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Prevalence of Malnutrition among Elderly in Rural Field Practice area of Chengalpattu Medical College

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ABSTRACT

Background: People of elderly age group were more vulnerable in terms of health compared to younger age group and nutrition plays an important role in determination of health. Malnutrition including both undernutrition and obesity has major impact on health status of elderly population. Hence measures to prevent malnutrition in elderly was of utmost importance in present situation.

Objectives

1. To estimate the prevalence of malnutrition among people of age ≥ 60 years in rural field practice area of Chengalpattu Medical College.
2. To explore the factors contributing to malnutrition among the study population.

Methodology

The study was a community based cross sectional study among 115 study participants in rural field practice area of Chengalpattu Medical College. The study population was arrived by Multistage sampling method and data was collected after obtaining permission from Institutional Ethical Committee and after getting informed consent from study participants. The study was conducted using a pre-tested semi-structured questionnaire which consists of sociodemographic details, personal habits, comorbidities and ailments, general examination, Anthropometry and nutrition assessment using Mini Nutrition Assessment tool. Data collected was entered in MS excel and data analysis done using SPSS version 20. Chisquare test and Pearson correlation was applied to analyze the data and p value <0.05 was taken as significant.

Results

Among the study population 35(30.43%) were males and 80(69.57%) were females. The mean age of entire study population was 68.11±5.561 years. Mean weight of the study participants was 54.65±10.04 kg. About 71(61.74%) participants had comorbidities and 49(42.61%) had addiction habits. The prevalence of malnutrition among the study participants was 12.17% and those at risk of malnutrition was about 49.56% according to Mini Nutrition Assessment and the prevalence of obesity was 6.09%, overweight was 18.26%, normal weight was 61.74% and underweight was 13.91%, based on Body Mass Index in the study area. There was a statistically significant (p-value <0.05) association between malnutrition (based on Mini Nutrition Assessment) in elderly and increasing age; illiteracy; those who were financially dependent population; those with psychological stress; people with reduced food intake and those taking < 3 meals per day. Female gender and presence of comorbidities had statistically significant association (p value <0.05) with obesity based on BMI. There was a Significant positive correlation between anthropometric measurements like weight, BMI, mid arm circumference and calf circumference and MNA scores both short form and full form except for height.

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Conclusion: The prevalence of Malnutrition among elderly in present study was 12.17% and more of concern was those at risk of Malnutrition contributed by 49.56%. Establishing Nutrition Centres for older people especially in rural areas emphasizing on healthy eating and promoting healthy lifestyle would be of immense help to achieve healthy and graceful aging.

INTRODUCTION

A shift in country's population towards older ages, known as "Population aging" was continuing in an unpredictable manner worldwide and the proportion of population aged more than 65 years had already outnumbered the number of children below five years of age. Globally by the year 2050, it was expected that the population more than 65 years (15.9%) would be twice that of children below 5 years(7.1%) of age [1]. In India too, it has been projected that the proportion of individuals ≥ 60 years of age would rise from 10.1% in 2021 to 13.1% in 2031[2]. According to National commission on population data the old age dependency ratio was projected to increase to about 15.7% by 2021 [2].

This increase in elderly population pose challenges in health related services especially growing prevalence of malnutrition among elderly, impairing their immunity and functional ability [3]. Adding to this, malnutrition in elderly tends to increase their morbidity and mortality [4]. Malnutrition results from imbalance in nutrient intake and requirement of the body to ensure growth and maintenance. Malnutrition poses a double burden in that lack of nutrients due to poor appetite, poor dentition, loss of taste and smell results in undernutrition and on the other-hand an excess of nutrients due to restriction of mobility and sedentary lifestyle increases the risk of overweight and obesity [5]. Undernutrition was a preventable and reversible condition in elderly. Globally, the prevalence of undernutrition in older people in community ranges between 1.3% to 47.8%, much higher in low and middle income countries than in high income countries [6]. Vulnerability to malnutrition among older population was influenced by many factors like functional, physiological, cognitive, social and lifestyle changes. Malnutrition, in addition acts as both a cause and effect of various morbidities among elderly, leading to a vicious cycle [7]. Majority of the elderly individuals were living in rural areas [7,8]. Most nutritional intervention programs are directed toward infants, young children, adolescents, and pregnant and lactating mothers. However, nutritional interventions could play a part in the prevention of degenerative conditions of the elderly and an improvement of their quality of life. A timely intervention can stop weight loss in those at risk of malnutrition [9,10].

