

**MACRONUTRIENT STATUS OF THE ELDERLY (60-80 YEARS)  
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## ABSTRACT

The present investigation was undertaken to assess the macronutrient intake of the elderly (60-80 years) from Central India. Four hundred elderly, which included 200 males and 200 females were selected from Nagpur city, Maharashtra, India, through stratified random sampling. All subjects were personally interviewed. Their socio-demographic characteristics and general dietary practices were studied by specially formulated questionnaires whereas quantitative daily food intake was assessed by 24-hour recall methods. The data were analyzed according to age (60 – 70 Y; 70 – 80 Y) and sex using frequency distribution, percentages, mean and standard deviation. Pearson's Correlation coefficient was used to determine the influence of the underlying determinants on macronutrient intake. Higher proportions of elderly males (31.5 %) were in the age group of 65-70 years whereas 44% elderly females were from the age group of 60-65 years. The majority of elderly males (91.5%) and females (73.5%) were married. Pension was the main source of income for the majority of elderly males (70.5%) and females (76.6%). 74% elderly females and 73% males were found to be consuming 4-5 meals in a day. 92% and 91% of elderly females and males were consuming meals regularly, respectively. The percent adequacy for pulses, other vegetables, milk and milk products and fat in elderly males was higher than Recommended Dietary Intake whereas in elderly females the percent adequacy for other vegetables and fat was higher than Recommended Dietary Intake suggested for Indian adults. The mean intake of pulses ( $z = 2.07$   $p < 0.05$ ), other vegetables ( $z = 2.03$   $p < 0.05$ ), fruits ( $z = 2.04$   $p < 0.05$ ) and fat ( $z = 2.53$   $p < 0.05$ ) was found to be significantly higher in elderly males of 60-70 years than 70-80 years. However, the dietary intake amongst the elderly females of 60-70 years and 70-80 years did not show any significant difference. Except fat intake in elderly females, consumption of all macronutrients was found to be less than Recommended Dietary Allowance suggested for adult Indians in both elderly males and females. The macronutrient intake in the elderly showed a significant negative correlation with age and positive correlation with number of meals consumed. Majority health problems among the elderly are diet related and nutrition dependent. There is an urgent need to prevent physiological aging getting converted in to pathological aging by creating health and nutrition awareness among elderly.

**Key words:** Elderly, Sociodemographic, Diet, Macronutrient, India

## INTRODUCTION

The twentieth century saw a revolution in longevity and unprecedented ageing of the population. Since 1950, the average life expectancy at birth has increased by 20 years. This is expected to increase by a further 10 years by 2050. The first quarter of the twenty-first century has often been called the Age of Ageing [1]. According to World Health Organization, the world's elderly population - people 60 years of age and older - is 650 million. By 2050, the "graying" population is forecast to reach 2 billion [2].

In Japan, one of the fastest ageing countries in the world, in 1950 there were 9.3 people under 20 for every person over 65. By 2025 this ratio is forecast to be 0.59 people under 20 for every person older than 65 [3]. Asia and Europe are the two regions where a significant number of countries face severe population ageing in the near future. The Oxford Institute of Ageing is an institution looking at global population ageing. Its research reveals that many of the views of global ageing are based on myths and that there will be considerable opportunities for the world as its population matures [4].

In order to focus attention, the United Nations declared the year 1999 as the International Year for the older persons. In May 2000, India joined China in the exclusive, one billion club - a demographic milestone. In India, old age population is likely to increase from 70 million in 1995 to 141 million by 2020 and 508 million by 2100 according to World Bank Projection [5].

The success story of increasing longevity in India is now creating a new challenge for ensuring the well-being of the enormous number of the elderly [6]. While earlier, the concern of societies was to prolong life, now it has shifted to adding quality to quantity, to make aging as productive and active as possible [7]. Nutrition is an important factor contributing to health and functional ability. There is definite evidence that malnutrition is more common in geriatric populations but it is underestimated in therapeutic procedures [8]. In view of the above discussion, the present investigation was undertaken to assess the macronutrient status of the elderly.

## MATERIALS AND METHODS

For the present investigation, Nagpur city (Maharashtra, India) was selected. The orange-growing capital of India, Nagpur forms the second capital of Maharashtra. It has area 9,892 sq. km. and population of 4,653,171. About 89.52 % of the population is literate. Nagpur city's foundation was laid by the Gond King of Deogad, "Bakht Buland Shah" in the year 1702. The city gets its name from the river Nag that flows through this land. It was once the capital of the central province, but was later incorporated into Maharashtra. Nagpur is endowed with rich forest and in itself is the second greenest city in India. The forests around Nagpur are full of high quality teak plantations [9].

Nagpur is the most centrally located city in India. With Nagpur being Zero Milestone, all distances across the length and breadth of India are mapped from Nagpur as a starting point. It is extremely well-connected to any part of the country by roadways, railways and airways. The adjoining districts are: East: Bhandara, South: Chandrapur, West: Amravati and Wardha, North: Boundary with Madhya Pradesh. Nagpur faces extreme variations in temperature with very hot summers and cold winters and a relative humidity of 60 per cent. Around Nagpur there are various ancient, historical, as well as beautiful places and spots that are greatly enjoyed by the tourists [10].

