

Original Research Article

Nutritional status and its associated factors among the elderly population of urban Puducherry

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ABSTRACT

Background: Health of the elderly determines the wealth of the nation. The capacity to defend the body against disease, maintain anatomic and structural normality, cognitive function, and desire for social activity are all influenced by one's nutritional status. Various age-related changes like physiological, psychological, social, nutritional, and environmental risk factors make the elderly vulnerable to malnutrition and increase the risk of impairment in vital functions of major organs. It is more complex in the elderly than in young age as it determines their morbidity and mortality.

Methods: A cross-sectional analytical study among 250 elderly using a simple random sampling method. The nutritional status was assessed with a mini nutritional assessment scale and activities of daily living using the Lawton-Brody IADL scale. The data was analyzed using descriptive and inferential statistics at a 5% level of significance.

Results: Among 250 elderly, only 68 (27.2%) of them had normal nutritional status and a majority 146 (58.4%) were at risk of malnutrition. More than half 130 (52%) of the elderly had mild anemia and only 85 (34%) of them had normal levels of hemoglobin. The education level, occupation, per capita income, type of stay, BMI, and functional level ($p<0.001$), while gender ($p<0.01$) and religion, and hemoglobin ($p<0.05$) had a significant association with the nutritional status of the elderly.

Conclusions: The elderly at risk for malnutrition are more than those who are malnourished. Attention towards the elderly nutrition and associated morbidities needs focus by the family, health personnel and the government for the increasing population of the elderly.

Keywords: Elderly, Nutritional status, Malnutrition, Mini nutritional assessment

INTRODUCTION

Older people are a vital resource for any country. Aging is a natural process that presents both possibilities and difficulties.¹ Elderly, are defined as those aged 60 years or over. It is a physiological process that begins at birth, lasts the whole of life, and terminates at death. The aging population is growing significantly faster than in the past; there are 670 million older people worldwide in 2022, accounting for 14% of the total population and it is

projected to increase to 26% by 2050.² There are currently 138 million elderly people living in India, which is expected to rise to 194 million (41%) by 2031.³

The World Health Organization (WHO) has projected that the healthcare system will face new challenges as the world's population ages. The health of the elderly will play a significant role in determining a population's health status.⁴ Older adults are at an increased risk of developing malnutrition, which is detrimental to their health, social,

and overall well-being. This is mainly due to the physiological decline associated with aging.⁵ As they age, many of them become reliant on other people for their daily necessities, and a significant proportion of them are without financial assistance, lack access to nutritious food, and are living with pre-existing medical conditions. Consequently, malnutrition among the elderly is not only a health issue but also a contributing factor to the development of diseases.⁶

In addition to other aspects of the environment, nutrition plays a vital role in aging.⁷ The phenomenon of malnutrition is more complex in the elderly than in young people, which is a major determinant of developing morbidity and mortality.⁸ Although malnourishment is not a natural consequence of aging, older individuals are at risk of developing malnourishment due to a variety of physiological, psychological, and social risk factors as well as nutritional and environmental factors.⁷

Based on recent year data, 2 out of 3 elderly people skip their meals and approximately 37-40% of elderly cannot be fed at a level sufficient to meet their daily caloric needs. This phenomenon is called “anorexia of aging”.⁹

Malnutrition impairs the vital functions of major organs such as reducing muscular power and endurance.¹⁰ Prolonged and severe malnutrition impairs cardiac function by causing bradycardia, hypotension, and cardiac muscle wasting.¹¹ Furthermore, it significantly alters renal hemodynamics by reducing renal plasma flow and glomerular filtration rate and the ability to concentrate urine and remove the acid load. When protein loss is more than 20%, will affect the structure and functions of respiratory muscles leading to Breathing difficulties and alteration in respiratory functions. In addition, a decrease in bile, pancreatic, and gastric secretions contributes to malabsorption. All gastrointestinal alterations associated with malnutrition cause inflammation and poor intestinal barrier function. As a result of these alterations, patients already suffering from severe malnourishment often develop diarrhea, further exacerbating their condition and creating a vicious cycle.⁸

