

Assessment of Nutritional Status and its Associated Factors among the Elderly Population: A Cross-sectional Study from Rural Area of Madurai, Tamil Nadu, India

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ABSTRACT

Introduction: Elderly malnutrition is an iceberg phenomenon and remains undiagnosed most of the time. The elderly people are at risk of malnutrition due to physical, psychological, social, dietary and environmental risk factors. When malnutrition gets compounded with various co-morbidities, it turns into a vicious cycle.

Aim: To focus on the assessment of nutritional status and its associated factors among the elderly population above 60 years of age in a rural area of Madurai district, Tamil Nadu, India.

Materials and Methods: This was a community-based cross-sectional study done for a period of four months in the rural field practice area of Madurai Medical College, Madurai, Tamil Nadu, India. Following ethical clearance, study subjects were selected by using single stage area wise cluster sampling technique. Data was collected from 240 elderly individuals by face to face interview using semistructured questionnaire. Details regarding socio-demographic variables like age, gender, educational status, occupational status, economic dependency and place of residence were taken. Nestle's Short Form Mini

Nutritional Assessment (SF-MNA) screening tool was used to assess the nutritional status of the study participants. The association was assessed by Chi-square test. Significance level was considered at p-value of ≤ 0.05 .

Results: Prevalence of malnutrition was seen among 33 (13.75%) individuals. A 105 (43.75%) were at the risk of malnutrition and 102 (42.5%) had satisfactory nutritional status. The comparison between well nourished, at risk of malnutrition and malnourished groups showed significant differences with respect to age (p-value=0.016), economic dependency (p-value=0.002), place of residence (p-value=0.004), Body Mass Index (BMI) (p-value=0.024), calf circumference (p-value=0.016) and presence of co-morbid illness (p-value=0.015).

Conclusion: The findings of the present study clearly indicate that malnutrition is a multifactorial condition associated with socio-demographic, somatic and functional status. A multidimensional approach is required to deal with these issues. Nutritional assessment and screening of elderly people should be done by opportunistic screening for early detection of malnutrition and to implement an appropriate nutritional intervention.

Keywords: Malnutrition, Mini nutritional assessment, Multidimensional, Nutritional screening

INTRODUCTION

Ageing is an inevitable process associated with progressive decline in physiological and biological process. The World Health Organisation (WHO) has stated that elderly population will impose new challenges to healthcare in near future [1]. In India, the elderly population was 8.6% as per 2011 census and this is expected to raise by more than 19% by 2050 [2]. As people age, their bodies undergo changes which makes them less resistant to chronic, debilitating and disabling conditions. Multimorbidity is more common among elderly individuals [3]. Many of the diseases suffered by the elderly individuals are the result of dietary factors compounded by changes that naturally occur with the ageing process [4].

Nutrition is a key component in maintaining good health, mobility and quality of life of the elderly individuals. The elderly people are at the risk of malnutrition due to physical, psychological, social, dietary and environmental risk factors. Early detection of nutritional deficiency is essential to avoid worsening of chronic conditions or diseases [5]. When malnutrition gets compounded with various co-morbidities it turns into a vicious cycle [6]. Malnutrition increases the chance of dependency thereby interfering with the quality of life of the elderly. Also, malnutrition leads to impaired muscle function, decreased bone mass, immune dysfunction, anaemia and poor wound healing leading to higher hospital admissions [7].

While most of our nutritional concerns are directed towards infants, young children, pregnant and lactating mothers, nutrition

of the elderly is often neglected. In India, majority of the elderly individuals live in rural areas with additional risk factors making them more prone for malnutrition. With national health policy focusing on maternal health, child health and communicable diseases, the health status of the elderly has not been given due consideration [3]. Hence, the present study was proposed to assess the nutritional status and its associated factors among elderly population above 60 years of age in rural area of Madurai district, Tamil Nadu, India.

MATERIALS AND METHODS

This was a community-based cross-sectional study conducted over a period of four months from January 2023 to April 2023 in the rural field practice area of Madurai medical college, a tertiary care institute in Madurai district, Tamil Nadu, India. Before the start of the study, the details of the methodology and clinical evaluation procedure were reviewed and approved by Institutional Ethical Committee (IEC) (EC/NEW/INST/2022/TN/0059). Ethical approval Dated 08 September 2021; ref no:-1197/Ethics/2021. A written consent was obtained from all the study participants.

