

Periodic Research

Assessment of Nutritional Status of Elderly with Mild Dementia in Urban Vadodara

Abstract

Dementia is one of most common problem in elderly population. Nutritional deficiency especially vitamin B₁₂, folate, antioxidants may increase the deterioration of mental health likely to be caused by dementia. **Materials and Methods:** The present study included assessment of nutritional and health status of mild dementia subjects between 60-85 years of age. 250 elderly male and female were screened using Mini Mental Score Examination and Cognitive Impairment Scale. Socio- demographic profile, nutritional status and diet profile were then studied. Appropriate statistical analysis was applied to evaluate the data. **Results:** Mean age of younger elder group was around 69 years and 80 years of older age group. Females were more overweight/ obese as compared to males in both the age group. There were lower intakes of energy, protein, iron, vitamin B₁₂ and β carotene whereas higher intake of fat, calcium and vitamin C in both the age groups. Majority subjects had <25 % of Vitamin B₁₂ intake in younger age group where as older age group had 26-50% of RDA. High prevalence of mild dementia was significantly noted ($p < 0.05$) by screening the elderly on MMSE and CIT scores. MMSE score was found low and CIT score was found higher in older age group (76-85 years) as compared to younger age showing mild dementia. Slightly positive correlation was obtained between CIT score and age ($r = 0.114$). **Conclusion:** Early identification of the dementia patients in the long run can preserve the mental health status in the elderly by ensuring the remedial measures.

Keywords: Elderly, Vitamin B₁₂, diet, nutritional status and mild dementia

Introduction

Dementia is estimated to afflict over 35.5 million people worldwide - this includes nearly 10 million people in Europe, nearly 4.4 million in North America, nearly 7 million in South and Southeast Asia, about 5.5 million in China and East Asia and about 3 million in Latin America (World Alzheimer's Report., 2009). Dementia and AD are age related. The frequency of dementia, of which AD is the common form, is double every five years after the age of 60 (ICMR, 2001).

Jotheeswaran (2010) showed that prevalence of dementia was high in women as compared to men in India. Presently, an estimated 3.7 million Indian people aged over 60 have dementia (2.1 million women and 1.5 million men). The prevalence of dementia increases steadily with age and higher prevalence is seen among older women than men. Ageing and the health transition in low and middle income countries (LAMICs) are responsible for an unprecedented increase in the prevalence and societal impact of non-communicable diseases, including dementia (Mathers and Loncar, 2006).

Methods and Materials

The present study was planned with the aim of assessing social demographic profile, nutritional status, dietary profile and mental health profile (MMSE and CIT) of an elderly population of urban Vadodara in relation to mental health among elderly men and women aged 60-85 years with mild dementia.

Two hundred and fifty elderly men and women in age group of 60 to 85 years (from middle income groups) were approached purposively through senior citizen associations by screening from the free living population with help of Mini Mental State Examination (MMSE) {Folstein et.al 1975} and Cognitive Impairment Test (CIT) {Katzman et.al, 1983}.

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Mini Mental Status Examination (MMSE)

This test was used to assess orientation, registration, attention, calculation, memory, language and visuo-spatial abilities of the subjects. The questionnaire contains different sections and the maximum score is 30. The total of all the answers gives the extent of mental health. The cut off was 21-26 for mild dementia and those who scored 27 were considered normal and those below 26 were considered having a mental impairment (Folstein *et. al.*, 1975).

Cognitive Impairment Test (CIT)

This test was used to assess the cognitive function of the selected subjects. Here the score of 1 was given for each incorrect response; maximum weighed error score was 28. Score of 0-10 indicates normal & 11-28 indicates abnormal score (Katzman *et al.*, 1983).

Basic information was collected from the subjects enrolled for the study which included mental health status, socio demographic profile, nutritional status which included anthropometric measurement and diet profile using 24 hour dietary recall. The data collected was analysed for the statistical values like percentages, mean, standard deviation, student-t test, Pearson correlation coefficient using Microsoft Excel software, 2007.