Hence identifying individuals with malnutrition as well as those at risk of malnutrition is the need of the hour. This study aims to estimate the prevalence of malnutrition and factors associated with it among elderly in rural field practice areas of Chengalpattu Medical College.

OBJECTIVES

1.To estimate the prevalence of malnutrition among people of age ≥ 60 years in rural field practice area of Chengalpattu Medical College.

2.To explore the factors contributing to malnutrition among the study population.

METHODOLOGY

A Community based Cross sectional study was conducted among 115 geriatric population of age ≥ 60 years residing in the rural field practicing area of Chengalpattu Medical College, Chengalpattu, Tamil Nadu during the month of November, 2021 to December, 2021. The sample size was calculated based on the study in rural areas of Trichy district in Tamil Nadu by Reddy et al [11], where the prevalence of malnutrition (including both underweight and obese) among elderly was 47.9%. Using the formula $n = z^2 pq/d^2$, p=47.9%, q=52.1% and d=9.58 (20% relative precision) the sample size was calculated as 104. Allowing 10% of refusals, the minimum sample size was calculated as 114.

Study Sampling Technique: Multi stage sampling method.

Stage 1: Chengalpattu medical college has 3 rural field practice area namely Acharapakkam Block PHC, Manamathi Block PHC and Sadras Block PHC. Among them Acharapakkam block was selected by simple random sampling method.

Stage 2: Acharapakkam block has 4 PHC's attached to it namely Acharapakkam PHC, L- Endathur PHC, Ramapuram PHC and Orathi PHC. Among them, by simple random sampling method Acharapakkam PHC was selected.

Stage 3: Acharapakkam PHC has 9 health subcentres namely Anaikundram, Athivakkam, Baburayampettai, Kattukaranai, Perumperkandigai, Siruperpandi, Thimmapuram, Meliyampakkam and Venkatesapuram. Among this Thimmapuram subcentre was selected by simple random sampling method. Thimmapuram subcentre has 1372 households and a total population of 4725 and among them 644 were ≥ 60 years of age. Dividing the total households of the study area by arrived sample size (1372 / 114) the sampling interval estimated as 12.

The first household to be interviewed was selected by simple random sampling with a unit number less than that of sample interval and using systematic random sampling method further households were selected at an interval of 12. All those individuals in the selected household satisfying inclusion and exclusion criteria's were included in the study until the desired sample size was reached.

Inclusion criteria: Individuals ≥ 60 years of age who were residing in the study area for more than 6 months and gives informed consent for study participation are included in the study.

Exclusion criteria:

Individuals ≥ 60 years who are bedridden and critically ill. 2) households which were locked even after three visits.

STUDY TOOL

The study was conducted using a pre-tested semi-structured questionnaire which consists of the following sections.

Section 1: Sociodemographic profile including Age, Sex, Education, Occupation, Type of family, Living arrangements, Economic status etc.

Section 2: Personal habits including addiction to smoking, alcohol, betelnut chewing etc. Section 3: Comorbidities and Ailments like hearing and vision impairment etc.

Section 4: General examination including measurement of Temperature, Blood pressure and deficiency manifestations.

Section 5: Anthropometry (Height, Weight, Midarm circumference, calf -circumference) and Nutrition assessment using Mini Nutrition Assessment tool and Body Mass Index.

Height was measured with measuring tape to the nearest 0.1 cm and weight measured using manual weighing scale to the nearest 0.1 kg. Body Mass Index was calculated by the formula weight in kilogram/ Height in metre square.

Mid-arm circumference was measured using measuring tape at the level of mid-point between the tip of the shoulder and the tip of the elbow with hands hanging freely in the non- dominant arm to the nearest 0.5cm [12].

Calf circumference was measured at the level of largest circumference of the calf with participant in sitting posture [12].