Nearly all immune response mechanisms are impacted by malnutrition, but cellular immunity and infection resistance are particularly compromised. Which causes a deterioration in health and raises the utilization of healthcare services.¹²

Studies on malnutrition of elderly are very few in India so the extent of the problem among India's elderly population is unknown. The country's nutritional intervention programs typically target children, antenatal, and lactating women. But the elderly are often neglected.¹³

In consideration of elderly health, the nutritional status is assessed by using the MNA questionnaire which is a

validated screening tool to provide a single, rapid assessment of nutritional status among the elderly.^{14,15} Factual information focusing on the nutritional status of the elderly will form a basis for providing better healthcare services to them. Therefore, the study aimed to assess nutritional status and its associated factors among the elderly population of urban Puducherry.

METHODS

Study design and setting

A community-based cross-sectional analytical study was carried out in the urban population in Ariyankuppam (ARM) PHC Puducherry, which caters to a population of around 56,000 in the areas of ARM, Verampattinam and Nonankuppam from September to October 2022. PHC provides comprehensive 24×7 care to the whole population residing in the 3 towns that are similar in terms of socio-demographic and cultural factors. Individuals above 60 years of age and residing in the area under the Ariyankuppam PHC were included in this study.

Sampling size and technique

The sample size was calculated based on the results of a study conducted in Tamil Nadu, with a prevalence of malnourishment among the elderly at 19.47%.¹⁶ With 5% absolute precision and 95% level of confidence. Estimated sample size was 250.

Simple random sampling was used to recruit elderly people for the study. The names and addresses of the elderly residing in the areas of Veerampattinam and Nonankuppam were obtained from the enumeration records of the Ariyankuppam PHC. The names were alphabetically arranged and using random numbers the subjects were selected.

Methodology of data collection

Information regarding sociodemographic variables, and behavioral factors was collected. And hemoglobin was checked using a hemoglobinometer. A MNA questionnaire was administered to assess the nutritional status of the elderly.

The data collection was started after getting the approval of NRMCC and the IEC committee of JIPMER. The researcher approached the elderly population in the selected urban Puducherry. Data were collected from participants at their residences and Ariyankuppam PHC. Informed consent was obtained from the participants after explaining the study. Data was collected through the face-to-face interview method using predesigned and pretested questionnaires, the MNA scale, an instrument designed by Nestle Nutrition Institute specifically for elderly people. Hemoglobin level was assessed using a hemoglobin meter (finger prick method) and functional

ability was assessed using the Lawton instrumental activities of daily living (IADL) scale.

Data collection tool

A data collection proforma consists of IV parts. Part I deals with the sociodemographic factors and behavioural factors. Part II deals with the HB estimation III deals with the Mini nutritional status examination and final part deals function abilities of the elderly using the IADL scale.

The MNA consists of 18 easily measurable items which are classified into four categories anthropometric measurements: (4 questions related to height, weight, and weight loss) dietary questionnaire: (6 questions related to the food and fluid intake, number of meals, food and fluid intake, autonomy feeding), global assessment: (6 questions related to medication, lifestyle, and mobility). Based on the response to each question score was given and the participants were classified as: normal nutritional status when it was >24, at the risk of malnutrition 17-23.5 and malnourished <17.

The Lawton instrumental activities of daily living (IADL) scale was used to assess the functional ability of the elderly which has 8 domains of functions measured (ability to use telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications, ability to handle finances).

Women were evaluated for each of the eight functions, while men have been excluded from housekeeping, food preparation hazards, and laundering and evaluated for the rest of the 5 functions. Based on the sum of scores interpreted as functionally dependent independent status was obtained.

Hemoglobin was monitored using a biosensor Hb check hemoglobinometer and classified based on guidelines for control of iron deficiency anemia- National Iron+ Initiative, Government of India.