Inclusion criteria: Elderly people above 65 years willing to participate were included in the study.

Exclusion criteria: Elderly people who were seriously ill, those with malignancy, those fed by feeding tube and elderly with known neuropsychiatric illness were excluded from the study.

Sample size: Sample size was 240 elderly individuals above 60 years of age. The sample size was calculated based on the prevalence of malnutrition among elderly in Coimbatore, Tamil Nadu which was 19.47% [1]. The sample size was calculated as follows:

$$\text{Sample size} = z^2 PQ/d^2 = (1.96^2 * 19.47 * 80.53) / 5^2$$

Considering absolute precision of 5% and confidence interval of 95%, the sample size obtained was 240.

Single stage area wise cluster sampling was done. The total population covered by the rural field practice area of Madurai Medical College was 37,538. Considering the national census 2011, the elderly population comprises of 8.6% [8]. Thus, the elderly population covered within the rural practice area would be approximately 3,228. This population was distributed among seven areas (clusters). One cluster (Samayanallur) was randomly selected. It covers a population of 4,951 with approximately, 425 elderly people. Among them, all eligible individual were included for the study. House to house survey was carried out in the selected cluster until the desired sample size was achieved.

The study protocol was explained in the local language. The study subjects were interviewed face to face using semistructured questionnaire containing socio-demographic details, personal and medical history. The last part was SF-MNA screening questions. This screening tool was validated for its use in community dwelling elderly individual [9].

Anthropometric measurements (weight, height and calf circumference) were measured. Weight was recorded without shoes and with light cloths using a digital weighing machine (model: GS series, Beurer India Pvt. Ltd., manufactured on 05/22). Height was recorded in standing posture without shoes and with light cloths on a wall mounted measuring tape to the nearest of 5 cm. BMI was calculated by using the formula weight (kg)/height (m²) [10]. Calf circumference was measured in sitting posture at the widest point of the calf perpendicular to the long axis of tibia [11].

A 24 hour dietary recall method was used to assess the calorie and protein intake of the individual [12].

Nutritional status was assessed by using SF-MNA screening tool [13]. Permission to use this tool for the present study was obtained from Mapi Research Trust. This is simple and non invasive tool with good reliability that can be effectively and efficiently (Cronbach's alpha of 0.71) used in nutrition screening among community- dwelling elderly people [14]. In previous studies, the use of malnutrition screening tools for community-dwelling elderly has helped to accurately identify those with low nutritional status [3]. SF-MNA detects subjects who are at risk of malnutrition well before significant changes occur in weight or serum albumin of the individual. Studies that have been done in India and other developing countries using this questionnaire have found it to be useful and accurate. A score of 12-14 is considered as "normal nutritional status", score of 8-11 is considered as "at risk of malnutrition" and score of 0-7 is considered as "malnourished" [13,14]. The calorie

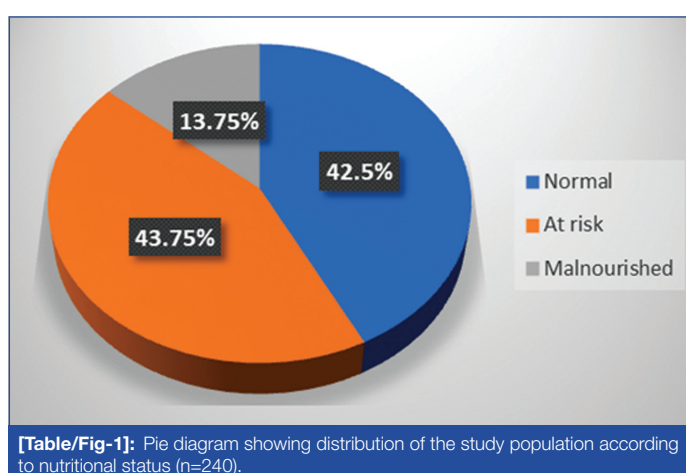
and protein requirement was calculated based on Indian Council of Medical Research (ICMR) guidelines [15].