Results

The results of the present study can be divided into the following categories:

- 1) Young elderly group: age between 60 and 75 years.
- 2) Old elderly group: age between 76 and 85 years.

Mental Health Status

The elderly population was initially screened for mental health by evaluating memory and cognitive functions using the screening tools as Mini Mental State Examination (MMSE) and Cognitive Impairment Test (CIT) and further were classified as per their scores. Only mildly demented subjects were enrolled in the study. The details are described in the table 1 below.

Table 1: Mean of MMSE scores of mild dementia subjects belonging to different age groups

Mental Health	60-75 years		76-85 years		Total N=250
	Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
MMSE	24.22 ± 1.64	23.71 ± 1.64	23.33 ± 1.67	22.78 ± 1.76	23.78 ± 1.67
Age	67.01 ± 4.33	68.88 ± 4.02	80.33 ± 3.55	80.14 ± 2.24	67.26 ± 6.23
Correlation	-	-	-	-	-0.153*

*significant at $p \leq 0.05$

Table 1 shows mean of subjects belonging to different age groups according to MMSE Scores. All subjects were selected between 21-26 MMSE score. At the significant ($p \leq 0.05$ levels, MMSE score was less in younger age group males and females as compared to older age group males and females. The data showed that as age increases the MMSE score decreases.

Table 2: Percentage of mild dementia subjects belonging to different age groups showing MMSE score distribution

MMSE scores	60-75 years		76-85 years		Total N=250
	Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
21	8.5 (6)	11.9(18)	20(3)	35.7(5)	12.8 (32)
22	10 (7)	14.6(22)	13.3(2)	14.3(2)	13.2 (33)
23	14.3(10)	18.5(28)	20(3)	14.3(2)	17.2 (43)
24	12.8(9)	18.5(28)	13.3(2)	14.3(2)	16.4 (41)
25	25.7(18)	17.9(27)	26.7(4)	14.3(2)	20.4 (51)
26	28.6(20)	18.5(28)	6.7(1)	7.1(1)	20(50)

Figures in the parenthesis denote number of subjects.

From the table 2 the MMSE score distribution of mild dementia subjects clearly shows that majority of the subjects (around 40%) were found to be at borderline score of mild cognitive impairment whereas lower number of people were found to at towards moderate MMSE score (around 26%). More number of people from younger age group was found at borderline score of mild cognitive impairment (around 46%) whereas more number of people from older age group was found towards moderate MMSE score. When MMSE scores were compared between the genders, it indicated that severity of dementia was found higher in females as compared to males in both the age groups and it also showed that as score decreases towards 26-21, the prevalence of women increased in both the age groups as compared to males.

Figure 1: Scatter diagram of correlation between MMSE score and age of total elderly subjects

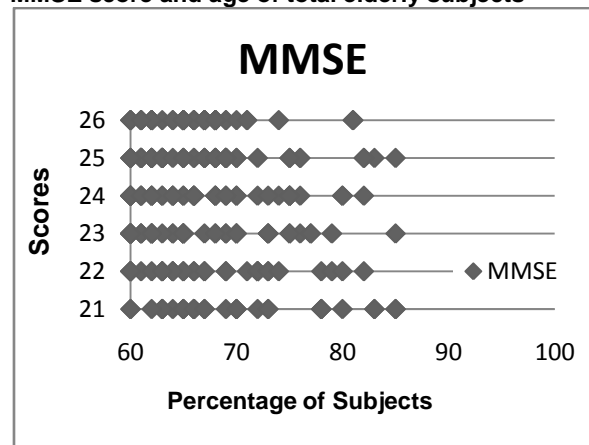


Figure 1 shows the linearity between the MMSE score and the age of the elderly subjects. The straight line has been indicating an inverse relationship among the MMSE score and age of the elderly. The reason being that as the age of subjects increased their MMSE score showed a decrease.

