants [12]. In a recent study by Khanna et al in Karnataka, nearly 18.3% were smokers and 9% were alcohol consumers [20].

Socio demographic factors associated with cognitive impairment

In this study, factors such as age >75 years, females, occupation (unskilled work and unemployed), education (up to middle school education), marital status (never married), destitute/abandoned and underweight elderly were found to have increased chances of development of cognitive impairment.

Age and cognitive impairment

In this study, we found a statistically significant association of advancing age and cognitive impairment. Rao et al in their study among the inmates of old age home reported increasing age as one of the risk factors for cognitive impairment [21]. The positive association between increasing age and prevalence of cognitive impairment was also noted in an epidemiological study done among geriatric population in Argentina [22]. Similarly in the studies by Espinosa et al in Ecuador and Dasgupta *et al* in West Bengal, age was found to be a risk factor for impaired cognition [12]. This finding was also noted in studies done by Ramachandran et al, Gambhir *et al* in Varanasi, Sengupta *et al* in North India and Samuel *et al* in Chennai [13,23–25].

Gender and cognitive impairment

In this study, females were found to have increased risk of cognitive impairment compared to males. Similar finding was noted [13,20,25]. The risk of cognitive impairment among females can be attributed to decrease in the levels of oestrogen following menopause [26, 27].

Educational level and cognitive impairment

In this study, education up to middle school level was found to be associated with cognitive impairment compared to those who are more educated. Similarly, in the study by Espinosa et al, lower education levels were found to have a significant impact on cognitive function. In a similar study in West Bengal, less education was found to be a risk factor for cognitive impairment [12]. The association between education and cognitive function could be due to various factors. Adults with higher education levels can do better on tests for cognition. Education also reflects an individual's innate level of cognitive ability. Reading and writing leads to enrichment of neural networks thereby enhances the cognitive reserve and effective processing of cognitive information.28 However, Patel and Singh in their study among elderly in Gujarat reported that higher education levels had a significant association with cognitive impairment [29].

Occupation and cognitive impairment

In this study, those who were unemployed and those engaged in unskilled work were found to have greater risk of cognitive impairment compared to those employed in skilled, semiskilled and professional jobs. Sengupta et al in a study among the elderly population in North India noted that lack of employment was associated with cognitive impairment [24]. In a similar study by Khanna et al, the authors found that unemployed elderly had increased risk of cognitive impairment [20]. On the contrary, Patel and Singh in their study among elderly in Gujarat reported that higher occupational levels were found to be a risk factor for impaired cognition [29].

Marital status and cognitive impairment

In this study, those elderly who were never married had increased risk of cognition compared to those who were married. Ramachandran *et al* in their study reported that single/widowed elderly compared to those married were found to be associated with cognitive impairment. Sengupta *et al* studied among the elderly population in North India noted that marital status (unmarried or widowed) was one of the factors associated with cognitive impairment. In a population based study in Shimla by Sharma *et al*, marital status was reported as one of the predictors of cognitive impairment [16].

Nutrition and cognitive impairment

In this study, underweight elderly were found to have increased chances of cognitive impairment In the study by Espinosa et al, malnutrition was noted to have association with cognitive impairment [19]. Similar finding was reported by Ramachandran *et al* and Goodwin *et al*. [13,30]. In the study done by Sharma et al in Shimla, the authors found no relation between under nutrition and impaired cognition [16]. Certain deficiencies such as vitamin B6, vitamin B12, thiamine, folate and zinc have been related to cognitive impairment [31].

Behavioural risk factors and cognitive impairment

Physical activity and cognitive impairment

Inadequate physical activity was found to be a risk factor for cognitive impairment in our study. Exercise was noted to have a protective effect against cognitive decline in the study done among elderly in Ecuador [19]. Researchers have reported that higher levels of physical fitness have been associated with higher levels of cognitive functioning [32].

Alcohol intake and cognitive impairment

In this study, alcohol was found to have a protective effect on cognition. In the study by Arizaga et al, alcohol consumption didn't show a correlation with cognitive impairment [22]. A prospective study in France noted a lower incidence of dementia and impaired cognition among subjects who were moderate alcohol consumers. It is possible that study subjects may not correctly report the intake of alcohol to the interviewers. More longitudinal studies are needed to understand the correlation between alcohol consumption and cognitive impairment. In the population based study in Shimla by Sharma et al, the authors noted that cognitive impairment was not associated with alcoholism [16].

CONCLUSION

A combination of interventions at various levels is required, maximum of which can be attained by IEC activities. Interventions in younger age group will lead to better quality of life as elderly. There is a need to strengthen geriatric care services in the existing public health system so that the increasing care demands of the elderly can be met33 Various measures if taken can postpone the incidence of cognitive impairment.