Mini Nutrition Assessment (MNA) tool was a validated screening tool for rapid assessment of nutritional status among the elderly and it has been validated and translated into several languages in many countries including India [13].

screening and assessment, the screening part has 6 questions related to food intake, mobility, psychological stress, neuropsychological problems and measurement of BMI; the assessment part has 12 questions related to nutrient intake, fluid intake, perception of nutritional status of self-compared to others etc. MNA-SF (Mini Nutrition Assessment -Short Form) takes into account the scores of screening part alone and if the scores point towards malnutrition, needs to complete MNA-full form. The MNA-SF was scored (maximum 14 points) as 0-7 Malnourished, 8-11 At risk of Malnutrition and 12-14 Normal nutrition status. MNA-full form includes all the 18 questions, each question was scored; a score of less than 17 points was malnourished, 17 to 23.5 was at risk of malnutrition and a score between 24 and 30 was of normal nutritional status. In this study, score of MNA-full form was used to categorize the nutrition status of elder people as it provides additional information regarding the factors associated with malnutrition [14].

DATA COLLECTION AND ANALYSIS

The study was conducted after obtaining permission from Institutional Ethical Committee of Chengalpattu Medical College. The data was collected by house to house visit with the help of village health nurse of Thimmapuaram Health Subcentre.COVID19 precautions followed during the interview of entire study period. The purpose of the study was explained to the study participants and after getting informed consent, the pre-validated semi- structured questionnaire was administered by the interviewer and the response of the participants recorded. Data collected was entered in MS excel and data analysis done using SPSS version 20. Chi square test and Pearson correlation was applied to analyze the data and p value <0.05 was taken as significant.

OPERATIONAL DEFINITIONS:

1. Elderly:

According to National policy for older persons adopted by GOI in 1999, Elderly were defined as persons who were of age 60 years and above [15].

2. Ailment-Illness or Injury:

Any deviation from state of physical and mental well-being [15].

3. Economic Independence:

A person is considered Economically independent if he/she does not require to take financial help from others in order to live a normal life [15].

4. Body Mass Index(BMI):

BMI is a statistical index using a person's weight and height to provide an estimate of body fat in males and females of any age. It is calculated by taking a person's weight in kilograms, divided by their height in meters squared, or BMI = weight (in kg)/height^2 (in m^2). The number generated from this equation is then the individual's BMI number. In this study, Asia-Pacific classification of BMI was used as the WHO BMI cutoffs underestimate the obesity risk in the Asian and South Asian populations [16].

Table 1: Asia Pacific classification of Body Mass Index

BMI cutoff	BMI Classification
<18.5 kg/m^2	Underweight
18.5-22.9 kg/m^2	Normal
23-24.9 kg/m^2	Overweight
>25 kg/m^2	Obese

RESULTS

The current study was a community based cross sectional study conducted among 115 individuals of age ≥ 60 years residing in Thimmavaram village of Acharapakkam block PHC (rural field practice area of Chengalpattu Medical College) and the results were discussed under following sub titles.

1.Socio demographic factors of the study participants

2.Addiction, Comorbid status and deficiency manifestation among the study participants

3.Nutrition status of the study participants

4.Outcome of Mini Nutrition Assessment

5.Factors associated with Nutrition status among study participants

6.Correlation between Anthropometric variables and MNA scores-SF (short form) and MNA Full form.

Socio demographic factors of the study participants:

Age, Sex, Religion, Type of family, Living Arrangements of study participants

The age of the study participants ranged between 60 to 89 years. The mean age of the study participants was 68.11±5.561 years and the mean age among males was 67.6 years and among females was 68.33 years.

As shown in table 2, majority, n=50(43.48%) of the study participants were in the age group 65 – 69 years, followed by n=23 (20%) in each of age group 70-74 years and 60-64 years and least n=2(1.74%) in age group 85-89 years.

Among the study participants, nearly two-third, n=80(69.57%) were females and one third n=35(30.43%) were males. As shown in Table 2, most of the study participants belong to Hindu religion n=102(88.69%) and among 115 study participants, nearly two-third n=78(67.83%) live as nuclear families. About a quarter of the study participants n=27(23.48%) lives alone at the time of study.

Education, Occupation, Socioeconomic status and Financial status of study participants

Out of 115 study participants, most of them were illiterates n=72(62.61%), followed by those who had completed primary school education, n=27(23.47%) and the least contributed by graduates, n=1(0.87%) and none were educated upto profession.

As shown in Table 3, majority of the study participants were employed in unskilled type of work n=75(65.22%), 3 (2.61%) were pensioners and about 9 participants (7.83%) were employed in other types of work like cow rearing.