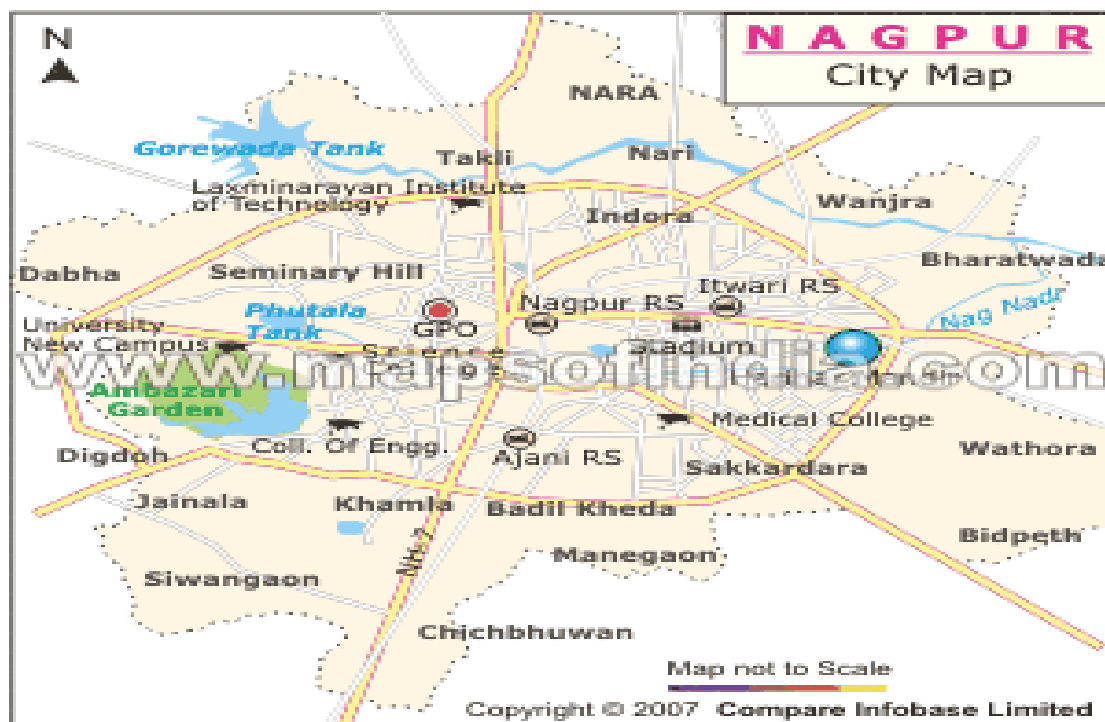


Figure 1: Map of Nagpur City

### Sampling Size and Sampling Procedure

Through a stratified sampling method, 200 elderly males and 200 elderly females ranging in age from 60-80 years were selected from Nagpur city. Nagpur city was firstly divided into five strata viz., east, west, north, south and central zone then from each stratum 40-50 elderly were selected on a random basis. The main target in each house was elderly having an age between 60-80 years. In the case of non-availability of elderly in this category in a targeted house, the next house in the list was selected to replace the sampled house.

### Data Collection Procedure

The present population-based, cross-sectional survey was carried out from January 2008-July 2008. A structured questionnaire was designed to provide relevant indicators of the health and nutritional status of elderly people. A pilot study of 25

elderly was undertaken for its validity. The objective of the study was conveyed/briefed to each of the respondent before data collection to get proper response. The data were collected under the following headings:

**General information:** - Socio-demographic attributes included information on age, marital status, family size, religion, educational qualification, professional status, income and social participation of the elderly.

**Dietary Assessment:** - Dietary pattern generally followed by elderly like food habits, consistency of meal, meal timings, skipping of meals, fasting practices and meal consumption pattern were studied. Quantitative information on consumption of foods was obtained by 24-hour recall methods and was carried out once [11]. In this recall method of oral questionnaire diet survey, a set of 'standardized cups' suited to local conditions were used. The elderly or the member of the household who invariably cooks and serves food to the family members was asked about the types of food preparations made at breakfast, lunch, afternoon tea time and dinner. An account of the raw ingredients used for each of the preparations was obtained. Information on the total cooked amount of each food item (preparation) for the specific individual in the family was assessed. The percent adequacy of diet was calculated by comparing with Dietary Guidelines for adult Indians suggested by National Institute of Nutrition, NIN (1999) [12]. The nutritive value of raw foods was calculated using food composition tables [13]. The nutrient intake was compared with Recommended Dietary Allowances (RDA) for adult Indians suggested by the Expert Committee of India Council of Medical Research (1990) [14].

**The other independent variables were operationally defined as follows:**

#### **Measurement of Independent variables**

Age of elderly refers to the actual age in years and religion is used interchangeably with faith or belief system followed by the elderly. The marital status refers to the condition of being married or unmarried and scored as 3 for married, 2 for widow and 1 for single. The type of family refers to the composition of family. The actual number of family members denotes the family size. Educational qualification refers to the number of formal schooling years and scored 3 for graduate/post graduate/Ph.D., 2 for SSC/HSSC/Inter/Diploma, 1 for up to High School and zero for illiterate. The working status of elderly was referred to as employed or unemployed. The monthly income refers to earnings. Total income of elderly includes the income of elderly in addition to family's total income. Involvement in social activities refers to engagement of elderly in social activities, which was scored 1 for no and 2 for yes. Food habits refer to the dietary practice of elderly and were scored 1 for non vegetarian and 2 for vegetarian. Number of meals refers to actual number of meals consumed from morning till bed time. Meal timings refers to the schedule of consumption of meals and scored 1 for irregular and 2 for regular. "Meals consumed with others" refers to family members and scored 3, with family/alone scored 2 and alone scored 1. Skipping of meals refers to avoiding meals and scored 3 for never, 2 for sometimes and 1 for often. Consistency of meals refers to the fluidity of meals and

scored 3 for normal, 2 for semi solid and 1 for soft diet. Therapeutic diet refers to the modification of diet in the presence of an ailment and scored 2 for therapeutic and 1 for normal. "The received foods" refers to the source of food received from and scored 2 if from home and 1 if received from other institutions or relatives. The religious fasting refers to avoiding regular meals and consumption of special foods on certain holy days. These were scored as 3 for fasting once in a year, 2 for once in a month and 1 for once in a week. An unhealthy lifestyles refers to consumption of tobacco, alcohol or cigarette smoking and were scored as 1 for no and 2 for yes.