STATISTICAL ANALYSIS

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 22.0 software and MS-Excel. Descriptive statistical measures like frequency distribution were calculated for all categorical variables and mean with standard deviation was calculated for numerical variables. Association between various categorical variables was assessed by Chi-square test as shown in results. Significance level was considered at p-value of ≤ 0.05 .

RESULTS

A total of 240 elderly subjects were included in the study. Among the study subjects, 102 (42.5%) were males and 138 (57.5%) were females. Majority 140 (58.3%) of the study subjects were in the age group of 60 to 69 years. Prevalence of malnutrition was 13.75% (n=33). Nutritional status of the study population is shown in [Table/Fig-1].



[Table/Fig-1]: Pie diagram showing distribution of the study population according to nutritional status (n=240).

The socio-demographic details of the study subjects like age, gender, educational status, occupational status, economic dependency status and place of residence were taken for comparing the nutritional status according to MNA-SF score. The comparison between well nourished, at risk of malnutrition and malnourished groups showed significant differences with respect to age, economic dependency and place of residence as shown in [Table/Fig-2].

The nutritional status of the elderly was assessed by the 24-hour recall method as shown in [Table/Fig-3]. The calorie requirement was calculated based on activity level and protein requirement based on weight of the elderly. If the individual consumes the required calculated calories and proteins, then calories and protein consumption was considered as adequate. If the consumption is lower than the required amount, then it's considered as inadequate. Only 13.3% of the study participants had adequate calorie intake

Socio-demographic variables		Nutritional status			Total (n=240)	p-value
		Normal (n=102)	At risk (n=105)	Malnourished (n=33)		
		n (%)	n (%)	n (%)		
Age (in years)	60-69	67 (47.9)	56 (40)	17 (12.1)	140 (100)	0.016*
	70-79	30 (35.3)	49 (57.6)	6 (7.1)	85 (100)	
	80 and above	5 (33.3)	-	10 (66.7)	15 (100)	
Gender	Male	38 (37.3)	54 (53)	10 (9.7)	102 (100)	0.741
	Female	64 (46.3)	51 (37)	23 (16.7)	138 (100)	
Educational status	Illiterate	53 (40.2)	57 (43.2)	22 (16.6)	132 (100)	0.427
	Literate	49 (45.4)	48 (44.4)	11 (10.2)	108 (100)	
Occupational status	Employed	19 (39.5)	23 (48)	6 (12.5)	48 (100)	0.392
	Unemployed	83 (43.2)	82 (42.7)	27 (14.1)	192 (100)	

Economic dependency	Dependent	18 (17.6)	77 (75.5)	26 (18.8)	121 (100)	0.002*
	Independent	84 (60.9)	28 (20.3)	7 (6.9)	119 (100)	
Place of residence	Alone	50 (30.8)	88 (54.4)	24 (14.8)	162 (100)	0.004*
	Living with someone	52 (66.7)	17 (21.8)	9 (11.5)	78 (100)	

[Table/Fig-2]: Comparison of socio-economic variables with nutritional status according to MNA-SF scores of the elderly (n=240).

*p-value <0.05 is considered as statistically significant

and 10% had adequate protein intake. All the elderly individuals who were malnourished had inadequate calorie and protein intake. Also, there was deficient calorie and protein intake even in elderly individuals with normal nutritional status. However, the nutritional status did not showed any statistically significant association with calorie and protein intake as assessed by 24-hour recall method.

Nutritional status (by MNA-SF)	24-hour dietary recall				p-value
	Calorie consumption		Protein consumption		
	Adequate n (%)	Deficient n (%)	Adequate n (%)	Deficient n (%)	
Normal	26 (25.5)	76 (74.5)	22 (21.5)	80 (78.5)	0.25
At risk	6 (5.7)	99 (94.3)	2 (1.9)	103 (98.1)	
Malnourished	-	33 (100)	-	33 (100)	
Total	32 (13.3)	208 (86.7)	24 (10)	216 (90)	

[Table/Fig-3]: Nutritional status according to 24 hour recall method (n=240).