At individual level

People can

- Focus on individual self-care
- Regular reading activities
- Balanced diet since young age
- Regular physical exercise
- Proper sleep pattern

At Community level

- Accessibility to healthcare services
- Safe environment
- Recreational activities for elderly
- Newer policies and initiatives for healthcare of elderly

Various health programs have been incorporated in maintaining geriatric health care. Government has taken up various initiatives in form of Policies and schemes to strengthen geriatric health care. The nodal ministry responsible for welfare of senior citizens is the Ministry of Social Justice and Empowerment.

In 1999, National Policy on older persons (NPOP) was launched, which laid concern on welfare of the geriatric group. 34

Other programs/schemes related to geriatric and mental health are as follows:

1. National Programme for Healthcare of the Elderly (NPHCE)
2. National Mental Health Program (NMHP)
3. Integrated Programme for Older Persons (IPOP)

In spite of all these programmes and measures, the special care facilities for the elderly are still grossly

insufficient and thus India is facing a challenging situation in providing comprehensive care for older persons because of the current status of fast eroding family structure. In view of this, the elderly are unable to cope with their lives left alone. The responsibility of geriatric care is pressurized over the community than the family per se.15

REFERENCES

1. Karmakar N., Datta A., Nag K., Tripura K. (2018). Quality of life among geriatric population: A cross-sectional study in a rural area of Sepahijala District, Tripura. Indian J Public Health. 2018 Apr 1;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. April 26 RD, May 7 2018 ISSUE DATE:, August 11 2018UPDATED:, Ist 2018 19:10. 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. 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/
5. Patel R.M., Singh U.S.(2018) Prevalence Study of Cognitive Impairment and its Associated Sociodemographic Variables using Mini-Mental Status Examination among Elderly Population Residing in Field Practice Areas of a Medical College. Indian J Community Med Off Publ Indian Assoc Prev Soc Med. 2018;43(2):113–6.
6. BIMS scale - Google Search [Internet]. [cited 2020 Mar 21]. Available from: https://www.google.co.in/search dcr=0&sxsrf=ALeKk01oW8bsyfWlbNHH-mZmqAaWAdyqGw%3A1584806333595&source= hp&ei=vTl2Xrm OIo7G4-EPmc-W2Ak&q=bims+scale&oq=bi&gs_l=psy ab.3.0.35i39l3j0j0i131l2j0l2j0i131j0.959. 3248..4449.. 2.0.. 0.407.1013.2-1j1j1.1..gws-wiz.DBSG-3vNKao
7. Andrews S. (2017) Predicting Cognitive Decline: Genetic, Environmental and Lifestyle Risk Factors. 2017.
8. Qiu C., Johansson G., Zhu F., Kivipelto M., Winblad B. (2019) Prevention of cognitive decline in old age—varying effects of interventions in different populations. Ann Transl Med [Internet]. 2019 Jul [cited 2020 Jun 4];7(Suppl 3). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6685914/
9. Prevalence and correlates of cognitive impairment in a north Indian elderly population [Internet]. [cited 2020 Mar 20]. Available from: https://apps.who.int/iris/handle/10665/329735
10. 10. Shaji S., Bose S., Verghese A. (2005). Prevalence of dementia in an urban population in Kerala, India. Br J Psychiatry. 2005 Feb;186(2):136–40.
11. 11. Samuel R., McLachlan C.S., Mahadevan U, Isaac V. (2016). 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 Int J Med. 2016 Oct 1;109(10):653–9.
12. Dasgupta A., Ghose S., Paul B, Bandyopadhyay L., Ghosh P., Yadav A. (2020). Cognitive impairment and its predictors: A cross-sectional study among the elderly in a rural community of West Bengal.J Family Med Prim Care 2020;9:4603-4612.
13. Ramachandran R., Mundodan J.M., Saju C.R., Joshy VM. (2018). Nutritional status and cognitive impairment in elderly population in a rural area of Thrissur district, Kerala. Int J Community Med Public Health 2018;5:1218-23.
14. Kumar, N., Sudhakar, T,P. (2013). Prevalence of cognitive impairment and depression among elderly patients attending the medicine outpatient of a tertiary care hospital in South India. Int J Res Med Sci 2013;1:359-64.
15. Santosh, A. (2014). A Study On Morbidity Pattern, Social Problems And Facilities Available For Geriatric People In Old Age Homes Of Davangere District [Internet] [Thesis]. 2014 [cited 2020 Jul 27]. Available from: http://localhost:8080/xmlui/handle/123456789/9357
16. Sharma, D., Mazta, S.R., Parashar, A.(2013). Prevalence of cognitive impairment and related factors among elderly: A population-based study. J Dr NTR Univ Health Sci. 2013 Jul 1;2(3):171.
17. Katta, A., krishnan, G.S,, kumar, G.P., Amalraj, C.V., Jha, R.K., Munuswamy, S. (2011). Morbidity Pattern and Nutritional Status of Elderly Population in Rural Tamil Nadu. J Indian Acad Geriatr 2011; 7: 159-162.
18. Swami, H.M., Bhatia, V., Gupta, A.K., Bhatia, S.P.S. (2005). An epidemiological study of obesity among elderly in Chandigarh. Indian J Community Med 2005; 30 (1): 11 – 13.
19. Espinosa del Pozo, P.H., Espinosa, P.S., Donadi, E.A., Martinez, E.Z., Salazar-Uribe, J.C., Guerrero, M.A., et al. (2020). Cognitive Decline in Adults Aged 65 and Older in Cumbayá, Quito, Ecuador: Prevalence and Risk Factors. Cureus [Internet]. 2020 Mar 20 [cited 2020 Mar 20];10(9). Available from: https://www.ncbi.nlm.nih.gov /pmc /articles/PMC6221535/
20. Khanna, A.B., Metgud, C.S. (2020). Prevalence of cognitive impairment in elderly population residing in an urban area of Belagavi.JFamily Med Prim Care 2020;9:2699-2703.
21. Rao, S.S., Chennamsetty, S.K., Kuna, S.R. (2014). A cross-sectional study of cognitive impairment and morbidity profile of inmates of old age home. Sch J App Med Sci 2014;2:1506-13.
22. 22. Arizaga, R.L., Gogorza, R.E., Allegri, R.F., Baumann, P.D., Morales, M.C., Harris, P., et al. (2014). Cognitive impairment and risk factor prevalence in a population over 60 in Argentina. Dement Amp Neuropsychol. 2014 Dec;8(4):364–70.
23. Gambhir, I.S., Khurana, V., Kishore, D., Sinha, A.K., Mohapatra, S.C. (2014). A clinico-epidemiological study of cognitive function status of community- dwelling elderly. Indian J Psychiatry 2014;56:365-70.