The subjects were further screened for cognitive impairment and the data is represented in the Table 3 as:

Table 3: Mean of CIT scores of dementia subjects

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Mental Health	60-75 years		76-85 years		Total N=250
	Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
CIT	13.02±2.07	13.80±2.70	14.8±2.88	14.28± 2.86	13.67±2.59
Age	67.01±4.33	68.88±4.02	80.33±3.55	80.14±2.24	67.26±6.23
Correlation	-	-	-	-	0.114

*significant at $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

The table shows that all subjects were selected between 11-28 CIT score to categorise mild dementia. Slight positive correlation was observed. Here, mean CIT scores of younger age group was less indicating normal stage as compared to older age group. With respect to gender, mean score of younger age group females was more than males whereas among older group no change was observed in the mean score between the genders.

Table 4: Percentage of mild dementia subjects as per CIT score distribution belonging to different age groups

CIT scores	60-75 years		75-85 years		Total N=250
	Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
11-16	90(63)	83.4(126)	66.7(10)	71.4(10)	83.6(209)
17-22	10(7)	13.9(21)	33.3(5)	28.6(4)	14.8(37)
23-28	0(0)	2.6(4)	0(0)	0(0)	1.6(4)

Figures in the parenthesis denote number of subjects.

Above table 4 depicts that the majority of the subjects (83.6%) were in 11-16 score of CIT as compared to less towards more abnormality score. According to above table less number of people was in 17-22 score. There were very few number of people (2.6%) in 23 -28 score which indicated high abnormality. Further, it cleared that the severity of dementia was high in females as compared to men in both the age groups.

Figure 2: Scatter diagram of correlation between CIT score and age of total elderly subjects

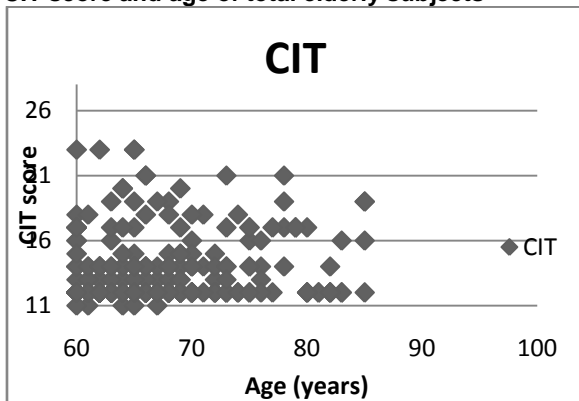


Figure 2 indicates a direct linear representation between the CIT score and the age of the elderly subjects. It is observed that as the age of subjects increased, their CIT score also showed an increase which clearly indicates mild dementia.

Thus, from the MMSE and CIT scores, it is evident that as the age advances there is deterioration of the mental status of the subjects showing poor memory, attention and concentration leading to the mild

cognitive impairment. The subjects screened for mild dementia were enrolled in the study for analysing the socio-economic, dietary and nutritional profile which are discussed in following categories:

Socio-demographic Profile

Pre tested questionnaire was used to obtain socio- demographic profile of elderly males and females of 60-85 years. The assessment included socio- demographic information on age, marital status, education, occupation, religion, type of family, per capita income and care taker of the subjects. The data is presented in table 5.

The table 5 shows that the mean age of subjects between 76-85 years was near to 80 years in both males and females whereas in case of 60-75 years, it was around 67 years in males and around 68 years in females. With respect to marital status widowhood category ranked higher in 76-85 years of age group in females whereas in case of 60-75 years, more number of men belonged to married category (92.8%). None of the separated cases was found. The educational levels of elderly revealed that all the subjects irrespective to gender were literate, minimum up to primary school level. Majority of elderly females in 76-85 years age group had primary school level education (85.7%) and 40% had secondary school education in case of males. In case of elderly from 60-75 years, only 28.4% in males and 5% in females were working and 56.2% females were house wife. In the age group of 76-85 years, 100% males were retired and 7.1 % females were house wife. Majority of the total subjects (98.4%) were Hindu. Majority (64.4%) of the subjects lived in joint family and 6% population were found to be living alone especially elderly women in both the age groups. All the subjects were belonging to middle income group. In case of 73.2% of subjects, their family members were the care givers to the elderly population and 5.6% elderly used to take care on their own (self-care giver).