The present study was conducted in rural area and hence modified BG Prasad scale was used for socioeconomic status classification based on updated BG Prasad scale for the year 2021(17). As shown in

About 60(52.17%) out of 115 participants were dependent financially on their children either completely or partially for their livelihood.

Addiction, Comorbid status and deficiency manifestation among the study participants

Among the study participants, 49 persons (42.61%) responded of having addiction habits and among them (n=49) most of the participants have habit of chewing betelnut n=42(85.71%), followed by smoking n=7(14.29%) and alcohol consumption n=7(14.29%).

As shown in Table 4, about 71 participants (61.74%) had associated comorbidities and nearly one-third of them had multiple comorbidities n=22(30.99%). Among those with comorbidities(n=71), majority had Systemic Hypertension, n=58(81.69%), followed by Diabetes Mellitus n=38(53.52%), Chronic Obstructive Pulmonary disease n=6(8.45%) and a least had associated cardiac problems n=5(7.04%).

Out of 115 study participants, 25(21.74%) responded of having hearing impairment and 23(20%) had visual impairment.

Among the study participants, 68 persons (59.13%) had nutrition deficiency manifestations, mostly manifesting as multiple signs and out of the 68, majority 67 persons (98.53%) had pallor, 6 participants (8.80%) had glossitis and angular stomatitis each.

Nutrition status of the study participants

The mean height of the study participants was 158.37± 8.110 cm and the mean weight was 54.65± 10.05 kg.

Body Mass Index

The mean BMI based on the Asia-Pacific classification of Body Mass Index was 21.74±3.306 kg/m^2 and about 16 study participants (13.91%) were underweight (BMI <18.5), 71 participants (61.74%) were of normal weight (BMI 18.5-22.9), 21 participants (18.26%) were overweight (BMI 23-27.5) and about 7 participants (6.09%) were obese (BMI >27.5).

Mini Nutrition Assessment

Mean Mid arm circumference among study participants was 26.60±3.257 cm and the mean Calf circumference 30.50±3.210 cm.

As shown in Table 5, based on Mini Nutrition Assessment short form, about 12 participants (10.43%) were found to be malnourished and 14 participants (12.17%) were found to be malnourished when details regarding dietary patterns and self-perception of nutrition were also included according to MNA full form. Mean score of MNA short form among study participants was 10.56 ± 2.329 and Mean score of MNA full form among study participants was 21.73 ± 3.787.

Outcome of Mini Nutrition Assessment

The outcome of Mini Nutrition Assessment, administered to study participants weregiven in Table 6(Screening) and Table 7 (Assessment). Most of the study participants had no decrease in food intake n=64(55.70%), were mobile n=110(95.70%), with mild dementia n=73(63.50%) and a majority n=36(31.30%) in the BMI range of 21-23.

Among 51 participants (44.30%) who responded of having reduced food intake, majority 37(72.55%) told the reason to be loss of appetite, followed by underlying illness=7(13.73%), chewing and swallowing difficulties n=3(5.88%) and least being stress and not able to afford, n=2(3.92%) contributed by each group.

As shown in Table 7, nearly 1/4th n=29(25.20%) of the study participants takes > 3 prescription drugs per day and a majority n=72(62.60%) takes < 3 meals/day, 112(97.39%) takes less protein and most of the participants n=108(93.90%) were able to self-fed without any problem.

Factors associated with Nutrition status among study participants

Association of sociodemographic factors, addictions, comorbid status and deficiency manifestations with nutrition status according to MNA in elderly

Analysis of factors associated with nutrition status in elderly according to MNA score showed a statistically significant (p value <0.05) difference between socio demographic factors like age (80-84 year); Education(illiterate); those living as three generation or joint family; those who were dependent financially and those manifesting deficiency signs and malnutrition as shown in Table 8.

There was no statistically significant association between gender (chi square value 2.324,df 2,p value 0.313), occupation (chi square value 11.848, df 8, p value 0.158), religion (chi square value 4.752, df 4, p value 0.314), living arrangements (chi square value 8.975, df 8, p value 0.344), socioeconomic status (chi square value 9.614,df 6,p value 0.101), addiction habits (chi square value 3.397,df 2,p value 0.183), presence of comorbidities (chi square value 3.679, df 2, p value 0.159) and status of nutrition according to MNA score.