### Data Analysis

The data were tabulated, analyzed statistically and classified according to sex and age (60-70 years and 70-80 years). The results were presented as the mean and standard deviation ( $M \pm S.D.$ ). *Chi* square test of independence was calculated for the assessment of association between the variables [15]. Comparison between the mean values of food and nutrient intakes was tested by "Z" test [16]. Correlation coefficient was computed using Windows 2007 for the assessment of correlation between the variables.

## RESULTS

### Sociodemographic Characteristic of the Elderly

Table 1 shows that out of 400 elderly, higher proportions of elderly males (31.5 %) were in the age group of 65-70 years whereas 44% elderly females were from the age group of 60-65 years. Males 17.5% and females 8.5%, all elderly were in the 75-80 years of age group whereas 29.5% and 22% elderly males and females, respectively, were in the age group of 70-75 years. All elderly belonged to Hindu religion. Majority of elderly males (91.5%) and females (73.5%) were married. Large numbers of elderly males (50.5%) were found to be staying with nuclear family whereas 50.5% females were with extended families; however 1.5% males and 6.5% females were staying alone. Greater proportion of elderly females (55%) and elderly males (53.5%) had a family less than or equal to four members whereas 14% and 10.5% of elderly males and females, respectively, had a family more than or equal to seven members. A majority of elderly males (64%) were graduate/post graduate or Ph.D. whereas majority females (48%) had education up to SSC/HSSC/ Inter or diploma. The rate of illiteracy was seen significantly ( $\chi^2 = 43.75$   $p < 0.01$ ) more in females (2.5%) as compared to males (0.5%). All the elderly males and only 23.5% females were found to be employed before the age of retirement. After the age of retirement, maximum elderly males (86%) and 97.5% elderly females were found not to be employed. Pension was the main source of income for the majority of elderly males (70.5%) and females (76.6%) whereas life savings as the source of income was for 15.5% males and 2.12% females.

The data on economic status of elderly presented in Table 1 revealed that 55% elderly males were earning Rs. 5,001 to 10,000 (1 dollar = 45.5 Rs. conversion rates for 16/02/2011 apply) per month whereas 24.5% were earning Rs.10,001 to 15,000 per

month. Out of 47 elderly females, 57.4% were getting up to Rs. 5,000 per month whereas 34% were getting Rs. 5,001 to 10,000. The economic status of families of elderly shows that for the majority of elderly males (53.5%) and females (53%) the total monthly income of family ranged between Rs. 5,000 to 20,000 per month. The numbers of elderly males engaged in social activities were found to be significantly higher than elderly females ( $\chi^2 = 21.44$   $p < 0.01$ ). Only 37% elderly males and 16.5% females were found to be engaged in social activities.

### Dietary Practices of the Elderly

Table 2 illustrates that a majority of elderly males (90.5%) and females (94%) were vegetarians. A majority of 4 elderly females (74%) and males (73%) were found to be consuming 4-5 meals in a day. About 92% and 91% of elderly females and males, respectively, were consuming meals regularly. Data also shows that 70% elderly males and 66% elderly females were consuming meals with their family whereas 20.5% females and 18% males were consuming meals alone. About 93.5% elderly males and 92% females were not skipping meals. Majority elderly females (79.5%) and males (77%) were consuming meals of normal consistency whereas 22% males and 20% females were consuming meals of soft consistency. It was further observed that 62% elderly males and 60% females were consuming therapeutic diet and 97% elderly males and females were consuming foods cooked at home. The number of elderly females observing fasts were more than elderly males ( $\chi^2 = 14.33$   $p < 0.01$ ). Unhealthy lifestyle habits (smoking and tobacco chewing) were seen significantly ( $\chi^2 = 52.34$   $p < 0.01$ ) more in elderly males than females.

### Food Intake of the Elderly

The diet intake of elderly males and females has been presented in Table 3. The results of food intake of elderly males showed that the intake of pulses ( $62.4 \pm 10.8$  gm), other vegetables ( $112.4 \pm 25.2$  gm), milk and milk products ( $319 \pm 154$  gm) and fats ( $30.8 \pm 4.8$  gm) was higher than the recommended dietary intake. The mean intake of pulses ( $z = 2.07$   $p < 0.05$ ), other vegetables ( $z = 2.03$   $p < 0.05$ ), fruits ( $z = 2.04$   $p < 0.05$ ) and fats ( $z = 2.53$   $p < 0.05$ ) was found to be significantly higher in 60-70 years of elderly males than 70-80 years. In elderly females, the intake of other vegetables ( $108.9 \pm 20.9$  gm) and fat ( $31.0 \pm 5.9$  gm) was more than the RDI. However, no significant difference was observed between the age groups (60-70 and 70-80 years) of elderly females with respect to the mean food consumption. The percent adequacy for cereal, green leafy vegetables, root vegetables, fruits and sugar in elderly males ranged from 10.2% to 56.8% whereas in females, percent adequacy for cereal, pulse, green leafy vegetables, root vegetables, fruits, milk and milk products and sugar ranged from 16.8% to 94.6%.