Data analysis

Data were entered in a Microsoft Excel sheet and analyzed using the SPSS version. The continuous variables such as age was expressed as mean with standard deviation according to normality assumption. The categorical variables such as nutritional status, functional status, gender, education, occupation, marital status, financial status, behavioral factors, hemoglobin level, the functional ability have been expressed by frequency and percentage. The association between sociodemographic factors and malnutrition was tested by (the chi-square test/Fisher's exact test). All the statistical analyses were carried out at a 5% level of significance and $p < 0.05$ was considered as significant.

RESULTS

Table 1 shows the sociodemographic characteristics of the study participants. Among 250 individuals, the majority were female 140 (56%). The age of the study participants ranged from 60 to 100 years and the mean age was 66.74 ± 6.3 . The majority 192 (76.8%) of the study participants were aged between 60-70 years. Of that 120 (48%) had no formal education and 171 (68.4%) were financially dependent. Most of the participants were Hindu 233 (93.2%) and 59.6% were married, majority of females were homemakers 84 (33.6%), 85 (34%) were employed. For most of the participants, 137 (54.8%) per capita income lies between 2465-4109. The type of stay with spouse and son was 78 (31.2%) and 81 (32.4%).

Table 1: Distribution of the elderly based on their sociodemographic profile (n=250).

Variables	Categories	Frequency N (%)
Age (in years)	60-70	192 (76.8)
	71-80	47 (19.2)
	>80	11 (4)
Mean±SD (age)	66.74±6.3	
Gender	Male	110 (44)
	Female	140 (56)
Religion	Hindu	233 (93.2)
	Christian	13 (5.2)
	Muslim	4 (1.6)
Marital status	Married	149 (59.6)
	Widow	80 (32)
	Widower	18 (7.2)
	Separated/divorced	3 (1.2)
Education	No formal education	120 (48)
	Primary and middle school	71 (28.4)
	Secondary	53 (21.2)
	College	6 (2.4)
Occupation	Homemaker	84 (33.6)
	Retired	22 (8.8)
	Employed	85 (34)
	Unemployed	59 (23.6)
Financially dependent	Yes	171 (68.4)
	No	79 (31.6)
Per capita income/month	8220 and above	35 (14)
	4110-8219	63 (25.2)
	2465-4109	137 (54.8)
	1230-2464	15 (6)
Type of stay	Spouse	78 (31.2)
	Son	81 (32.4)
	Daughter	27 (10.8)
	Relative	2 (0.8)
	Alone	62 (24.8)

Figure 1 shows the behavioral factors of 250 elderly participated in the study. The majority never consumed

alcohol 210 (84%), smoked 220 (88%), or used tobacco 245 (98%) (n=250).

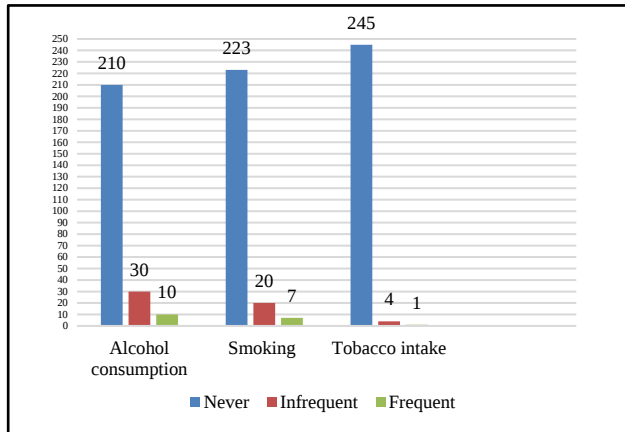


Figure 1: Distribution of elderly based on their behavioural factors.

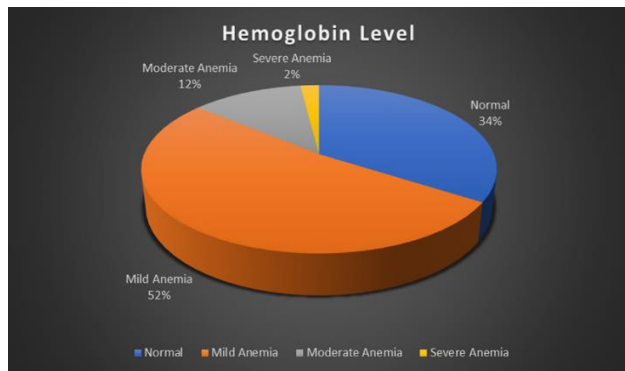


Figure 2: Distribution of the elderly according to their hemoglobin estimate.

