

A Multivariate Analysis of Nutritional Intake of Elderly Residing in Old Age Homes

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ABSTRACT

The incidence of malnutrition is certainly higher in old people than in younger age-groups. The food habits of the elderly are the result of the lifetime, influences of cultural, social, economic and psychological factors. The present study conducted in the seven old age homes located at Varanasi district. Purposive sampling method was adopted for the study. Total 156 elderly was interviewed with the help of the predesigned interview schedule. The result clearly shows that the vegetarian elderly group was deficient than the elderly belonged to non-vegetarian food habit group. Intake of fat, calcium, iron and riboflavin was concerned, males were found to consume higher percentage. An increase in percentage consumption of protein, fat, calcium and iron were noticed with increase in income.

Key Words : Malnutrition, Demographic, Socio-economic, Anthropometric, Dietary

INTRODUCTION

The incidence of malnutrition is certainly higher in old people than in younger age-groups. This can be attributed to a higher proportion of old people living in poverty and a greater prevalence of diseases leading to malnutrition. The food habits of the elderly are the result of the lifetime, influences of cultural, social, economic and psychological factors. Chheda and Kadiyala (2005), reported that up to 20.5% of older people living residential homes are at risk of malnutrition (Elia, 2003). M. Lamy *et al.* (1999) reported that poor oral status also seemed to put elderly institutionalized subjects at higher risk of under nutrition. Alteration in smell and taste and poor dental health directly decrease food intake or influence food selection (MacIntosh *et al.*, 2000 and Gariballa, 2004). Data on the nutrition status of the elderly population was limited. Thus, an attempt has been made here to find some relevant facts about various factors effecting nutritional intake of elderly in the old age homes.

METHODOLOGY

The present study conducted in the seven old age homes located at Varanasi district. Purposive sampling method was adopted for the study. Total 156 elderly was interviewed with the help of the predesigned interview schedule. Interview schedule consists of three parts, first part information on demographic and socio-economic variables. Second Part of the schedule confined to information regarding anthropometric measurement. Third part of schedule confined to information pertaining to nutritional status and dietary intake. For the purpose of data analysis and statistical calculations of different measures SPSS software was applied.

RESULTS AND DISCUSSION

Analyzing the fact of the Table 1, it was found that the average per cent intake of RDA of stated nutrients were obtained to be more in non-vegetarian elderly in comparison to vegetation elderly group except vitamin A

Table 1 : Distribution of respondents according to their food habit and various nutrient intakes by per cent of RDA

Nutrients	Food Habit				df=154 Value of t, P
	Vegetarian		Non-Vegetarian		
	Mean	±SD	Mean	±SD	
Energy	82.96	23.72	89.97	22.07	1.68, >0.05
Protein	85.80	25.63	103.13	29.81	361, <0.001
Fat	76.21	36.11	99.88	32.71	3.59, <0.001
Calcium	63.97	37.01	112.74	48.45	3.73, <0.001
Iron	30.46	12.55	34.48	13.13	1.77, >0.05
Vitamin A	151.51	190.51	111.69	124.76	1.27, >0.05
Thiamine	81.52	33.82	80.21	25.91	0.23, >0.05
Riboflavin	69.37	39.48	83.74	30.63	0.16, <0.05

and thiamine. It was also observed that the difference in the per cent consumption of RDA of protein, fat, calcium and riboflavin was found to be statistically highly significant while in other nutrients like energy, iron, vitamin A and thiamine it was insignificant. The result clearly shows that the vegetarian elderly was deficient than the elderly belonged to non-vegetarian food habit group because non-vegetarian foods are rich sources of energy, protein, fat and iron. Elderly people may eat less meat for a variety of historic and economic factors, and because the liking or taste for meat may decline in later years (Gregory *et al.*, 1990).

The Table 2 reflects that the energy consumed by respondents (84.89 ± 23.43) per cent, protein (90.58 ± 27.86) per cent while average fat and calcium intake was (83.46 ± 36.54) per cent and (77.41 ± 45.86) per cent respectively, which was less than RDA. The average per cent intake of energy and protein was obtained to be more in female elderly than the female elderly whereas in case of fat and calcium consumption it was more in males than females. The difference was significant only in the consumption of energy and calcium between male and female respondents. The average per

cent of iron intake was very less (31.57 ± 12.80) per cent than RDA out of which male elderly were consumed significantly more than the female elderly.