### Macronutrient Intake of the Elderly

Table 4 shows that the mean daily intake of calorie and protein in 60-80 y old males was  $1647.1 \pm 352.6$  kcal and  $53.4 \pm 10.9$  gm/day, respectively. Whereas mean intake of carbohydrate, fat and total fibre was found to be  $240.1 \pm 58.6$  gm/d,  $50.3 \pm 10.2$  gm/d and  $35.6 \pm 8.14$  gm/d, respectively. The percent adequacy for fat was found to

be highest (93.4%) followed by total fibre (88.9%), protein (88.9%), energy (67.9%) and carbohydrate (56.6%). The mean nutrient intake of elderly males of 60-70 year of age was found to be higher for all nutrients as compared to elderly of 70-80 years of age. The mean intake of energy ( $z = 2.42$   $p < 0.05$ ), protein ( $2.59$   $p < 0.01$ ), carbohydrate ( $z = 2.12$   $p < 0.05$ ), fat ( $z = 2.24$   $p < 0.05$ ) and total fibre ( $z = 2.86$   $p < 0.01$ ) was significantly higher in 60-70 years compared to 70-80 years of age of elderly males.

The mean daily intake of energy and protein in 60-80 y old females was  $1474.3 \pm 287.7$  kcal/d and  $47.1 \pm 8.67$  gm/d, respectively whereas that of carbohydrate, fat and total fibre was  $208.5 \pm 48.6$  gm/d,  $48.4 \pm 9.48$  gm/d and  $31.3 \pm 7.04$  gm/d, respectively. The percent adequacy for fat was highest in females (116.1%) followed by protein (94.1%), energy (78.6%), total fibre (78.2%) and lowest for carbohydrate (63.6%). Intake of all the nutrients excluding fat was more in elderly females of 60-70 years of age than 70-80 years. However, no significant difference ( $z > 0.05$ ) was observed among the elderly females of 60-70 years and 70-80 years with respect to macronutrient intake.

### **Correlation Coefficient between Socio-Economic Profile and Macronutrient Intake of the Elderly**

Age of elderly males was found to be negatively and significantly correlated with energy ( $r = -0.18$   $p < 0.01$ ), protein ( $r = -0.2$   $p < 0.01$ ), carbohydrate ( $r = -0.18$   $p < 0.01$ ) and total fibre ( $r = -0.22$   $p < 0.01$ ) intake. Age of females, too, showed negative and significant correlation with carbohydrate ( $r = -0.13$   $p < 0.05$ ) and fibre ( $r = -0.15$   $p < 0.05$ ) intake. Carbohydrate intake showed positive and significant correlation ( $r = 0.13$   $p < 0.05$ ) with marital status of elderly males. The macronutrient intake of both elderly males and females was not found to be significantly correlated with educational qualification, family size, monthly income and social involvement.

### **Correlation Coefficient between Dietary Pattern and Macronutrient Intake of the Elderly**

Results of correlation given in Table 5 indicate that elderly males consuming meals with their family had significant association with energy ( $r = 0.15$   $p < 0.05$ ), protein ( $r = 0.13$   $p < 0.05$ ), carbohydrate ( $r = 0.15$   $p < 0.05$ ) and fibre ( $r = 0.13$   $p < 0.05$ ) intake. Intake of energy ( $r = 0.46$   $p < 0.01$ ), protein ( $r = 0.42$   $p < 0.01$ ), carbohydrate ( $r = 0.41$   $p < 0.01$ ), fat ( $r = 0.47$   $p < 0.01$ ) and fibre ( $r = 0.33$   $p < 0.01$ ) were found to be highly associated with number of meals consumed by elderly males. Elderly males receiving food cooked at home showed positive relationships with protein ( $r = 0.14$   $p < 0.05$ ), carbohydrate ( $r = 0.13$   $p < 0.05$ ) and fibre ( $r = 0.14$   $p < 0.05$ ) intake. Skipping of meals by elderly males showed significant and negative correlation with fat ( $r = -0.17$   $p < 0.05$ ) intake only.

Data on correlation between dietary pattern and macronutrient intake shows that fat intake ( $r = -0.14$   $p < 0.05$ ) in elderly females was negatively associated with food habits. Diet consistency of elderly females positively correlated with energy ( $r = 0.15$



$p < 0.05$ ), protein ( $r = 0.16$   $p < 0.05$ ), carbohydrate ( $r = 0.16$   $p < 0.05$ ) and fibre ( $r = 0.19$   $p < 0.01$ ) intake. Like elderly males, the intake of energy ( $r = 0.38$   $p < 0.01$ ), protein ( $r = 0.32$   $p < 0.01$ ), carbohydrate ( $r = 0.24$   $p < 0.01$ ), fat ( $r = 0.55$   $p < 0.01$ ) and fibre ( $r = 0.17$   $p < 0.05$ ) was highly correlated with number of meals consumed by elderly females. Modification in diet done by elderly females showed negative and significant correlation with energy ( $r = -0.13$   $p < 0.05$ ) and carbohydrate ( $r = -0.16$   $p < 0.05$ ) intake. Unhealthy lifestyle of elderly females showed negative and significant correlation with fibre ( $r = -0.13$   $p < 0.05$ ) intake. Meal timings and religious fasting followed by both elderly males and females were not significantly associated with macronutrient intake.

