Interrelationship Between the Nutritional Status and Functional Abilities of Elderly Living in Old Age Homes of Coimbatore

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Abstract

Malnutrition in the elderly is a public health concern in developing countries as nutrition plays a vital role in maintaining optimal health. Inadequate food intake in old age may lead to malnutrition, reduced work capacity, and poor mental and physical health. Therefore, the present study was carried out to assess the nutritional and functional abilities of the elderly and assess the interrelationship between the nutritional status and functional abilities of the elderly.

Objectives

Assess the interrelationship between the nutritional status and functional abilities of elderly living in old age homes from selected old age homes of Coimbatore.

Methods

The present study was a cross-sectional survey. Purposive sampling techniques were implemented during the selection of the elderly. Socio-demographic data and morbidity profiles of the elderly were collected using a pre-designed questionnaire, and generally used indicators such as BMI and MUAC to estimate the participants' nutritional well-being. Additionally, the Katz Index was employed to assess the functional ability of the elderly. The data were analysed using Chi-square tests of correlation.

Results

The study includes 100 elderly, among 100 elderly most (63%) of the elderly were women and 37% were men. 57% of the elderly aged 60-65 years were in the normal BMI category compared to 47% of the elderly in 66-70 years and 41% of the elderly in 71-75 years age group. The findings of the study reveal that there is a statistically significant association between age groups and BMI categories ($p < 0.001$) and there is a statistically significant association between BMI category and the level of functional impairment ($p < 0.01$). The correlation coefficient of -0.367 indicates a moderate negative relationship, as age increases, BMI tends to decrease. The correlation coefficient of -0.318 shows a moderate negative correlation, suggesting that MUAC tends to decline with increasing age.

Introduction

The aging population increasing significantly faster than other age groups worldwide, in 2022 the aged population accounting for 14% of the total population is projected to rise 26% in 2050 (ESCAP, 2022). At present 138 million elderly people living in India, which is expected to increase to 194 million (41%) by 2031(Ministry of Statistics and Programme,2022). Obesity and undernutrition adversely affect the muscle mass of the elderly (Sousa-Santos et al, 2020) Chronic and degenerative diseases are positively associated with progressive aging and frequently correlated with malnutrition (Volkert et al,

2018)Elderly are a high-risk group for malnutrition due to a wide range of changes in physical, mental and social characteristics, are suggested for systematic screening measures as per standard clinical guidelines, followed by a nutritional assessment to develop a personalized support plan for the elderly with positive results in the screening test (Benito et al,2022 Dent et al 2019).

Reduced intake due to various non-communicable diseases such as cancer, neurodegenerative diseases such as Parkinson's, depression, dementia, and changes in sensory functions are highly associated with the onset of malnutrition in old age. The dependency status to do their daily tasks is also one of the contributing factors to malnutrition (Díaz et al,2020, Lázaro et al, 2019). Potentially modifiable risk factors for malnutrition in older people are notably, low physical function, including activities of daily living, strength, or performance (Dent et al, 2023).

The undernourishment in community-dwelling elderly or in nursing home elderly act as a risk factor in developing nutrition-related complications, increasing dependency to live their life (Mastronuzzi et al, 2015, Agarwalla, et al, 2015). Global risk factors causing malnutrition in the elderly are Gender, marital status, education, expenditure of the family (Ferdous et al,2009, Wong et al, 2019), and food behavior (Agarwalla et al, 2015, Sutradhar et al,2019) Elderly living in old age homes and in community differ in their body composition, nutritional status, functional disabilities, mental disabilities and predisposition to malnutrition (Kiesswetter et al, 2020, Saghafi-Asl, 2017). BMI is commonly utilized as a physical measurement indicator of body constitution and a measure to assess nutritional well-being (Holmes, 2021).