*p-value <0.05 is considered as statistically significant

The anthropometric measurements like height, weight and calf circumference were taken. BMI was calculated. BMI <18.5 was considered as under-weight. The anthropometric measurements and MNA scores of the study subjects are depicted in [Table/Fig-4]. Overall, 64 (26.7%) of the elderly were underweight, 149 (62.1%) had normal weight, 17 (7%) were overweight and 10 (4.2%) were obese. Among the study participants, 75 (31.2%) of them had calf circumference of less than 31 cm and 165 (68.8%) of them had more than 31 cm. Out of 26.7% of underweight elderly individuals, 56 (23.3%) were at risk of malnutrition and malnourished. The comparison between well nourished, at risk of malnutrition and malnourished groups showed significant differences with respect to BMI (p-value=0.024) and calf circumference (p-value=0.016).

Anthropometric measurements		Nutritional status			p-value
		Normal n=102 (%)	At risk n=105 (%)	Malnourished n=33 (%)	
BMI	<18.5	8 (7.8)	32 (30.5)	24 (72.7)	0.024*
	18.5-24.9	72 (70.5)	68 (64.8)	9 (27.3)	
	25-29.9	14 (13.8)	3 (2.9)	-	
	>30	8 (7.9)	2 (1.8)	-	
Calf circumference	Less than 31	14 (13.7)	36 (34.3)	25 (75.7)	0.016*
	31 and above	88 (86.3)	69 (65.7)	8 (24.3)	

[Table/Fig-4]: Association between MNA scores and anthropometric measurements of elderly people (n=240).

*p-value <0.05 is considered as statistically significant

Behavioural factors like tobacco and alcohol consumption were taken for comparison with nutritional status. Also, history of any co-morbid conditions like diabetes, hypertension, heart disease and respiratory illness was taken. The comparison between well nourished, at risk of malnutrition and malnourished groups showed significant differences with respect to the presence of co-morbidity (p-value=0.015) as shown in [Table/Fig-5].

DISCUSSION

Nutrition is an important contributing factor to health and functional ability. Malnutrition may remain unrecognised in elderly individuals because many of the changes that are seen with inadequate nutrition are often associated with changes that occur with ageing. Identifying malnourished elderly helps in preventing frequent

Variables		Nutritional status			p-value
		Normal (n=102)	At risk (n=105)	Malnourished (n=33)	
Tobacco consumption	Never/past	63 (61.8)	60 (57.1)	20 (60.6)	0.677
	Current consumer	39 (38.2)	45 (42.9)	13 (39.4)	
Alcohol consumption	Never/past	82 (80.4)	83 (79)	27 (81.9)	0.547
	Current consumer	20 (19.6)	22 (21)	6 (18.1)	
Co-morbidity	Present	50 (49)	66 (62.9)	24 (72.7)	0.015*
	Absent	52 (51)	39 (37.1)	9 (27.3)	

[Table/Fig-5]: Comparison of behavioural risk factors and co-morbid status with nutritional status of the elderly people (n=240).

*p-value <0.05 is considered as statistically significant

hospitalisation and care giver burden. Early detection and prompt intervention is the need of the hour. The nutritional status is one of the major determinants of the quality of life in the elderly and therefore, screening for malnutrition should be a part of any geriatric assessment. In present study, majority of the elderly, 43.75% were at the risk of malnutrition and 13.75% were found to be malnourished. Only 42.5% of the study participants had satisfactory nutritional status. Present study showed more elderly to be at risk of malnutrition than actually malnourished. Similar prevalence of malnutrition (14%) and the risk of malnutrition (49%) in elderly was reported in a study done in Tamilnadu by Vedantam A et al., [3]. Similarly, a study done in 2018 in rural areas of Puducherry reported a prevalence of 17.9% of elderly malnutrition and 58.8% of elderly at risk of malnutrition [16]. This emphasises the fact that high prevalence of protein-energy deficiency exists in elderly individuals without obvious malnutrition.

The present study revealed a significant relationship between age group and MNA status. A similar observation between age group and nutritional status was also made in studies done [17,18]. Hence, it is apparent that increased focus on nutritional status is required as age of the individual increases. Many studies had reported high prevalence of malnutrition among elderly females compared to males [18,19]. Although present study showed higher rate of malnutrition in females compared to males, the association between MNA status and gender was not statistically significant.