Association of various parameters in MNA with Nutrition status according to MNA in Elderly

As shown in Table 9, there was a statistically significant difference(p value <0.05) in nutrition status of elderly according to MNA score and reduced food intake (chi square value 16.671, df 2, p value 0.000),presence of psychological stress in past 3 months(chi square value 8.252, df 2, p value 0.016) ,presence of neuropsychiatric manifestations(chi square value 15.668, df 2, p value 0.000), taking < 3 meals per day(chi square value 69.269,df 4, p value 0.000) and < 2 servings of fruits and vegetables per day(chi square value 43.12, df 2, p value 0.000) and those who were self-fed with some difficulty(chi square value 25.012,df 2, p value 0.000) compared to the counterpart.

There was no statistically significant association between nutrition status of elderly population and independent living (chi square value 3.171, df 2, p value 0.205), fluid intake <5 cups per day (chi square value 5.917, df 2, p value 0.052) and taking > 3 prescription drugs per day (chi square value 3.614, df 2, p value 0.164).

Association of socio demographic factors and Nutrition status according to BMI

Prevalence of overweight n=18(22.50%) and obesity n=7(8.75%) were high among females compared to males and the difference observed was found to be statistically significant (chi square value 8.590, df 3, p value 0.035). None other sociodemographic factors like age, education, occupation, religion, type of family, socioeconomic status scale and presence of addiction habits had significant association with overweight and obesity.

Association between Comorbidities and Nutrition status according to BMI

As shown in Table 10, there was an increase in prevalence of comorbidities like Diabetes Mellitus, Systemic Hypertension, Coronary artery disease among those who were overweightand obese compared to those who were of normal weight and this difference observed was found to be statistically significant (p value <0.05).

Correlation between Anthropometric variables and MNA scores-SF (short form) and MNA Full form

Anthropometric variables like height, weight, Body mass index, mid arm circumference and calf circumference were analysed using Pearson correlation to determine the degree of correlation between Anthropometric variables and MNA scores both Short Form and Full form. As shown in table 11, there was a significant positive correlation between weight, BMI, mid arm circumference, calf circumference and MNA-SF and MNA-Full by partial correlation coefficient after controlling for age and sex.

DISCUSSION

In the current study, the prevalence of malnutrition according to Mini Nutrition Assessment full form was 12.17% and that of persons at risk of malnutrition was 49.56%. In a study done by Vidhyalakshmi et al [10] at Tiruvallur district in Tamilnadu, the prevalence of malnutrition was 17.6% and those at risk of malnutrition was 48.7%, the findings were similar to that of the present study. Krishnamoorthy et al [18] in their study had findings of 17.9% of malnutrition which was similar to the current study but those at risk of malnutrition was found to 58.8% which was slightly higher than the present study.In a study done by Sumanta Chakraborty et al [19] in rural areas of Eastern India , the prevalence of malnutrition among elderly was 32.2% which was higher compared to the present study. This difference might be contributed by difference in race, ethnicity and sociodemographic factors among the study participants.

The prevalence of overweight and obesity according to Asian classification of BMI in the current study was 18.26% and 6.09% respectively. In a study done by Goswami et al [5], among resettlement colony in Delhi, the prevalence of overweight and obesity according to BMI was 19.4% and 6.6% respectively and the findings were similar to the present study.

In the present study, the prevalence of Malnutrition was higher among participants of age group 80-85 years and 75-79 years were prone for at risk of malnutrition, ie, as age increases the prevalence of malnutrition also increased. In a study done by Agarwalla et al [9] the prevalence of malnutrition was higher among very old (>85 years) population and the findings were similar to the current study. Govind et al [7] in their study found malnutrition to be higher in oldest old age group (>80 years) which was similar to the present study.

In this current study people, malnutrion as well as the risk of malnutrition was higher among illiterates 18.05% and 55.56% respectively. Konda et al [20] in their study concluded that prevalence of malnutrition was higher in elderly with less education and the findings were similar to the present study. Similar findings were observed in a study conducted by Krishnamoorthy et al [18], where the prevalence of malnutrition was higher in those with no formal education (21.1%) compared to those who had formal education. This might be due to the

Table 2: Age, Sex, Religion, Type of family, Living Arrangements of study participants.