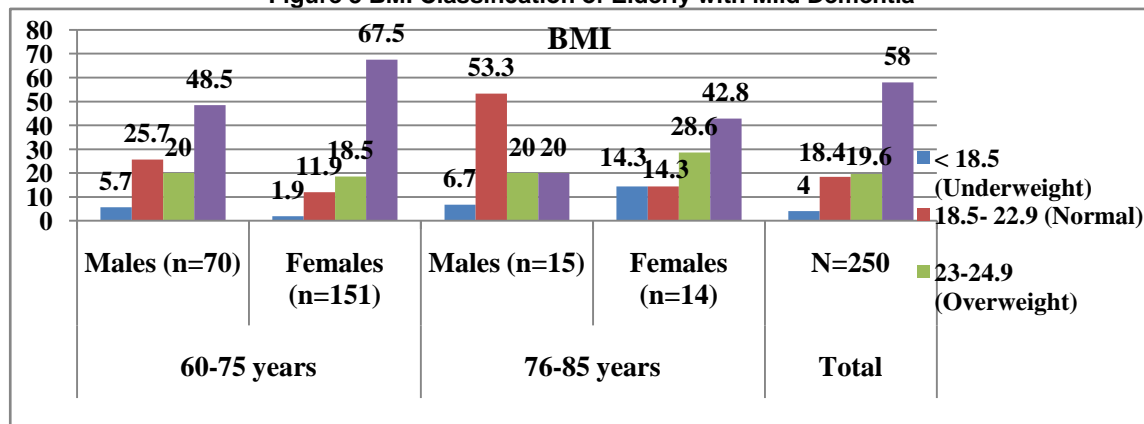
Table 5: Socio demographic characteristics of mild dementia subjects 60 to 85 years (Figures in the parenthesis denote number of subjects)

S. No.	Characteristics	60-75 years		76-85 years		Total N=250
		Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
1	Age (years)					
	Mean ± SD	67.01±4.33	68.9±4.02	80.33±3.55	80.14±2.24	67.26±6.23
2	Marital Status					
	Married	92.8(65)	79.4(120)	64.2(9)	28.5(4)	79.2(198)
	Unmarried	1.4(1)	0(0)	0(0)	0(0)	0.4(1)
	Widow/widower	5.7(4)	20.5(31)	42.8(6)	71.4(10)	20.4(51)
	Separated	0(0)	0(0)	0(0)	0(0)	0(0)
3	Education level					
	Post-graduation	2.8(2)	3.3(5)	0(0)	0(0)	2.8(4)
	Graduation	27.1(19)	15.2(23)	13.3(2)	0(0)	17.6(44)
	High secondary school	15.7(11)	8.6(13)	13.3(2)	7.1(1)	10.8(27)
	Secondary school	42.8(30)	39.7(60)	40(6)	7.1(1)	38.8(97)
	Primary school	11.42(8)	33.1(50)	33.33(5)	85.7(12)	30(75)
4	Occupation					
	Service	4.2(3)	3.9(6)	0(0)	0(0)	3.6(9)
	Self employed	24.2(17)	1.3(2)	0(0)	0(0)	7.6(19)
	House wife	0(0)	56.2(85)	0(0)	7.1(1)	34.8(87)
5	Religion					
	Hindu	98.5(69)	100(15)	98.0(148)	100(14)	98.4(246)
	Muslin	1.4(1)	0(0)	0(0)	0(0)	0.4(1)
	Christian	0(0)	0(0)	0(0)	0(0)	0(0)
	Jain	0(0)	0(0)	1.9(3)	0(0)	1.2(3)
	Other	0(0)	0(0)	0(0)	0(0)	0(0)
6	Type of family					
	Nuclear	35.7(25)	28.4(43)	33.3(5)	7.1(1)	29.6(74)
	Joint	61.4(43)	66.8(101)	53.3(8)	64.2(9)	64.4(161)
	Extended	0(0)	0(0)	0(0)	0(0)	0(0)
	Single living	2.8(2)	4.6(7)	13.3(2)	28.5(4)	6(15)
7	Per capita income					
	<1500	7.1(5)	8.6(13)	13.3(2)	7.1(1)	8.4(21)
	1500-3000	31.4(22)	27.1(41)	26.7(4)	28.6(4)	28.4(71)
	3000-4500	18.6(13)	25.8(39)	0(0)	14.2(2)	21.6(54)
	4500-6000	18.6(13)	17.2(26)	13.2(2)	14.2(2)	17.2(43)
	>6000	24.3(17)	21.2(32)	46.7(7)	35.7(5)	24.4(61)
8	Care taker of the subject					
	Family member	65.7(46)	77.4(117)	73.3(11)	64.2(9)	73.2(183)
	Spouse	21.4(15)	15.2(23)	13.3(2)	0(0)	16(40)
	Self	8.5(6)	4.6(7)	0(0)	7.1(1)	5.6(14)
	Any other	4.2(3)	2.6(4)	13.3(2)	28.5(4)	5.2(13)