## DISCUSSION

Results indicate that majority of elderly males and elderly females were from 60-70 years of age. A greater proportion of elderly males than females were found to be married. Widows were more than widowers. The majority were found to be staying with nuclear and extended family. Higher proportion of elderly males and females had family size of one to four members. The educational qualification of elderly males was significantly higher than for elderly females. Before retirement, all males and only 25% of females were employed. While after retirement, a higher proportion of elderly males and females were not employed. Pension was the main source of income. The average monthly income of elderly males was found to be Rs. 9,622  $\pm$  5,760 whereas for elderly females it was found to be Rs. 1,479  $\pm$  3,479. The total monthly income of family ranged from Rs. 5,000 to 20,000. A majority were vegetarians, consuming 4-5 meals in a day, taking meals with their family, not skipping their meals, consuming meals of normal consistency, consuming therapeutic diet, consuming foods cooked at home, mostly keeping fast yearly followed by monthly, having low unhealthy lifestyle habits.

Although this study showed higher intakes, in a similar study from rural India, mean consumption of cereals and millets, which forms the bulk of the Indian diet, was below the Recommended Dietary Intake and the consumption of other vegetables (such as brinjals, ladies fingers, french beans, cluster beans and bottle gourd) were greater than the recommended levels in females [19]. This study showed a mean deficit intake of cereals, green leafy vegetables, root vegetables, fruits, and sugar in both sexes as compared to RDI. The survey carried out by National Nutrition Monitoring Bureau (NNMB) in nine states of India in 2001, revealed that the average daily intakes of various foods except for roots and tubers were below the recommended levels. The intake of protective foods such as GLV was grossly inadequate. The intake of fresh fruits was  $< 20$  g/day. There were no significant changes in the intakes of various foods during the period of past three decades [20]. Further in the study it was noted that the mean intake of cereals and pulses was higher for 60-70 year-olds than for 70-80 year-olds in both elderly males and females. A similar trend has been reported in a survey of rural India [19].

The study showed that, except for fat intake in elderly females, the mean daily intake of all macronutrients in both elderly males and females was less than the Recommended Dietary Allowance. Similar findings have been reported in surveys conducted by National Nutrition Monitoring Bureau (NNMB), that the median energy intake in males (8.703 MJ; 2080 Kcal) and females (7.067 MJ; 1689 Kcal) were less than the RDA [19]. Data regarding the nutrient intake of elderly men of all income groups in Baroda city revealed lower consumption of energy and protein than the RDA. The consumption of fat was higher than the RDA in all the three groups of elderly men, which may be attributed to the cooking methods and use of clarified butter in the diets of the elderly. In case of elderly women, the mean caloric intake was 50% of the RDA, whereas that of protein was about 60% of RDA in LIG women [21].

The study also observed that the macronutrient intake of both elderly males and females showed significant negative correlation with age. The findings agree with previous studies carried out by different researchers on elderly [8, 22, 23, 24, 25]. The nutritional status of elderly declines further as age advances [8]. There was profound effect of age on diet profile, nutritional status in both the elderly males and females in rural area of Vadodara [22, 23]. A survey on Kondh primitive tribe revealed that the intakes of various foods tended to decrease with increase in age from 60-69 years to > 80 years [24]. Dietary intakes of energy, fat, and carbohydrates were significantly lower for people aged 75 and older compared with people aged 65–74 [25]. Educational qualification, family size, income and social participation of both elderly males and females were, however, not significantly correlated with macronutrient intake.

In the present study, the intake of all macronutrients increased significantly in both elderly males and females as the number of meals increased. A similar observation found in a multivariate model was that low energy intake was associated with not consuming snacks for men [25]. In elderly males, significant and positive relationships existed between meals consumed with family, foods cooked at home/received from home and macronutrient intake whereas negative relationship existed between skipping of meals and fat intake. Consistency of diet consumed by elderly females was significantly and positively associated with macronutrient intake, whereas modification in diet and unhealthy lifestyles were significantly and negatively associated with energy, carbohydrate and fat intake, respectively. There was no significant association observed between the meal timings and fasting practices of both elderly males and females and their macronutrient intake.

## CONCLUSION AND RECOMMENDATION

This study attempted to provide information about the actual intake of macronutrients by both elderly males and females of 60-80 years from central India and the interrelationship between the socioeconomic as well as dietary pattern with macronutrient intake. The study shows that there was a deficient intake of all the

macronutrients in both elderly males and females than Recommended Dietary Allowance except fat intake in elderly females. It was also observed that the macronutrient intake in both elderly males and females is influenced by increasing age and the number of meals consumed.

With the withering of joint families, elderly are being abandoned. Describing ageing as a major challenge, there is a need to give more attention to the care and protection of the elderly by the family members. Creating health and nutrition awareness regarding the physiological changes associated with ageing is the most important task lying ahead. The health care providers such as medical practitioners, dietitians and nutritionists could create health and nutrition awareness by organizing camps for elderly.

#### **ACKNOWLEDGEMENT**

Authors are thankful to Dr Mrs. Sabiha Vali, Former Head and Professor, Post Graduate Teaching Department of Home Science, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for her guidance.