Assessment of nutritional status in the elderly includes body mass index and mid-upper arm circumference (MUAC) as an indicator (Selvaraj et al., 2016). Both nutrition and physical activity have a positive impact on improving functional abilities and preventing sarcopenia in the elderly (Papadopoulou, 2020, Franzke, 2018, Bosaeus, 2016). Various studies on the functional abilities of the elderly indicate an association between ADL limitations and malnutrition (Song et al., 2021; Alam et al., 2020; Bakhtiari et al., 2020) As activities of daily living involve work like eating and movements, disabilities in this areas can impact in inadequate food intake and finally lead to malnutrition (Alam et al., 2020). ADL limitations have been associated with malnutrition in multiple studies (Song et al., 2021; Alam et al., 2020; Bakhtiari et al., 2020) and found a high correlation between high risk of malnutrition, high physical disabilities, and co-morbidity.

"As age increases, functional decline also tends to increase, impacting physical, cognitive, and physiological systems, as highlighted by Vaish et al. (2020)Malnutrition among elderly living in old age homes are common public health problem. Thus poor nutritional status reduces the functional capacity in old age and can increase the risk of morbidity and mortality.

The present study aims to assess the nutritional status and functional capacities of the elderly living in old age homes.

OBJECTIVES

1. Assess the socio-economic status of elderly living in old age home
2. Assess the nutritional status and functional abilities of the elderly living in old age home
3. Assess the interrelationship between the nutritional status and functional abilities of the elderly living in an old age home

Methodology

The study is a cross-sectional survey design. The study aimed to examine the nutritional status, functional abilities, and association of malnourishment and functional capacities of elderly ≥ 60 years old living in old age homes in Coimbatore city. Three old age homes were selected randomly from the seventeen registered old age homes in Coimbatore which shelter both men and women. Purposive sampling techniques were implemented during the selection of the elderly. The total population of aged people living in the selected old age homes was 225, out of which 100 were randomly chosen following the inclusion and exclusion guidelines.

Inclusion Criteria

"Elderly individuals aged 60 years and above who expressed interest in participating were included in the current research."

Exclusion Criteria

Elderly with severe morbidity, any neurodegenerative disease, unwilling to participate in the study

Data Collection Tools

The tools used to collect data include a pre-designed structured interview schedule consisting of socio-demographic information and anthropometric measurements (age, gender, religion, educational level, economic status, height, weight, upper arm circumference, and BMI); these variables were considered based on previous studies (Mabiama et al., 2021, Wei et al., 2019). Additionally, the KATZ standardized scale for assessing activities of daily living (ADL) was used. Instruments such as a weighing machine, and flexible, non-stretchable tape were used to measure anthropometric measurements.

Anthropometry

Weight measurements of the elderly were taken using a digital scale, rounded to the nearest 0.1 kg. "The height of elderly individuals was measured while they were barefoot and wearing minimal clothing to ensure accuracy."Height measurements of participants were taken with a stadiometer. The Elderly stood with their shoulder blades, buttocks, and heels against a wall, maintaining a natural, non-stretched neck position. The circumference of the mid-upper arm (MUAC) was assessed with a non-stretchable tape, precise to 0.1 cm. The nutritional status of the elderly was assessed by BMI and MUAC. Body mass index was computed, based on the BMI obtained from anthropometric assessment. Nutritional status was rated as normal for BMI values between 18.5 and 24.9 kg/m².and obese (≥ 30 kg/m²). BMI and MUAC are utilized to evaluate nutritional status based on WHO standards.

Functional abilities

The Katz Index evaluates six essential activities: bathing, dressing, toileting, transferring, continence, and feeding. Individuals receive a score of 1 for each activity they can perform independently and 0 if they require assistance. This tool is commonly applied to gauge the functional capabilities of older adults in both healthcare and home environments (Wallace & Shelkey, 2007

Results and Discussion

Table 1 presents the Socioeconomic status of the Elderly

Table: 1 . Socio-economic status of the Elderly (N= 100)

Characteristics	Number (N = 100)	Percentage (%)
Age		
60 - 65 years	37	37.0
66 - 71 years	36	36.0
72 -75years	27	27.0
Sex		
Men	37	37.0
Women	63	63.0
Education		
Illiterate	17	17.0
Primary	55	55.0
Matric	19	19.0
Higher Secondary	7	7.0
Graduate	2	2.0
Married position		
Married	72	72.0
Unmarried	13	13.0
Divorced	3	3.0
Widow	10	10.0
Widower	2	2.0
Economic status		
Dependents	100	100.0