Anthropometric status

The anthropometric status was assessed in terms of B.M.I. The categorisation of the elderly according to B.M.I. has been presented in the Figure no 3 below

Figure 3 BMI Classification of Elderly with Mild Dementia



When BMI classification was studied, it was found that 58% of the total subjects were falling under obese category and 19.6% were found to be overweight. It can be noted from the above table that the prevalence of degree of overweight and obesity was higher in females in both the age groups as compared to males. It may be found due to sedentary life style with minimal physical activity or exercise. Researchers have also demonstrated that the risk of dementia, Alzheimer's disease and cognitive impairment is lower in those who engage in high levels of physical activity compared to those exercising little (Rockwood K and Middleton L., 2007).

Nutrient Intake

The nutrient intake was assessed in terms of energy, protein, fat, iron, calcium, vitamin C, vitamin

B₁₂ and β carotene. Another study done by Ryan and Shea (1996) estimated that 16% of elders ingest less than 1000 kcal/day, which is below their recommended caloric requirement. This decrease in nutrient intake could result in the onset of affective disorders such as depression and dementia among elderly. Previous study carried in the department of Foods and Nutrition, The M.S University (Chauhan and Patil, 2007) on depressed elderly have also revealed that elderly with depression had poor protein, iron, vitamin B₁₂ intake as compared to non depressed elderly female subjects. The nutrient intakes expressed as percent RDA of subjects belonging to different age groups at various levels have been depicted in table 6.

Table 6: Mean nutrient intake of subjects belonging to different age groups

S N o	Nutrients	Males RDA	Females RDA	60-75 years		76 - 85 years		Total N=250
				Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
1	Energy (Kcal)	1750	1350	1430±311	1249±291	1342±397	1182±220	1302±310
2	Protein (g)	60	50	41.65± 10.82	36.56± 8.83	40.09± 15.07	34.53± 7.71	38.08±10.04
3	Fat (g)	30	30	47.84± 11.92	41.37±11.15	45.51± 14.15	40.00± 9.64	43.36±11.78
4	Iron (mg)	30	28	11.12± 4.08	13.60±44.16	9.70± 2.79	9.10±3.31	12.42±34.32
5	Calcium (mg)	400	400	658±246	579±276	725±288	595±199	611±267
6	Vitamin C (mg)	40	40	182.80±97.14	148.43±96.6	162.16±110.44	120.46±74.07	157.31±97.37
7	Vitamin B ₁₂ (µg)	1	1	0.31±0.15	0.28±0.16	0.35±0.20	0.34±0.13	0.30±0.16
8	β - carotene (µg)	2400	2400	1016±2497	781±1619	956±1534	964±2244	868±1923