**Table 1: Distribution of Elderly Respondents by Socio Economic Characteristics**

Sr. No.	Variables	Categories	Elderly Subjects			
			Male N =200		Female N =200	
1	Age (Y)	60 – 65	43	(21.5)	88	(44)
		65 – 70	63	(31.5)	51	(25.5)
		70 – 75	59	(29.5)	44	(22)
		75 – 80	35	(17.5)	17	(8.5)
2	Religion	Hindu	200	(100)	200	(100)
3	Marital Status	Married	183	(91.5)	147	(73.5)
		Single	01	(0.5)	04	(2)
		Widower/Widow	16	(8)	49	(24.5)
4	Type of Family	Extended	94	(47)	101	(50.5)
		Joint	02	(1)	01	(0.5)
		Nuclear	101	(50.5)	85	(42.5)
		Single	03	(1.5)	13	(6.5)
5	Family Size	1-4	107	(53.5)	110	(55)
		5-6	65	(32.5)	69	(34.5)
		≥ 7	28	(14)	21	(10.5)
6	Educational Qualification	Illiterate	01	(0.5)	05	(2.5)
		Up to high School	04	(2)	29	(14.5)
		Matric/HSSC/Diploma/Inter	67	(33.5)	96	(48)
		Graduate/PG/PhD.	128	(64)	70	(35)
7	Employed Before Retirement	Yes	200	(100)	47	(23.5)
		No	---	---	153	(76.5)
8	Employed	Yes	28	(14)	05	(2.5)

	<b>After Retirement</b>	No	172 (86)	195 (97.5)
9	<b>Source of Income</b>	Pension	141 (70.5)	36 (76.59)
		Pension + PF/ Service/ Retirement benefit/farming	08 (4)	01 (2.12)
		Saving property	31 (15.5)	01 (2.12)
		Saving property + Service/ business	04 (2)	-----
		Service/Business/ commission/ farming	14 (7)	03 (6.38)
		Nil	02 (1)	06 (12.7)
10	<b>Distribution of Income of Elderly/Month</b>	0 - 5,000	32 (16)	27 (57.44)
		5,001-10,000	110 (55)	16 (34)
		10,001-15,000	49 (24.5)	
		15,001-20,000	04 (2)	03 (6.38)
		> 20,000	05 (2.5)	01 (2.12)
11	<b>Distribution of Total Income of Elderly/Month</b>	< 5,000	07 (3.5)	09 (4.5)
		5,000-20,000	107 (53.5)	106 (53)
		20,000-40,000	46 (23)	58 (29)
		40,000-80,000	33 (16.5)	22 (11)
		>80,000	07 (3.5)	05 (2.5)
12	<b>Involvement In Social Activities</b>	Yes	74 (37)	33 (16.5)
		No	126 (63)	167 (83.5)

(The numbers in parenthesis indicates per cent cases)

**Table 2: Distribution of Elderly Respondents by Dietary Practices**

Sr. No.	Variables	Categories	Elderly Subjects	
			Male N = 200	Female N =200
1	Food Habits	Vegetarian	181 (90.5)	188 (94.0)
		Non vegetarian	19 (9.5)	12 (6.0)
2	No. of Meals	≤ 3 Meals	16 (8.0)	26 (13.0)
		4-5 Meals	146 (73.0)	148 (74.0)
		≥ 6 Meals	38 (19.0)	26 (13.0)
3	Meal Timings	Regular	182 (91.0)	184 (92.0)
		Irregular	18 (9.0)	16 (8.0)
4	Meals Consumed With	Alone	36 (18.0)	41 (20.5)
		Family	140 (70.0)	132 (66.0)
		Alone/Family	24 (12.0)	27 (13.5)
5	Skipping of Meals	Sometimes	9 (4.5)	8 (4.0)
		Often	4 (2.0)	8 (4.0)
		Never	187 (93.5)	184 (92.0)
6	Consistency of Diet	Normal	154 (77.0)	159 (79.5)
		Soft	44 (22.0)	40 (20.0)
		Semi solid	2 (1.0)	01 (0.5)
7	Type of Diet	Normal	76 (38.0)	80 (40.0)
		Therapeutic	124 (62.0)	120 (60.0)
8	Received Food From/Cooked From	Home	194 (97.0)	194 (97.0)
		Relatives	3 (1.5)	3 (1.5)
		Packed meals centre	3 (1.5)	3 (1.5)
9	Religious Fasting	Weekly	52 (26.0)	72 (36.0)

		Monthly	22	(11.0)	39	(19.5)
		Yearly	126	(63.0)	89	(44.5)
<b>10</b>	<b>Unhealthy Life Style Habits</b>	Tobacco	36	(18)	02	(1)
		Smoking	07	(3.5)	-----	-----
		Alcohol	06	(3)	-----	-----
		Nil	151	(75.5)	198	(99)

(The numbers in parenthesis indicates per cent cases)

**Table 3: Intake of Foodstuffs (g/person) Among Elderly by Age and Sex**

Age	N	Mean S.D. % Adequacy	Cereals	Pulses	Green Leafy Vegetables	Other Vegetables	Root Vegetables	Fruits	Milk And Milk Products	Fats	Sugar
<b>Males</b>											
60 –70	106	Mean	248.58	63.82	41.7	115.85	20	21.56	322.88	31.56	10.33
		S.D.	± 74.44	± 8.21	± 24.84	± 22.28	± 13.43	± 18.05	± 155.08	± 4.49	± 6.63
		% Adequacy	59.18	106.36	41.7	115.85	10	21.56	107.62	157.8	41.33
70 –80	94	Mean	227.23	60.69	37.71	108.56	21.12	16.33	313.83	29.84	11.83
		S.D.	± 81.28	± 12.94	± 25.59	± 27.74	± 13.54	± 18.07	± 153.39	± 5.05	± 7.7
		% Adequacy	54.1	98.86	37.71	108.56	10.56	16.33	104.61	149.2	47.32
60- 80	200	Mean	238.55	62.35	39.83	112.43	20.43	19.1	318.63	30.75	13.33
		S.D.	± 78.26	± 10.78	± 25.21	± 25.2	± 13.39	± 18.2	± 153.97	± 4.83	± 5.57
		% Adequacy	56.79	103.91	39.83	112.43	10.21	19.1	106.21	153.75	53.33
<b>RDI</b>			420	60	100	100	200	100	300	20	25
<b>Z Test</b>			1.92	2.07*	1.11	2.03*	0.58	2.04*	0.41	2.53*	1.46