Figure 2 shows that among the 250 elderly, half of them had their hemoglobin level in mild anemia status. Only 85 (34%) of them had normal levels of hemoglobin (n=250).

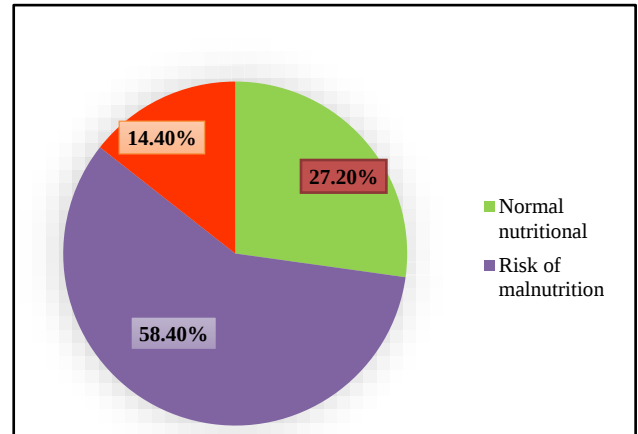


Figure 3: Distribution of the elderly based on their nutritional status.

The pie chart in Figure 3 depicts the nutritional status of 250 elderly population of Ariyankuppam PHC. Only 68 (27.2%) of the 250 elderly had normal nutritional status. The majority 146 (58.4%) are at risk for malnutrition and 36 (14.4%) are having malnutrition (n=250).

Table 2 shows a highly significant association between the nutritional status of the elderly with their education, occupation, monthly per capita income, type of stay, functional status, and BMI at $p < 0.001$. Gender had a significant association at $p < 0.01$ while religion and hemoglobin level showed a significant association at $p < 0.05$.

Table 2: Association between socio-demographic, behavioral, and hemoglobin factors with nutritional status of the elderly residing in selected urban areas of Puducherry.

Variables	Categories	Nutritional status			Total	P value
		Normal	At risk	Malnutrition		
Age in years	60-70	55 (28.6)	110 (57.3)	27 (14.1)	192	0.863
	71-80	11 (23.4)	28 (59.6)	8 (17.0)	47	
	>80	2 (18.2)	8 (72.7)	1 (9.1)	11	
Gender	Male	42 (38.2)	57 (51.8)	11 (10.0)	110	0.002**
	Female	26 (18.6)	89 (63.6)	25 (17.9)	140	
Marital status	Married	51 (34.2)	79 (53.0)	19 (12.8)	149	0.063
	Widow	13 (16.3)	53 (66.3)	14 (17.5)	80	
	Widower	4 (22.2)	12 (66.7)	2 (11.1)	18	
	Separated/divorced	0 (0.0)	2 (66.7)	1 (33.3)	3	
Religion	Hindu	64 (27.5)	137 (58.8)	32 (13.7)	233	0.029*
	Christian	1 (7.7)	9 (69.2)	3 (23.1)	13	
	Muslim	3 (75.0)	0 (0.0)	1 (25.0)	4	
Education	No formal education	18 (15.0)	81 (67.5)	21 (17.5)	120	0.000***
	Primary and middle school	15 (21.1)	45 (63.4)	11 (15.5)	71	
	Secondary	29 (54.7)	20 (37.7)	4 (7.5)	53	
	College	6 (100)	0 (0.0)	0 (0.0)	6	

Continued.