As seen from the table, the mean nutrient intake of all the subjects indicated lower intake of energy according to RDA given by Natrajan (1991). In both the age groups a lower intake of protein, iron, vitamin B₁₂ and β carotene whereas higher intake of fat, calcium and vitamin C was observed. The females belonging to 76-85 years were the most affected group having low nutrient intake. This might be due to multiple factors like psychological problems, instability with life style, physiological causes of low food intake etc. Amino acids, energy, antioxidants and B vitamins are important to maintain mental health. Thus any

deficiency of these nutrients can affect the mental health. In a study conducted by Andres *et al.*, (1996) on 260 elderly people aged 65 – 90 years to know the association between dietary intake and cognitive performance, it was found that a diet with less fat and cholesterol and more carbohydrate, fibre, vitamin C, E and B-carotene not only improve the general health of the elderly but also improve cognitive functions. The assessment of nutritional profile included was shows the consumption of various nutrients as percentage of RDA.

Table 7: Percentage of dementia subjects of different age groups showing percent RDA

Sr. No.	Nutrients % RDA	60-75 years		76-85 years		Total N=250
		Males (n=70)	Females (n=151)	Males (n=15)	Females (n=14)	
1.	Energy (kcal)					
	<25%	0(0)	0(0)	0(0)	0(0)	0(0)
	26% - 50%	1.4(1)	0.7(1)	6.7(1)	0(0)	1.2(3)
	51% - 75%	37.1(26)	20.5(31)	46.7(7)	21.4(3)	26.8(67)
	76% - 100%	50(35)	47.7(72)	33.3(5)	57.1(8)	48(120)

	>100%	11.4(8)	31.1(47)	13.3(2)	21.4(3)	24(60)
2.	Protein (g)					
	<25%	0(0)	0(0)	0(0)	0(0)	0(0)
	26% - 50%	10(7)	6.6(10)	26.7(4)	7.1(1)	8.8(22)
	51% - 75%	60(42)	54.9(83)	33.3(5)	57.1(8)	55.2(138)
	76% - 100%	24.3(17)	27.1(41)	26.7(4)	35.7(5)	26.8(67)
	>100%	5.7(4)	11.3(17)	13.3(2)	0(0)	9.2(23)
3.	Fat (g)					
	<25%	0(0)	0(0)	0(0)	0(0)	0(0)
	26% - 50%	0(0)	0(0)	0(0)	0(0)	0(0)
	51% - 75%	0(0)	2.6(4)	0(0)	0(0)	1.6(4)
	76% - 100%	1.4(1)	13.9(21)	13.3(2)	14.3(2)	10.4(26)
	>100%	98.6(69)	83.4(126)	86.7(13)	85.7(12)	88(220)
4.	Iron (mg)					
	<25%	15.7(11)	19.2(29)	20(3)	42.8(6)	19.6(49)
	26% - 50%	74.3(52)	70.2(106)	80(12)	50(7)	70.8(177)
	51% - 75%	8.6(6)	10.6(16)	0(0)	7.1(1)	9.2(23)
	76% - 100%	0(0)	0(0)	0(0)	0(0)	0(0)
	>100%	1.4(1)	0(0)	0(0)	0(0)	0.4(1)
5.	Calcium (mg)					
	<25%	0(0)	0.7(1)	0(0)	0(0)	0.4(1)
	26% - 50%	0(0)	1.9(3)	0(0)	0(0)	1.2(3)
	51% - 75%	1.4(1)	7.3(11)	0(0)	7.1(1)	5.2(13)
	76% - 100%	4.3(3)	10.6(16)	0(0)	21.4(3)	8.8(22)
	>100%	94.3(66)	79.4(120)	100(15)	71.4(10)	84.4(211)
6.	Vitamin C (mg)					
	<25%	0(0)	1.3(2)	0(0)	0(0)	0.8(2)
	26% - 50%	0(0)	1.3(2)	0(0)	0(0)	0.8(2)
	76% - 100%	0(0)	1.3(2)	0(0)	0(0)	0.8(2)
	>100%	100(70)	94.0(142)	100(15)	100(14)	96.4(241)
7.	Vitamin B12(µg)					
	<25%	55.7(39)	63.6(96)	40(6)	35.7(5)	58.4(146)
	26% - 50%	31.4(22)	24.5(37)	40(6)	50(7)	28.8(72)
	51% - 75%	10(7)	10.6(16)	20(3)	14.3(2)	11.2(28)
	76% - 100%	2.8(2)	1.3(2)	0(0)	0(0)	1.6(4)
	>100%	0(0)	0	0(0)	0(0)	0(0)
8.	β carotene (µg)					
	<25%	74.3(52)	83.4(126)	73.3(11)	85.7(12)	80.4(201)
	26% - 50%	15.7(11)	5.9(9)	6.7(1)	0(0)	8.4(21)
	51% - 75%	4.3(3)	2.6(4)	6.7(1)	7.1(1)	3.6(9)
	76% - 100%	0(0)	1.9(3)	0(0)	0(0)	1.2(3)
	>100%	5.7(4)	5.9(9)	13.3(2)	7.1(1)	6.4(16)