Females											
60 –70	139	Mean	206.15	56.04	41.73	110.09	21.73	16.12	277.16	31.12	9.89
		S.D.	± 63.32	± 15.83	± 20.53	± 20.39	± 16.01	± 14.48	± 128.98	± 5.81	± 4.56
		% Adequacy	68.71	93.4	41.73	110.09	21.73	16.12	92.38	155.6	49.45
70 –80	61	Mean	191.23	56.56	38.69	106.31	23.52	18.44	299.18	30.82	10
		S.D.	± 51.95	± 14.09	± 22.08	± 21.87	± 15.39	± 18.27	± 112.64	± 6.27	± 5.48
		% Adequacy	63.74	94.26	38.69	106.31	23.52	18.44	99.72	154.1	50
60- 80	200	Mean	201.6	56.2	40.8	108.94	22.28	16.83	283.88	31.03	10.97
		S.D.	± 60.34	± 15.52	± 21.01	± 20.87	± 15.81	± 15.73	± 124.36	± 5.94	± 3.8
		% Adequacy	67.2	93.66	40.8	108.94	22.28	16.83	94.62	155.15	54.85
<b>RDI</b>			300	60	100	100	100	100	300	20	20
<b>Z Test</b>			1.74	0.22	0.91	1.14	0.74	0.87	1.21	0.31	0.13

\*p < (0.05), S.D. = Standard Deviation, RDI = Recommended Dietary Intake

**Table 4: Average Daily Intake of Macronutrients (Per Person) Among Elderly by Age and Sex**

Age (Years)	N	Mean S.D. % Adequacy	Energy (Kcal.)	Protein (gm)	Carbohydrate (gm)	Fat (gm)	Fibre (gm)
<b>Males</b>							
60 – 70	106	Mean S.D. % Adequacy	1703.86 ± 318.01 70.26	55.23 ± 9.81 92.05	248.4 ± 52.42 58.52	51.85 ± 9.71 96.19	37.10 ± 7.46 92.75
70 – 80	94	Mean S.D. % Adequacy	1583.15 ± 379.53 65.28	51.23 ± 11.74 85.38	230.74 ± 63.75 54.36	48.62 ± 10.54 90.2	33.83 ± 8.56 84.57
60 – 80	200	Mean S.D. % Adequacy	1647.13 ± 352.6 67.92	53.35 ± 10.92 88.91	240.1 ± 58.55 56.57	50.33 ± 10.22 93.37	35.57 ± 8.14 88.92
<b>RDA</b>			2425	60	424.4	53.9	40
<b>Z Test</b>			2.42*	2.59**	2.12*	2.24*	2.86**

Females							
60 – 70	139	Mean	1482.29	47.15	211.09	48.15	31.64
		S.D.	± 297.6	± 8.96	± 50.71	± 9.41	± 7.26
		% Adequacy	79.05	94.3	64.33	115.46	79.1
70 – 80	61	Mean	1456.22	46.87	202.68	49	30.43
		S.D.	± 265.36	± 8.03	± 43.24	± 9.68	± 6.51
		% Adequacy	77.66	93.74	61.77	117.5	76.07
60 – 80	200	Mean	1474.34	47.07	208.52	48.41	31.27
		S.D.	± 287.74	± 8.67	± 48.6	± 9.48	± 7.04
		% Adequacy	78.63	94.14	63.55	116.09	78.17
<b>RDA</b>			1875	50	328.1	41.7	40
<b>Z Test</b>			0.61	0.21	1.19	0.57	1.16

\*  $p < (0.05)$ , \*\*  $p < (0.01)$ , S.D. = Standard Deviation, RDA = Recommended Dietary Allowance

**Table 5: Correlation Coefficient between Dietary Pattern and Macronutrient Intake of Elderly**

Dietary Pattern	Sex	Energy (kcal.)	Protein (gm.)	Carbohy- drate (gm.)	Fat (gm.)	Total fibre (gm.)
Food Habits	M	-0.11	-0.09	-0.12	-0.09	-0.1
	F	-0.07	-0.02	-0.02	-0.14*	0.03
Consistenc y of Diet	M	0.03	-0.002	0.02	0.03	-0.02
	F	0.15*	0.16*	0.16*	0.07	0.19**
Meal Timings	M	-0.07	-0.11	-0.01	-0.1	-0.05
	F	0.03	0.01	0.05	-0.01	0.06
Meals Consumed With	M	0.15*	0.13*	0.15*	0.11	0.13*
	F	0.02	0	-0.01	0.06	0.01
No. of Meals	M	0.46**	0.42**	0.41**	0.47**	0.33**
	F	0.38**	0.32**	0.24**	0.55**	0.17*
Received Food From	M	0.12	0.14*	0.13*	0.05	0.14*
	F	-0.08	-0.07	-0.1	-0.05	-0.06
Skipping of Meals	M	-0.1	-0.11	-0.05	-0.17*	-0.01
	F	0.06	0.03	0.08	0.01	0.09
Fasting Practices	M	-0.1	-0.09	-0.11	-0.02	-0.12
	F	0.01	0.01	0.004	0.03	0.05
Modificatio n of Diet	M	-0.05	-0.01	-0.08	0.01	-0.02
	F	-0.13*	-0.12	-0.16*	-0.05	-0.11
Unhealthy Life Style	M	0.08	0.1	0.08	0.07	0.12
	F	-0.07	-0.08	-0.1	-0.09	-0.13*