The socio-demographic details include the age, gender, education, and marital status, of the selected elderly living in the old age home of Coimbatore. Table 1 shows the socio-demographic Characteristics of the elderly respondents. The study includes 100 elderly, among 100 elderly most (63%) of the elderly were women and 37% were men. Regarding the age it ranges from 60 years to 75 years. The majority of the population fell in the age range 60-65 years (37%) and 71-75 years with 27%.

From the data it was observed that a majority (55%) of the elderly had primary education, 17% were illiterate, 19% completed metric, and only 2% had graduation. It was observed that out of 100 elderly 72% were married, 13% were unmarried, 10% were widows and 2 % were widowers. Among the selected elderly 6.16% were widows. All the elderly were dependent for their financial needs.

Table 2 represents the distribution of anthropometric Measurements of Elderly

Table 2 Distribution of Anthropometric Measurement of Elderly

(N= 100)

	Minimum	Maximum	Mean	S.D
Ht	140.00	166.00	155	5.61
Wt	39.00	75.00	54	8.15
MUAC	16.00	32.00	21	3.30
Waist	61.00	105.00	81	10.44
Hip	69.00	115.70	91	10.04
WHR	0.81	0.95	0.88	0.032
BMI	16.50	29.70	22	3.36

The mean height of the elderly was 155±5.61 and weight was 55±8.1. Mean BMI was 22.6±3.36 and MUAC was 22±3.30. The mean waist circumference was 82±10 and the Waist hip ratio was 0.88.

The data regarding BMI as per age is given in Table 3

Table 3 Percentage Distribution of respondents as per age and BMI (WHO classification)

(N= 100)

	BMI						**total**	
	Underweight 16.6-18.5 kg/m^2		**Normal >18.5 - 24.9 kg/m^2**		**Overweight 25 -29.9 kg/m^2**		**No.**	**%**
	No.	%	No.	%	No.	%		
60-65 years	-	-	21	57	16	43	37	100.0
66-70 years	14	39	17	47	5	14	36	100.0
71-75 years	11	41	11	41	5	18	27	100.0
total	25	25	49	49.0	26	26.0	100	100.0

Chi-Square Test

	Value	**df**	**Sig.**
Chi-Square	22.401	4	**

**Significant at 1%level.

Table 3 data reveals that 57% of elderly belongs to 60-65 years were in the normal BMI category compared to 47% elderly in 66-70 years and 41% elderly in 71-75 years age group . This data indicates that as age increases BMI decreases . Under weight category includes 41 percent and 39 percent elderly in 71-75 years and 66-70 years elderly respectively. This again stress that as age increases the weight of the elderly decreases due to low intake of food and other age related factors . The chi -square test shows a stronger association between age and BMI categories, that there is a statistically significant association between age groups and BMI categories ($p < 0.001$).