Variables	Categories	Nutritional status			Total	P value
		Normal	At risk	Malnutrition		
Occupation	Homemaker	16 (19.0)	52 (61.9)	16 (19.0)	84	0.000***
	Retired	16 (72.7)	5 (22.7)	1 (4.5)	22	
	Employed	25 (29.4)	51 (60.0)	9 (10.6)	85	
	Unemployed	11(18.6)	38 (64.4)	10 (16.9)	59	
Financially dependent	Yes	44 (25.7)	105 (61.4)	22 (12.9)	171	0.341
	No	24 (30.4)	41 (51.9)	14 (17.7)	79	
Per capita income/month	8220 and above	25 (71.4)	6(17.1)	4 (11.4)	35	0.000***
	4110-8219	13 (20.6)	47 (74.6)	3 (4.8)	63	
	2465-4109	29 (21.2)	85 (62.0)	23 (16.8)	137	
	1230-2464	1(6.7)	8 (53.3)	6 (40.0)	15	
Type of stay	Spouse	34 (43.6)	34 (43.6)	10 (12.8)	78	0.000***
	Son	16 (19.8)	56 (69.1)	9 (11.1)	81	
	Daughter	1 (3.7)	21 (77.8)	5 (18.5)	27	
	Relative	0 (0.0)	1 (50.0)	1 (50.0)	2	
	Alone	17 (27.4)	34 (54.8)	11 (17.7)	62	
Alcohol consumption	Never	52 (24.8)	128 (61.0)	30 (14.3)	210	0.264
	Infrequent	12 (40.0)	14 (46.7)	4 (13.3)	30	
	Frequent	4(40.0)	4(40.0)	2(20.0)	10	
Smoking	Never	61 (27.4)	132 (59.2)	30 (13.5)	223	0.662
	Infrequent	5 (25.0)	10 (50.0)	5 (25.0)	20	
	Frequent	2 (28.6)	4 (57.1)	1 (14.3)	7	
Tobacco	Never	66 (26.9)	144 (58.8)	35 (14.3)	245	0.497
	Infrequent	1 (25.0)	2 (50.0)	1 (25.0)	4	
	Frequent	1 (100.0)	0 (0.0)	0 (0.0)	1	
Hemoglobin	Normal	28 (32.9)	48 (56.5)	9 (10.6)	85	0.045*
	Mild	37 (28.5)	76 (58.5)	17 (13.1)	130	
	Moderate	3 (10.0)	19 (63.3)	8 (26.7)	30	
	Severe	0 (0)	3 (60.0)	2 (40.0)	5	
BMI	Underweight	0 (0.0)	11 (55.0)	9 (45.0)	20	0.000***
	Normal	3 (4.0)	55 (73.3)	17 (22.7)	75	
	Overweight	15 (29.4)	31 (60.8)	5 (9.8)	51	
	Obese	50 (48.1)	49 (47.1)	5 (4.8)	104	
IADL	Independent	64	128	22	214	0.000***
	Dependent	4	18	14	36	

*p<0.05; **p<0.005; ***p<0.0005.

DISCUSSION

The current study in urban Puducherry showed that about 14.4% of the elderly were malnourished and about 58.4% of the elderly were at risk of malnutrition. These findings were almost similar to a study conducted in Assam where 15% of the elderly are malnourished and 55% are at risk of malnutrition.¹⁷ Another study in Tamil Nadu found 14% of the elderly to be malnourished and 49% to be at risk of malnutrition.⁷

However, our findings were lower than the study conducted in Coimbatore by Mathew et al where 19.7% are malnourished and 47% are at risk of malnutrition.¹⁶ A study conducted in West Bengal where 29.4% malnutrition and 60.4% risk of malnutrition.¹⁸

Whereas in few other studies namely Nepal, Rajasthan, and Srilanka showed a lesser percentage of elderly

(11.6%, 7.3% and 12.5%) being malnourished compared to the present study.¹⁹⁻²¹

This difference in the prevalence of malnutrition among the elderly population could be because of the study setting and population size, sociodemographic factors, and cultural habits. However, in the present study, in almost all studies elderly who are at risk of malnutrition are more than those with malnourishment.