\* p < (0.05), \*\* p < (0.01)

## REFERENCES

1. **Gokhale SD** Towards Multi-Disciplinary Approach-Going Beyond Physical Science Ageing: A Natural Phenomenon. **In:** Proceedings of International Conference on Multi Disciplinary Approach To Healthy And Participatory Ageing, Mumbai, 22nd -24<sup>th</sup> January 2009; 19.
2. **World Health Organization (WHO)**. 10 facts on ageing and the life course, <http://www.who.int/features/factfiles/ageing/en/index.html> accessed: 3/04/2011.
3. **United Nations**. 2004, [http://en.wikipedia.org/wiki/Population\\_ageing](http://en.wikipedia.org/wiki/Population_ageing) accessed: 3/04/2011.
4. **United Nations Development Programme**. (September 2005) Human development report 2005: international cooperation at a crossroads-aid, trade and security in an unequal world, [http://en.wikipedia.org/wiki/Population\\_ageing](http://en.wikipedia.org/wiki/Population_ageing) accessed: 3/04/2011.
5. **Rajagopalan S** Demographic Ageing of the Population and Its Implication In The Next Millennium. **In:** Proceedings of the Nutrition Society of India, National Institute of Nutrition, Hyderabad, 2000; **Vol. 48**, 105-106.
6. **Medhi GK and J Mahanta** Population ageing in India: Health promotion through life course approach. **In:** Current Science Vol. 93, No. 8, 25 October, 2007.
7. **Indira Jai Prakash** Quality Ageing: Psychosocial Issues. **In:** proceedings of International Conference on Multi Disciplinary Approach To Healthy And Participatory Ageing, Mumbai, 22nd -24<sup>th</sup> January 2009; 60.
8. **Baweja S, Agarwal H, Mathur A, Haldiya KR and Mathur** Assessment of nutritional status and related risk factors in community dwelling elderly in western Rajasthan. *Journal of Indian Academy of Geriatrics* 2008; **1**: 5-13.
9. **Census-2011.co.in** Population Census India, <http://www.census2011.co.in/census/district/343-nagpur.html> accessed: 27/10/2012.
10. **Welcome to Nagpur District**, <http://www.nagpuronline.com/whereitis.htm> accessed: 25/02/2011.

11. **Thimmayamma BVS and Parvathi Rau** Dietary assessment as part of nutritional status. **In:** Mahtab S. Bamji, N. Pralhad Rao and Vinodini Reddi Text Book of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi. 1998; 130.
12. **National Institute of Nutrition.** Dietary Guidelines for Indians -A manual, NIN, ICMR, Hyderabad.1999 pp 74.
13. **Gopalan C, Rama Sastri BV and SC Balasubramanian** Nutritive value of Indian foods, National Institute of Nutrition, ICMR, Hyderabad 2004.
14. **Indian Council of Medical Research,** Nutrient Requirements and Recommended Dietary Allowances for Indians. Report of Expert Group of Indian Council of Medical Research, New Delhi.1990.
15. **Garrett HE and RS Woodworth** Statistics In Psychology And Education (5th edition). Vakils, Feffer and Simons Private Ltd. Bombay, India. 1969.
16. **Kothari CR** Research Methodology: Methods And Techniques. New Age International (P) Limited, New Delhi. 2007; 197.
17. **Kerlinger NF** Foundation of Behavioural Research (3rd edition). Fort Worth: Harcourt Brace 1992; 453-455.
18. **Gomez KA and AA Gomez** Statistical Procedures for Agricultural Research, John Wiley and Sons, New York. 1984.
19. **Arlappa N, Balakrishna N, Sharad Kumar, Brahman GNV and K Vijayaraghavan** Diet and nutritional status of the elderly in rural India. *Journal of Nutrition for The Elderly* 2003; **22(4):** 39-40.
20. **Brahmam GNV** Changing Profile Of The Aged In India. **In:** Proceedings of Conference On Nutrition and Self Care for Healthy Aging, National Institute of Nutrition, Hyderabad, 2 -3 September 2005; **I:** 1-3.
21. **Mehta P** Diet, Nutrition And Health Profile Of Elderly Population Of Urban Baroda. **In:** proceeding of National Conference On Ageing, Nutrition And Health, Baroda, India. 1999; 55.
22. **Desai AN, Patel HV and AK Bhattacharya** Nutritional status and health of elderly males in rural Vadodara, <http://www.japi.org> accessed 10/05/2009.

23. **Desai AN, Patel HV and AK Bhattacharya** Nutritional status and health of elderly females in rural Vadodara, <http://www.japi.org> accessed 10/05/2009.
24. **Bulliyya G** Nutritional Status of Elderly In Kondh. **In:** Nutrition Society of India 33<sup>rd</sup> Annual Meeting 1999.
25. **Shahar D, Shai I, Vardi H and D Fraser** Dietary intake and eating patterns of elderly people in Israel: who is at nutritional risk? *European Journal Clinical Nutrition* 2003; 57: 18–25.