The average consumption of vitamin A was more than RDA (140.54 ± 175.38) per cent but they consumed in heterogeneous pattern. It was more consumed by the female elderly than RDA while by male less than the RDA. The difference was found to be statistically significant. As far as concerned with the consumption of thiamine and riboflavin, the average per cent of RDA was observed to be (81.18 ± 31.76) per cent and (73.33 ± 37.71) per cent out of which the intake of thiamine was more in females than male while it was just reverse in case of riboflavin. In both the nutrients the differences were insignificant.

It clearly indicated that the male respondents were taking more fat, calcium, iron and riboflavin whereas other nutrients like energy, protein, vitamin A and thiamine were more consumed by the female respondents. Diet surveys carried out by NNMB (1979-2002) indicate that the prevalence of over nutrition was higher in elderly men as compared to elderly women. The finding of present study was supported by Ritchie *et al.* (1998) according to his

Table 2 : Sex wise distribution of respondents according to their average per cent intake of nutrients by RDA

Nutrients	Sex						df=154 Value of t, P
	Male		Female		Total		
	Mean	±SD	Mean	±SD	Mean	±SD	
Energy	79.30	19.63	88.00	24.48	84.89	23.43	2.45, <0.05
Protein	89.98	27.71	90.86	28.05	90.58	27.86	0.18, >0.05
Fat	88.33	32.76	81.17	38.12	83.46	36.54	1.14, >0.05
Calcium	94.87	43.81	69.18	44.67	77.41	45.86	3.37, <0.01
Iron	38.36	15.49	28.36	9.88	31.57	12.80	4.88, <0.001
Vitamin A	92.69	80.13	163.10	202.01	140.54	175.38	2.38, <0.05
Thiamine	76.15	24.77	83.52	34.43	81.18	31.76	1.36, >0.05
Riboflavin	76.25	28.08	71.96	41.53	73.33	37.71	0.66, >0.05

study report that predictors of dietary intake were sex, poor appetite, burden of disease and quality of vision (Fig. 1).

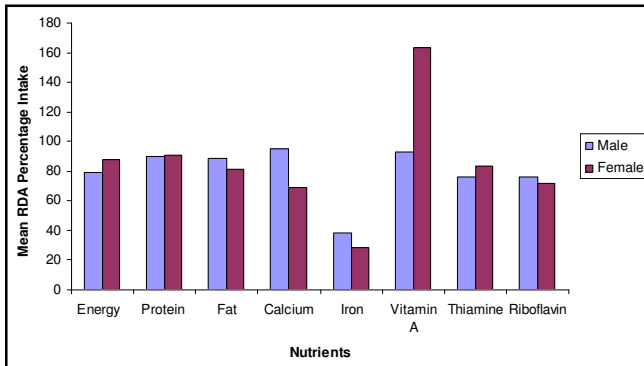


Fig. 1 : Sex wise distributio of respondents according to their mean per cent intake of nutrients by per cent of RDA

The Table 3 and Fig. 2 elaborates that the average intake of energy, protein, fat, calcium and vitamin A was found to be maximum in the elderly of age-group (>80) years followed by (70-79) years and was minimum in the (60-69) years age-group. It clearly shows that the trend of average consumption of energy, protein, fat, calcium and vitamin A was in increasing order as age advances. The other remaining nutrients iron, thiamine and riboflavin was consumed to be more in per cent by (70-79) years of age-group followed by (>80) years and minimum in (60-69) years of age-group. The average

per cent intake of all the stated nutrients was accounted to be less in the elderly of age group (60-69) years in comparison to other two elderly age groups may be due to the fact that elderly of this age group is in the process of adaptation with new environment and post-retirement conditions. Statistical F test signifies that there were significant differences among various age-groups of respondents regarding the average per cent consumption of fat, calcium and riboflavin while in other nutrients it was insignificant. Pirlich and Locs (2001) stated that malnutrition is more common in elderly persons than is younger adults.