From the table 7, it can be inferred that 50% and 47.7% of the younger elderly subjects i.e. males and females belonging to 60-75 years and 57.1% of females from 76-85 years had energy intake between 76%-100% of RDA whereas the older age group's males (76-85 years) had a little lower intake (46.7%) and met 51-75% of RDA according to Natrajan (1991). It was indicated that except older aged males, all had a good energy intake.

The protein intake of subjects belonging to both the age groups had 51%-75% of RDA for protein which indicated poor protein intake by the subjects. Iron intake was 25%-50% and β carotene was <25% of RDA in both the age groups. Fat and calcium intake was >100% of RDA in all the dementia subjects.

With regards to other nutrients related to mental health like vitamin C, the intake of majority of dementia elderly was in the range of > 100% of RDA in both the group whereas vitamin B12 intake was < 25% of the RDA in both males and females (55.7%

and 63.6%) belonging to 60-75 years of age group and 40% and 50% of older group males and females had much higher intake of vitamin B12 i.e. 26%-50% of RDA. One study carried out in Switzerland on 442 subjects aged 65 to 94 years. They found that among people aged 65 and older, higher ascorbic acid and beta-carotene plasma level are associated with better memory performance. These results indicate the important role played by antioxidants in brain aging and may have implications for prevention of progressive cognitive impairments (Perrig *et al.*, 1997).

Paleologos *et al.*, 1998; (n=117) found that a high vitamin C intake was associated with a lower prevalence of cognitive impairment, as measured by the MMSE. Though in the present study there was no relationship seen between good vitamin C intake and presence of dementia, which can be studied further in detail with respect to plasma vitamin C levels.

Conclusion

The severity of cognitive impairment increases with increasing age. Also with the increase in age and level of cognitive impairment, the nutrient intake decreases too. Deficiency of nutrients related to mental health like vitamin B12, folic acid, vitamin E can be considered as a risk factor for cognitive impairment and dementia.

Thus, the present study clearly indicates the need for taking concrete steps for creating awareness amongst pre geriatric and geriatric population from free living population regarding mild dementia and its predisposing factors. Identifying and seeking treatment for the same are as essential as physical health problems while tackling health issues of elderly. Most of the work reported in the literature revolves around medications and psychotherapies as the disease is being diagnosed at later stages. Early detection is the key to alleviate this disorder from turning serious by nutritional approaches or medicinal therapies. If this approach of present study is proved to be effective on larger sections of the society, our efforts are fruitful.

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