Variable		Frequency(n=115)	Percentage
Age group in years	60-64	23	20%
	65-69	50	**43.48%**
	70-74	23	20%
	75-79	14	12.17%
	80-84	3	2.61%
	85-89	2	1.74%
Sex	Male	35	30.43%
	Female	80	**69.57%**
Religion	Hindu	102	**88.69%**
	Christian	10	8.70%
	Muslim	3	2.61%
Type of family	Joint	1	0.87%
	Nuclear	78	**67.83%**
	Three generation	36	31.30%
Living Arrangement	Lives with Spouse	33	**28.69%**
	Lives with Children	30	26.09%
	Lives with Spouse and children	24	20.87%
	Lives with Relatives	1	0.87%
	Lives Alone	27	23.48%

Table 3: Education, Occupation, Socioeconomic status and Financial status of study participants.

Variable		Frequency(n=115)	Percentage
Education	Illiterate	72	**62.61%**
	Primary school education	27	23.47%
	Middle school education	6	5.22%
	High school education	9	7.83%
	Graduate	1	0.87%
Occupation	Pensioner	3	2.61%
	Unemployed	19	16.51%
	Unskilled	75	**65.22%**
	Semi-skilled	9	7.83%
	Others	9	7.83%
Socio economic status (per capita income in Rs/month)	I (7770 and above)	0	0%
	II (3808-7769)	11	10%
	III (2253-3808)	38	33.04%
	IV (1166-2253)	55	**47.82%**
	V (<1166)	11	10%
Financial status	Independent	55	47.83%
	Dependent	60	**52.17%**

fact that higher education could fetch good job and higher income as well as relatively a good knowledge on nutrition compared to the counterpart.

The prevalence of malnutrition and at risk of malnutrition was higher among elderly who were economically dependent,13.33% and 60% respectively. Agarwalla et al [9] in their study concluded that malnutrition was higher among those who were financially dependent and the findings were similar to the current study. Similar findings were observed by Vaish et al [21] where they found a statistically significant association(p value<0.000) between possible malnutrition and financial dependency among elderly.

In the present study there was no statistically significant association between malnutrition and addiction habits like cigarette smoking and alcohol intake. In a study done by Damayanthi et al [22], there was a significant association between malnutrition and alcohol (p value<0.029) and the findings were contrary to the present study.

Reduced food intake and < 3 meals per day were found to be independent risk factors for malnutrition in the present study. Similar findings were observed in a study conducted by Vedantam et al [23], in rural south India where they found a statistically significant association between malnutrition among elderly and number of meals per day (p value<0.001) and decreased food intake(p value<0.001).

Table 4: Addiction, Comorbid status and deficiency manifestation among the study participants.

Variable		Frequency	Percentage
Addiction (n=115)	present	49	42.61%
	absent	66	**57.39%**
Comorbid status(n=115)	present	71	**61.74%**
	absent	44	38.26%
Comorbidities (n=71)	single	49	**69.01%**
	multiple	22	30.99%
Deficiency manifestations (n=115)	Present	68	**59.13%**
	Absent	47	40.87%

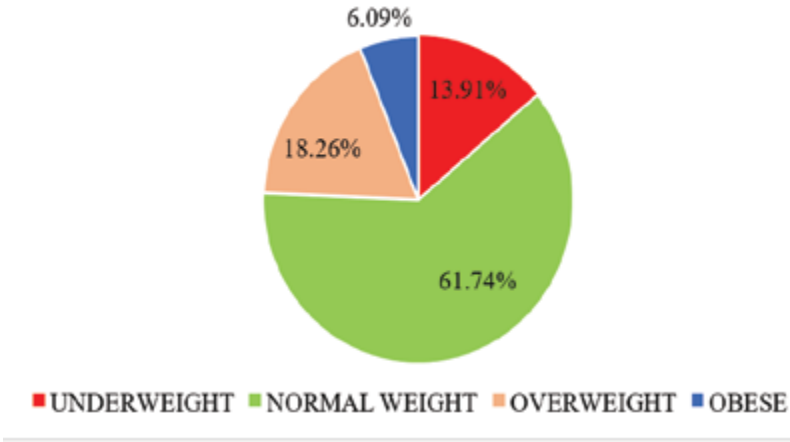

Figure 1: Nutritional status of study participants according to Asia-Pacific classification of BMI.