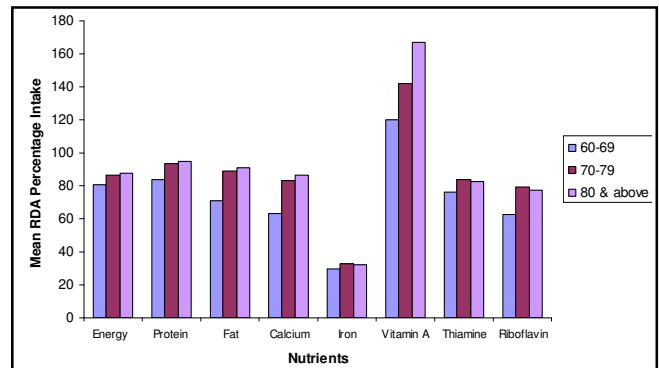


Fig. 2 : Age wise distribution of study subject according to their average per cent of intake of different nutrients with respect to RDA

The average per cent intake of major nutrients was analyzed according to the caste-group of elderly

Table 3 : Age wise distribution of study subject according to their average per cent of intake of different nutrients with respect to RDA

Nutrients	Age Group (Years)						Value of	
	60-69		70-79		80 & above		F	P
	Mean	±SD	Mean	±SD	Mean	±SD		
Energy	80.94	23.49	86.47	25.63	87.61	18.21	1.14,>0.05	
Protein	83.88	24.35	93.41	31.02	94.90	25.06	2.33,>0.05	
Fat	70.78	31.68	89.11	37.69	91.11	37.01	4.98,<0.01	
Calcium	63.39	36.95	83.23	48.96	86.69	47.87	3.85,<0.05	
Iron	29.55	12.08	32.68	14.41	32.38	10.31	0.97,>0.05	
Vitamin A	120.15	174.98	142.04	155.18	167.13	210.15	0.77,>0.05	
Thiamine	76.34	24.99	84.13	39.77	82.50	21.81	0.93,>0.05	
Riboflavin	62.44	29.23	79.50	44.72	77.41	30.92	3.39,<0.05	

Significant pairs (1vs2),(1vs3)
Significant pairs (1vs2),(1vs3)
Significant pairs (1vs2)

individuals in Table 4. It elaborates that the elderly of SC/ST caste-group were consumed more than of RDA of all major nutrients, except iron and thiamine as well as the average per cent intake was found to be higher in comparison to the elderly of other caste-group unlike the findings of Vijayaraghavan *et al.* (2000) study, where intake of SC/ST elderly was low. Only vitamin A was consumed in more average per cent of RDA by General caste group of elderly in comparison to other caste-groups. It was also observed that the average per cent intake of various nutrients was in decreasing trend when increasing from SC/ST group to OBC and General caste group respectively with the exceptional case of vitamin A consumption. The statistical F test adduced that there were no significant differences in average per cent intake of various nutrients among the various caste groups, except calcium.

The study subjects were also distributed according average per cent of RDA of major specified nutrient intake with the marital status of the elderly in Table 5. It reveals that the average per cent intakes of RDA of energy, iron, vitamin A and thiamine were accounted to be more in widow/widower followed by unmarried and minimum in married elderly, except vitamin A respectively. The average per cent intake of RDA of protein, fat, calcium and riboflavin was observed to be maximum quantity in unmarried respondents whereas it was minimum in married elderly; except calcium. The differences in average per cent intake of energy and calcium among marital status group were statistically significant while in case of other nutrients it was insignificant. It clearly shows that the married elderly group was deficient regarding consumption of various nutrients with respect to remaining two marital status

Table 4: Caste wise distribution of study subjects according to their Mean (\pm SD) per cent of RDA intake of various nutrients

Nutrients	Caste						Value of	
	SC/ST		OBC		General		F,	P
	Mean	\pm SD	Mean	\pm SD	Mean	\pm SD		
Energy	101.67	25.46	84.76	24.89	83.90	22.22	1.64,	>0.05
Protein	111.67	24.40	94.10	30.47	87.14	25.76	2.96,	>0.05
Fat	103.63	14.27	85.35	38.54	81.05	36.07	1.20,	>0.05
Calcium	125.74	35.58	76.13	43.80	75.09	46.33	3.59,	<0.05
							Significant pairs (1vs2),(1vs3)	
Iron	33.57	11.38	31.40	12.84	31.54	12.97	0.08,	>0.05
Vitamin A	103.22	58.16	130.39	159.34	148.96	189.33	0.34,	>0.05
Thiamine	85.62	19.07	80.61	28.85	81.19	34.18	0.08,	>0.05
Riboflavin	95.14	22.68	68.60	32.58	74.76	40.84	1.52,	>0.05