24. Sengupta, P., Benjamin, A.I., Singh, Y., Grover, A. (2014). Prevalence and correlates of cognitive impairment in a north Indian elderly population. WHO South-East Asia J Public Health 2014;3:135-43.
25. Samuel, R., McLachlan, C.S., Mahadevan, U., Isaac V. (2016). 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 Int J Med. 2016 Oct 1;109(10):653–9.
26. PhDThesis_jesne_tryk_nofront.pdf [Internet]. [cited 2020 Jun 1]. Available from: https://backend.orbit.dtu.dk /ws/files/142116594/PhDThesis_jesne_tryk_nofront.pdf
27. Ren, L., Zheng, Y., Wu, L., Gu, Y., He, Y., Jiang, B., et al. (2018). Investigation of the prevalence of Cognitive Impairment and its risk factors within the elderly population in Shanghai, China. Sci Rep. 2018 Feb 23;8(1):3575.
28. Barnes, D.E., Tager, I.B., Satariano, W.A., Yaffe, K [Internet]. (2004). The Relationship between Literacy and Cognition in Well-Educated Elders. The Journals of Gerontology; 2004 [cited 2020 Mar 31]. Available from: https://academic.oup.com/biom\edgerontology/article/59/4/M390/637780.
29. Patel, R.M., Singh, U.S. (2018). Prevalence Study of Cognitive Impairment and its Associated Sociodemographic Variables using Mini-Mental Status Examination among Elderly Population Residing in Field Practice Areas of a Medical College. Indian J Community Med Off Publ Indian Assoc Prev Soc Med. 2018;43(2):113–6.
30. Goodwin, J.S., Goodwin, J.M., Garry, P.J. (1983). Association between nutritional status and cognitive functioning in a healthy elderly population. JAMA 1983;249:2917-21.
31. Riggs, K.M., Spiro, A., Tucker, K., Rusch, D. (1996). Relation of vitamin, B-12, vitamin B-6, folate and homocysteine to cognitive performance in the Normative Aging Study. American Journal of Clinical Nutrition. 1996;63:306–314.
32. Dustman, R.E., Emmerson, R., Shearer, D. (1994). Physical activity, age, and cognitive-neuropsychological function. Journal of Aging and Physical Activity. 1994;2:143–181.
33. Sharma, D., Mazta, S.R., Parashar, A. (2013). Prevalence of cognitive impairment and related factors among elderly: A population-based study. J Dr NTR Univ Health Sci. 2013 Jul 1;2(3):171.
34. National Policy for Older Persons Year 1999.pdf [Internet]. [cited 2020 Sep 18]. Available from: http://socialjustice.nic.in/writereaddata/UploadFile/National%20Policy%20for%20Older%20Persons%20Year%201999.pdf