This study's findings were comparable to other studies conducted in rural Puducherry where 17.9% were malnourished and 58.8% were at risk of malnutrition.²² Where the prevalence of malnutrition was higher in rural but the risk of malnutrition is similar in both areas. Another study conducted in rural Puducherry found 24.8% of the elderly to be malnourished.

A study conducted in Rajasthan revealed that rural

elderly were more malnourished (52.21%) and at risk of malnutrition (25.41%) than urban elderly (40% and 3.49% respectively).²³ Similar results are also present in a study in Nepal, Belagavi, Karnataka, and Southwest Ethiopia.²⁴⁻²⁷ This major difference in nutritional status between urban and rural may be because of a lack of knowledge and awareness about nutritious foods, healthy lifestyles, sociocultural factors, economic level, purchasing power, available resources, and less access to a wide variety of foods.

In our study, a statistically significant association was found between gender, religion, education, occupation, per capita income, and type of stay. These findings were also observed in various studies conducted across the different states Nepal, East of Iran, Manipur.^{24,28,29} prevalence of malnutrition was higher among elderly females as compared with males this could be because of economic dependence and the role of women in the family, as they are always concerned about the health of the family members but not the health of themselves as this is common in our traditions. Moreover, education, occupation, and income are interrelated with each other which is also directly proportional to the nutritional status of the elderly. The type of stay was associated with the nutritional status of the elderly. The prevalence of living alone was having higher rates of malnutrition. This may be due to practical difficulties, and physiological changes that make it difficult to take care of oneself and influence choices of foods and eating patterns.

Among the underweight 45% were malnutrition and 55% were at risk of malnutrition, and 0% were normal nutrition. Compared to other classifications of BMI (normal BMI 22.7%, overweight 9.8%, obese 4.8% were malnourished) where underweight had more chance of being malnourished. Similar findings observed in Kerala, Rajasthan and Srilanka.^{21,23,30}

The Hb level and lymphocyte count are suitable indicators of malnutrition. In this study, a significant association of the nutritional status of the elderly with their Hb level was observed which has been interpreted as non-anemic (10.6%), mild anemia (13.1%), moderate anemia (26.7%), and severe anemia (40%). None of the elderly with normal nutritional status had severe anemia. Similar findings were also found in studies conducted at Birjand, East of Iran.²⁸

A significant association was found between IADL and the nutritional status of the elderly. It was seen that irrespective of nutritional status, 214 (86%) elderly were independent, and only 36 were functionally dependent. The prevalence of malnutrition was high in functionally independent elderly. Similar findings were observed in studies conducted in Assam, and Brazil.^{17,31}

The current study has certain strengths such as it was a community-based study that has provided a better understanding of the nutritional status and related factors of the elderly. The study findings can be a baseline for

formulating studies with nutritional intervention for the elderly. The usage of standardized questionnaires has provided valid results that corroborate numerous research.

This study also has certain implications that insist on mainstreaming geriatric care clinics from the primary level to the tertiary level and framing specific nutritional schemes and interventions to improve the nutritional status and prevent of risk of malnutrition among the elderly.

There are some limitations of the study. Since it's a cross-sectional study; establishing a cause-and-effect relationship was not possible, only the prevalence of malnutrition could be identified. It was not possible to look into co-morbidities that might affect the nutritional status of the elderly. The study cannot be generalized as it covered only a sample of individuals from one single community in urban Puducherry. Data collection was dependent on the response of the person to questionnaires this may also lead to both under-reporting and over-reporting of responses.

CONCLUSION

The elderly who are at risk of malnutrition are more than those who are malnourished. Malnourishment and associated morbidities can be easily prevented by early assessment, diagnosis, and timely intervention. MNA tool is a highly reliable tool and can be easily administered on a routine basis in OPD of tertiary hospitals as well as in PHC. The government is yet to focus on elderly nutrition, therefore the role of the health professional in the early detection and correction of nutritional deficits cannot be ignored.

Recommendations

A multi-centric study can be conducted and the nutritional status of the elderly with specific morbidities and co-morbidities can be carried out. In this study Hb alone was measured, a study can be conducted for other key micro-nutrients.

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