Table 5 : Distribution of study subjects between Mean (\pm SD) nutrient intake by per cent of RDA and marital status

Nutrients	Marital Status						Value of	
	Married		Unmarried		Widow/Widower		F,	P
	Mean	\pm SD	Mean	\pm SD	Mean	\pm SD		
Energy	73.51	18.52	86.27	24.67	86.93	23.43	3.12,	<0.05
							Significant pairs (1vs2),(1vs3)	
Protein	80.73	17.92	97.10	34.44	90.46	26.65	2.38,	>0.05
Fat	72.68	30.43	88.81	36.27	83.97	37.69	1.35,	>0.05
Calcium	72.28	36.23	101.28	53.38	70.12	42.36	6.57,	<0.01
							Significant pairs (1vs2),(2vs3)	
Iron	34.43	17.41	34.88	15.29	49.77	10.19	2.77,	>0.05
Vitamin A	142.43	191.93	122.41	177.44	146.52	172.28	0.24,	>0.05
Thiamine	75.98	20.01	76.64	29.96	83.91	34.31	1.02,	>0.05
Riboflavin	75.29	30.79	79.83	36.12	70.60	39.62	0.81,	>0.05

groups, except in case of vitamin A.

It is evident from the Table 6 that the average per cent intake of RDA of fat, calcium, iron, thiamine and riboflavin were found to be higher in the elderly qualified up to graduate level or more than graduate while in other nutrients such as protein and vitamin A was maximum in the elderly qualified in the range of high school to intermediate but in case of energy it was higher in illiterate elderly living in old age homes. Statistically it was seen that there were no significant variations in average per cent intake of RDA of all major nutrients except calcium and riboflavin respectively. It may be concluded that the impact of educational level of elderly on the quantity of consumption of various nutrients was found to be positive in the present study which indirectly refers to their better financial conditions as results inclusion of quality foods like milk products, green leafy vegetables and fruits in their diet. Similarly, as result of the present study. Vijayaraghavan *et al.* (2000) found that among the illiterate the current consumption of cereals and millets and green leafy vegetables was higher. However, among illiterates the consumption of milk, fish and other flesh food, fruits, other vegetables and nuts and oil seeds was lower than that among literates. Zimmer *et al.* (2005) reported that more education continues to be strongly associated with better health and greater survival and Freisling *et al.* (2009) concluded that food frequency index was significantly related the educational level of the subjects (Fig. 3).

Income is an important factor for assessing the level of nutrient consumption. Considering the importance, the distribution of study subjects according to the average

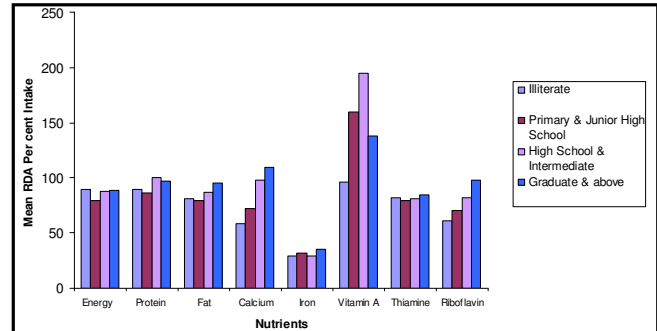


Fig. 3 : Distribution of study subjects between various nutrients intake by per cent of RDA and educational status

per cent intake of RDA of various nutrients and their monthly income is given in Table 7. It reveals that the average per cent intake of energy, fat, thiamine and riboflavin was found to be maximum varying in the range of (86.53-94.45 per cent) for the elderly having monthly income between Rs. (1,000-4,999) respectively, while in the income group Rs. >5,000 it was maximum for the consumption of protein, calcium and iron. Vitamin A consumption was found to be more in elderly belonged to Rs. <1,000 monthly income group. There were some differences in average per cent intake of major nutrients among the elderly of various income groups but it was statistically significant in case of protein, fat, calcium, iron and riboflavin respectively. It may be concluded that the trend in per cent consumption of RDA of protein, calcium and iron were in increasing order as income increases while just reverse in case of vitamin A. High income enables the elderly free for purchasing of quality foods like milk products, green leafy vegetables and fruits