Table 5: Nutritional status of study participants according to Mini Nutrtion Assessment.

Variables	Frequency (n=115)	Percentage
MNA short form		
Malnourished	12	**10.43%**
At risk of malnutrition	53	46.09%
Well nourished	50	43.48%
MNA full form		
Malnourished	14	**12.17%**
At risk of malnutrition	57	49.56%
Well nourished	44	38.27%

Table 6: Outcome of Mini Nutrition Assessment (screening).

Outcome of Nutritional Assessment		Frequency n=115	Percentage
Decline in food intake	moderate decrease	51	44.30%
	no decrease	64	**55.70%**
Loss of weight	doesnot know	34	29.60%
	weight loss 1-3 kg	12	10.40%
	no weight loss	69	60%
Mobility	able to get out of bed doesn't go out	5	4.30%
	goes out	110	95.70%
Psychological stress in past 3 months	present	14	12.20%
	absent	101	**87.80%**
Neuropsychological problems	mild dementia	73	**63.50%**
	no psychosocial problem	42	36.50%
Body mass index	BMI less than 19	21	18.30%
	BMI 19 to less than 21	30	26.10%
	BMI 21 to less than 23	36	**31.30%**
	BMI 23 or greater	28	24.30%

Table 7: Outcome of Mini Nutrition Assessment (Assessment).

Outcome of Nutritional Assessment		Frequency (n=115)	Percentage
Lives independently	yes	113	98.30%
	no	2	1.70%
Takes >3 prescription drugs per day	yes	29	25.20%
	no	86	74.80%
Pressure ulcer or skin ulcers	present	1	0.90%
	absent	114	99.10%
Number of full meals	1 full meal	3	2.60%
	2 full meal	69	**60%**
	3 full meal	43	37.40%
Protein intake score	0	112	**97.39%**
	0.5	3	2.61%
Two or more servings of fruits or vegetables per day	yes	37	32.20%
	no	78	**67.80%**
fluid consumption per day	3-5 cups	13	11.30%
	> 5 cups	102	**88.70%**
Mode of feeding	self-fed with some difficulty	7	6.10%
	self-fed without any problem	108	**93.90%**
Self-view of Nutritional status	uncertain of nutritional state	40	34.80%
	views self as having no nutritional problem	75	65.20%
nutrition status compared with others	not as good	2	1.74%
	does not know	41	35.65%
	as good	67	58.26%
	better	5	4.35%
Mid Arm Circumference(MAC) in cm	MAC less than 21	2	1.74%
	MAC 21 to 22	4	3.48%
	MAC greater than 22	109	**94.78%**
Calf Circumference (CC) in cm	CC less than 31	61	53%
	CC 31 or greater	54	47%

Table 8: Association of sociodemographic factors and deficiency manifestations with nutrition status according to MNA in elderly.

Variables		Nutrition status according to MNA score			Test,df	p value
		Malnourished	**At risk of malnutrition**	**Normal nutrition status**		
Age group	60-64 years(n=23)	2(8.69%)	11(47.83%)	10(43.48%)	Chi-square value 25.223,10	**0.005***
	65-69 years(n=50)	1(2%)	23(46%)	26(52%)		
	70-74 years(n=23)	6(26.09%)	12(52.17%)	5(21.74%)		
	75-79 years(n=14)	3(21.43%)	**9(64.28%)**	2(14.29%)		
	80-84 years(n=3)	**2(66.67%)**	1(33.33%)	0(0%)		
	85-89 years(n=2)	0(0%)	1(50%)	1(50%)		
Education	Illiterate(n=72)	**13(18.05%)**	**40(55.56%)**	19(26.39%)	Chi-square value16.584,8	**0.035***
	Primary(n=27)	0(0%)	12(44.44%)	15(55.56%)		
	Middle(n=6)	0(0%)	3(50%)	3(50%)		
	High school(n=9)	1(11.11%)	2(22.22%)	6(66.67%)		
	Graduate(n=1)	0(0%)	0(0%)	1(100%)		

Type of family	Joint(n=1)	0(0%)	1(100%)	0(0%)	Chi-square value9.814,4	**0.044***
	Nuclear(n=78)	7(8.97%)	34(43.59%)	37(47.44%)		
	Three generation(n=36)	**7(19.44%)**	**22(61.11%)**	7(19.45%)		
Financial status	Independent(n=55)	6(10.91%)	21(38.18%)	28(50.91%)	Chi-square value7.302,2	**0.026***
	Dependent(n=60)	**8(13.33%)**	**36(60%)**	16(26.67%)		
Deficiency signs	present(n=68)	**11(16.18%)**	**37(54.41%)**	20(29.41%)	Chi-square value6.383,2	**0.041***
	absent(n=47)	3(6.38%)	20(42.55%)	24(51.07%)		

Table 9: Association of various parameters in MNA with Nutrition status according to MNA in Elderly.