Functional status of elderly is depicted in figure I

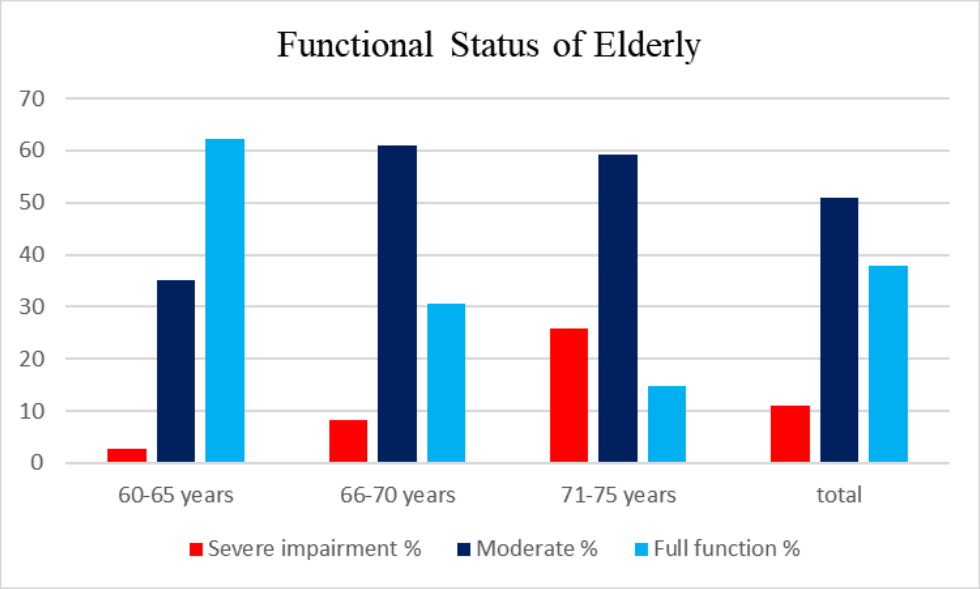

Figure I - Prevalence of Functional status of elderly

From the figure it was observed that 71-75 years showed higher rates of severe impairment compared to younger groups (60-65 years and 66-70 years). The majority (62%) of the elderly showed full function in the younger age groups compared to 71-75 years group (15%). These data assures that as aging advances the functional capacity also decreases.

Chi-Square test

	Value	df	Sig.
Chi-Square	20.955	4	**

The present study indicates that there is a significant association between age and Katz score categories. This suggests that levels of impairment vary across age groups.

Table 4 presents data regarding the distribution of Katz scores according to BMI

Table 4. Distribution of Katz scores of Elderly According to BMI

		Katz score						Total	
		Severe Impairment (0 - 2)		Moderate (3 -5)		Full function(6)		No.	%
		No	%	No.	%	No.	%		
BMI	Underweight 16.6-18.5 kg/m^2	5	20	19	76	1	4	25	100.0
	Normal >18.5 - 24.9 kg/m^2	3	6	22	45	24	49	49	100.0
	Over weight 25 -29.9 kg/m^2	3	11	10	39	13	50	26	100.0
Total		11	11.0	51	51.0	38	38.0	100	100.0

Chi-Square Test

	Value	df	Sig.

Chi-Square	17.275	4	**

Table 4 presents the distribution of Katz scores across three BMI categories underweight, normal and overweight. The Katz scores distribution is severe impairment, moderate and full function. Moderate impairment shows some difficulty in doing activities. A large proportion (76%) of elderly had moderate impairment, and only 4% is fully functional. A significant percentage (49%) of elderly in the normal BMI category has full function. The rest (45%) had moderate impairment. These data may indicate that elderly with a normal BMI are more likely to maintain functional independence compared to those in other BMI categories. While 50% of overweight elderly are fully functional, a notable portion (38.5%) had moderate impairment. This suggests that overweight individuals can still be largely functional but may experience some limitations while performing day today activities. The chi-square test is significant (**p < 0.01**), there is a statistically significant association between BMI category and the level of functional impairment (Katz score).

Table 5 presents the data on nutritional status of elderly as per age

Table 5. Distribution of elderly as per nutritional status

	MUAC				**Total**	
	Under Nutrition		**Normal**		**No.**	**%**
	No.	**%**	**No.**	**%**		
60-65 years	7	19	30	81	37	100.0
66-70 years	19	53	17	47	36	100.0
71-75 years	16	59	11	41	27	100.0
Total	42	42.0	58	58.0	100	100.0