Table 6 : Distribution of study subjects between various nutrients intake by per cent of RDA and educational status

Nutrients	Educational Status								Value of F, P
	Illiterate		Primary and Junior High School		High School and Intermediate		Graduate and above		
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	
Energy	89.50	25.39	79.70	18.56	87.66	28.33	88.26	26.40	1.99, >0.05
Protein	89.46	26.01	86.50	26.40	100.25	36.22	97.00	28.37	1.62, >0.05
Fat	81.07	36.81	79.33	33.30	86.98	39.56	95.39	40.95	1.40, >0.05
Calcium	58.79	34.78	72.20	41.96	97.75	61.26	109.59	42.98	9.83, <0.001
									Significant pairs All
Iron	29.25	10.58	32.06	13.05	29.14	13.80	35.49	14.48	1.61, >0.05
Vitamin A	96.46	111.23	159.76	215.92	195.01	195.33	137.77	127.83	1.75, >0.05
Thiamine	81.80	23.98	79.38	26.32	81.26	35.50	84.30	49.66	0.17, >0.05
Riboflavin	60.95	26.17	69.83	32.93	81.78	41.19	97.54	50.50	6.59, <0.001
									Significant pairs (1vs4),(2vs4)

Table 7: Distribution of study subjects between Mean (±SD) nutrient intake by per cent of RDA and present monthly income

Nutrients	Present Monthly Income (Rs.)						Value of F , P
	<1,000		1,000-4,999		> 5,000		
	Mean	±SD	Mean	±SD	Mean	±SD	
Energy	78.28	22.80	86.53	22.18	85.86	21.72	1.84,>0.05
Protein	79.39	27.03	94.26	25.63	98.23	25.78	5.77,<0.01
Fat	61.22	31.17	94.45	37.43	94.07	35.40	Significant pairs (1vs2),(1vs3) 13.13,<0.001
Calcium	46.57	35.22	88.37	38.20	107.25	47.08	Significant pairs (1vs2),(1vs3) 24.24,<0.001
Iron	28.43	11.91	32.43	12.18	36.40	14.69	Significant pairs (1vs2),(1vs3) 3.52,<0.05
Vitamin A	181.18	234.84	134.48	160.62	125.82	113.63	Significant pairs (1vs3) 1.05,>0.05
Thiamine	74.66	29.31	86.91	40.85	81.15	24.49	1.57,>0.05
Riboflavin	50.67	26.41	88.82	45.07	88.12	28.65	16.85,<0.001 Significant pair (1vs2),(1vs3)

which are rich sources of calcium, protein, vitamin A, and iron which were generally less in the diet of elderly in old age homes. Like present study results Fischer and Johnson (1990) in a study stated that factors that contribute to poor nutritional status include lowered socioeconomic status, functional disabilities and social isolation. Weimer (1997) reported that poor nutritional status is a primary concern for the elderly. Poverty may be one of the most important environmental determinates of inadequate nutrition among the elderly. Sahyoun and Basiotis, (2000) stated that there was a strong relationship between food insufficiency and poverty. Sachdeva *et al.* (2006) reported that inadequate money influenced the nutritional status of elderly. Bowman (2007) reported that low economic status is associated with suboptimal intake of nutritious foods by adults and elderly in the National

Health and Nutrition Examination Survey (NHANES, 1999-2002) (Fig. 4).

The elderly individuals were also analyzed regarding their weight and average per cent intake with respect to RDA of major nutrients and presented in Table 8. It describes that average per cent intake of RDA of all kind of specified nutrients was found to be higher in the elderly had weight in the range of (44-67) kg. with the exceptional case of iron and vitamin A intake in which maximum were in (>67) kg. and (<44) kg. of weight category respectively. The differences were found to be statistically significant for all the nutrients among the various weight categories except intake of energy and thiamine. Thus, it may be concluded that the elderly had