Malnutrition in the elderly is a multidimensional concept comprising physical and psychological elements. Social and economic conditions can adversely affect dietary choices eventually leading to malnutrition [20]. Elderly people become vulnerable to malnutrition when they are economically dependent owing to inappropriate diet intake. Also, social deprivation greatly influences dietary patterns [21,22]. Loneliness leads to reluctance to prepare meal and eat which adds up to malnutrition. A study done in the rural area of West Bengal had reported that 46.4% elderly individuals who lived alone showed moderate to severe decline in food intake [6]. The present study also showed significant difference in malnutrition with respect to economic dependency and loneliness. A study done in rural areas of Dindigul district, Tamil Nadu found direct association of educational status and income in determining the nutritional status of the elderly [22]. However in the present study, no significant association was observed between educational status and malnutrition. Also, the present employment status did not show any significant association with nutritional status of the elderly.

The diet consumption was assessed by 24-hour recall method. Reduced calorie and protein intake was observed in malnourished and those at risk of malnourishment. But the association between nutritional status and diet was not significant. This result was in contrast with a study done in Hyderabad (using 24-hour recall method) which showed a statistically significant relationship between nutritional status and calorie consumption [23]. This could be attributed to the inaccurate method used for calculating the calorie and protein intake. The chance of variation in diet pattern on various days might have affected the results. However, the 24-hour total calorie intake does not reflect the current nutritional status of the elderly except in malnourished individuals. When the elderly individuals with low calorie and protein intake was asked for the reasons of consuming poor diet, only few reasons related to old age like loss of tooth, unable to chew and the food was less palatable were given. Apart from these reasons few stated that loneliness and hesitant to cook for themselves was the reason. Some elderly followed restricted diet in view of their co-morbid conditions and few were totally unaware of the deficient state. Hence, while addressing to elderly malnutrition various factors should be kept in mind. Thus, a holistic management addressing loneliness, co-morbid conditions and financial burden should be taken care.

In present study, there was a significant association between MNA scores and BMI. Majority of the malnourished and those at risk of malnourishment were underweight. Studies done in various parts of the country reported positive correlation with BMI [24,25]. Similarly, majority of the malnourished elderly had calf circumference of <31 cm. Similar results were obtained in a study conducted in Karnataka by Ananthesh BG et al., [5].

Many studies reported significant association between lifestyle factors particularly smoking and alcohol consumption with malnutrition [25-27]. However in the present study, no significant association between lifestyle factors and malnutrition was observed. In the present study individuals with any co-morbidity like diabetes, hypertension, heart disease and respiratory illness had higher prevalence of malnutrition and this association was statistically significant. Nutritional assessment and screening of elderly people should be done as opportunistic screening for early detection of malnutrition. At the household level, primary care givers should be trained to identify the at risk elderly individuals and prompt management can be advised. Health promoting activities emphasising on healthy eating and healthy lifestyle as recommended by National Programme for Health Care of Elderly would help to combat with malnutrition and achieve healthy ageing.

Hence, the findings of the present study clearly indicate that malnutrition is a multifactorial condition associated with socio-demographic, somatic and functional status.

Limitation(s)

The technique of using 24 hour recall method is not an accurate method for calculating the calorie and protein intake of an individual as the diet pattern may vary from day to day. Other reliable techniques for calculating calorie intake like food frequency questionnaire or weighing of raw foods should be considered. The data collection involved few individuals from non nutrition background and this might contribute to bias. However, biochemical and haematological investigations are required for complete assessment of malnutrition.

CONCLUSION(S)

As there is significant proportion of elderly people are with malnutrition and risk of malnutrition, it is necessary to raise awareness regarding about the quality, quantity and frequency of food intake. Other factors like economic dependency and living alone should be taken care of by supportive interventions like communal gatherings

and by providing meals on wheels for the needy. However, a multidimensional approach is required at this moment to deal with these issues. Routine screening for malnutrition is essential for early detection and prompt treatment, and should be an integral part of the regular geriatric outpatients to increase the quality of care and improve outcomes.

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