Chi-Square Test

	Value	**df**	**Sig.**
Chi-Square	13.110	2	**

Table 5 provides information about nutritional status (specifically under-nutrition and normal nutrition) across three age groups (60-65, 66-70, and 71-75 years). In the 60-65 years group, 19% were undernourished, and 81% were in the normal nutritional status. The 60-65-year-old group has the lowest percentage of undernourishment, indicating that the elderly at this age tend to maintain a better nutritional status than older groups. The elderly belonging to 71-75 age group have the highest rate of undernutrition, with nearly 60% of individuals being undernourished. This suggests a continued increase in undernutrition prevalence as age advances, possibly due to factors like reduced food intake, health complications, or metabolic changes. The Chi-Square test was done to check if there is a statistically significant association between age group and nutritional status. The calculated p-value is 0. 0014.Since this p-value < 0.001. The significance level of 0.05, it is concluded that there is a statistically significant association between age group and nutritional status. This shows that nutritional Data regarding functional independence across MUAC is presented in Table 6

Table 6. Distribution of Katz scores - functional independence across MUAC

		Katz score						Total	
		Severe Impairment (0 - 2)		Moderate (3 -5)		Full function(6)		No.	%
		No.	%	No.	%	No.	%		
MUAC	Under Nutrition	7	16.7	27	64.3	8	19.0	42	100.0
	Normal	4	6.9	24	41.4	30	51.7	58	100.0
Total		11	11.0	51	51.0	38	38.0	100	100.0

Chi-Square Test

	Value	df	Sig.
Chi-Square	54.425	2	**

Data presented in Table 6 reveals the distribution of Katz scores (functional independence) across two categories of MUAC (Mid-Upper Arm Circumference), which serves as a measure of nutritional status. A significant proportion (64.3%) of elderly with undernutrition have moderate impairment on the Katz score. Only 19% are fully functional, and 16.7% have severe impairment. From the findings, it can be observed that the elderly with lower MUAC experience a higher level of functional impairment. A major proportion (51.7%) of elderly with normal MUAC had full function and were more independent in their daily activities. Additionally, 41.4% had moderate impairment. This indicates that normal nutritional status is associated with better functional independence.

Since the p-value is less than 0.01, it is concluded that MUAC category and functional impairment are significantly related. The findings show that an elderly nutritional status, as measured by MUAC, is significantly associated with their level of functional impairment.

Table 7 Correlation of Age, Nutritional Status, and Functional Independence in Elderly

		BMI	MUAC	Katz score
Age	Correlation	-.367**	-.318**	-.542**

**. Correlation is significant at the 0.01 level.

The correlation coefficient of -0.367 indicates a moderate negative relationship, as age increases, BMI tends to decrease. The correlation coefficient of **-0.318** shows a moderate negative correlation, suggesting that MUAC tends to decline with increasing age. The correlation of **-0.542** is a strong negative correlation, indicating that as age increases, Katz's score decreases, reflecting higher levels of functional impairment with age.

Table 8 Correlations of Katz score, BMI, and MUAC of Elderly

		Katz score
BMI	Correlation	.373**
MUAC	Correlation	.368**

The data presented in Table 8 indicates the correlation of Katz score ,BMI and MUAC of elderly. This positive correlation suggests that as BMI increases, the Katz score tends to be higher. A higher Katz score typically reflects greater independence in daily living activities of the elderly, so elderly with a higher BMI may have better functional capability or physical strength. This positive correlation indicates that higher MUAC values are associated with higher Katz scores. Since MUAC is a nutritional indicator, a greater MUAC may correspond to better muscle mass or nutritional status, which in turn is linked to greater functional independence. These correlations indicate that both BMI and MUAC are positively associated with functional independence (measured by the Katz score) among the elderly.

Conclusion

The study's findings emphasize the importance of good nutrition for maintaining functional independence and highlight that individuals with undernutrition are at a higher risk of functional impairment. Targeting nutritional improvements could be an effective strategy to support independent living for those at risk. In the present study, age is negatively correlated with BMI, MUAC, and Katz score. This suggests that as people age, they tend to have lower BMI and MUAC and may face greater difficulties in daily living. Results of the study state that Katz's score is positively correlated with BMI and MUAC, indicating that better nutritional and physical health (higher BMI and MUAC) is associated with better functionality and independence. The study pointed out that the relationship where nutritional status and physical health significantly impacts functional independence, particularly as age increases. Thus interventions focused on maintaining or improving nutritional health to support independence in the elderly are essential.

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