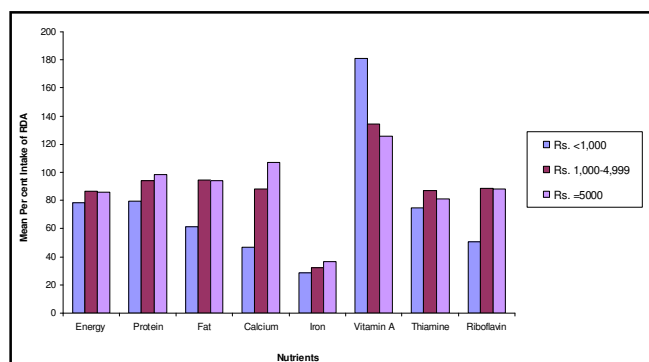


Fig. 4 : Distribution of study subjects according to their mean nutrient intake by per cent of RDA and present monthly income

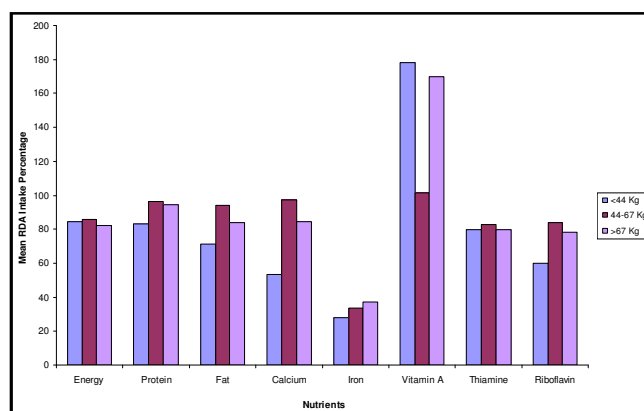


Fig. 5 : Distribution of elderly individuals according to their weight and various nutrient intake by RDA per cent

Table 8 : Distribution of elderly individuals according to their weight and various nutrient intakes by per cent of RDA

Nutrients	Weight (kg.)						Value of f , P
	<44		44-67		>67		
	Mean	±SD	Mean	±SD	Mean	±SD	
Energy	84.36	24.23	85.86	22.77	82.38	24.36	0.17,>0.05
Protein	83.33	26.91	96.20	27.03	94.34	30.56	4.05,<0.05
Fat	71.40	35.22	93.98	33.60	83.90	22.16	Significant pair (1vs2) 7.25,<0.05
Calcium	53.58	35.60	96.94	45.04	84.67	43.62	Significant pair (1vs2) 19.74,<0.001
Iron	27.88	11.48	33.71	12.31	37.07	16.71	Significant pairs (1vs2),(1vs3) 5.48,<0.01
Vitamin A	178.17	227.13	101.54	97.40	169.92	187.48	Significant pairs (1vs2),(1vs3) 3.71,<0.05
Thiamine	79.62	39.43	82.82	24.64	79.60	26.71	Significant pair (1vs2) 0.20,>0.05
Riboflavin	60.17	41.23	83.90	32.51	78.42	28.59	Significant pair (1vs2) 7.72,<0.01

weight <44 kg. were more deficient regarding consumption of different kind of stated nutrients except vitamin A. Low dietary intake leads lowering of body weight due to negative calorie balance in the body (Fig. 5).

Conclusion:

The result clearly shows that the vegetarian elderly was deficient than the elderly belonged to non-vegetarian food habit group because non-vegetarian foods are rich sources of energy, protein, fat and iron. Intake of fat, calcium, iron and riboflavin was concerned, males were found to consume higher percentage whereas other nutrients like energy, protein, vitamin A and thiamine were more consumed by the female respondents. It was noteworthy that unmarried and widow female subjects had high amount of all nutrient's intakes. The impact of educational level of elderly on the quantity of consumption of various nutrients was found to be positive in the present study. Subjects belonging to lower income group (Rs.<1,000) were found to consume lowest amount of all nutrients except for vitamin A. An increase in percentage consumption of protein, fat, calcium and iron were noticed with increase in income. Low dietary intake leads lowering of body weight due to negative calorie balance in the body. Sachdeva *et al.* (2006) conducted a

study on Ludhiana district and reported that inadequate money, physical disability, loneliness, loss of appetite, dependence on others for their main economic resources were some of the social and health factors that influenced the nutritional status of elderly supports the findings of the present study.

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