Variables		**Nutrition status as per MNA score**			**Test, df**	**p value**
		Malnourished	**At risk of malnutrition**	**Normal nutrition status**		
Food intake	Decreased(n=51)	**9(17.65%)**	**33(64.70%)**	9(17.65%)	Chi-square value16.671, 2	**0.000***
	no decrease(n=64)	5(7.81%)	24(37.5%)	35(54.69%)		
psychological stress in past 3 months	present(n=14)	**4(28.57%)**	**9(64.29%)**	1(7.14%)	Chi-square value8.252,2	**0.016***
	absent(n=101)	10(9.90%)	48(47.52%)	43(42.58%)		
Neuro psychiatric problems	present(n=73)	**11(15.07%)**	**44(60.27%)**	18(24.66%)	Chi-square value15.668, 2	**0.000***
	absent(n=42)	3(7.14%)	13(30.95%)	26(61.91%)		
number of meals per day	1 meal(n=3)	**3(100%)**	0(0%)	0(0%)	Chi-square value69.269, 4	**0.000***
	2 meals(n=69)	11(15.94%)	**48(69.56%)**	10(14.50%)		
	3 meals(n=43)	0(0%)	9(20.93%)	34(79.07%)		
fruits and vegetable intake per day	≥ 2servings(n=37)	0(0%)	7(18.92%)	30(81.08%)	Chi-square value43.12,2	**0.000***
	< 2servings(n=78)	**14(17.95%)**	**50(64.10%)**	14(17.95%)		
Fluid intake	3-5 cups(n=13)	2(15.38%)	10(76.93%)	1(7.69%)	Chi-square value5.917,2	0.052
	> 5 cups(n=102)	12(11.76%)	47(46.08%)	43(42.16%)		
Mode of feeding	Self-fed with some difficulty(n=7)	**5(71.42%)**	2(28.58%)	0(0%)	Chi-square value25.012, 2	**0.000***
	Self-fed without any problem (n=108)	9(8.33%)	55(50.93%)	44(40.74%)		

*statistically significant

Table 10: Association of Comorbidities and nutrition status according to BMI among Elderly.

Comorbidities	Nutrition status according BMI				test, df	p value
	Underweight (BMI<18.5)	Normal weight (BMI18.5-22.9)	Overweight (BMI23- 27.5)	Obese (BMI>27.5)		
Diabetes Mellitus	5(31.25%)	18(52.35%)	9(42.86%)	**6(85.71%)**	Chi-square value11.613,3	**0.009***
Systemic Hypertension	3(18.75%)	33(46.48%)	**17(80.95%)**	5(71.43%)	Chi-square value15.928,3	**0.001***
Coronary Artery Disease	0(0%)	2(2.82%)	1(4.76%)	**2(28.57%)**	Chi-square value11.013,3	**0.012***
Chronic Obstructive Pulmonary Disease	1(6.25%)	3(4.23%)	1(4.76%)	1(14.3%)	Chi-square value1.349,3	0.718

Table 11: Correlation between Anthropometric variables and MNA scores-SF (short form) and MNA Full form.

Anthropometric Variables	MNA-SF Total score (partial correlation coefficient)	p value	MNA-FullTotal score r2 (partial correlation coefficient)	p value
Height	0.14	0.14	0.175	0.064
Weight	0.581	0.000*	0.584	0.000*
BMI	0.646	0.000*	0.632	0.000*
Midarm circumference	0.457	0.000*	0.548	0.000*
Calf circumference	0.427	0.000*	0.548	0.000*

* statistically significant at p value < 0.000

The prevalence of malnutrition and at risk of malnutrition was higher in those with Psychological stress in the current study.

In the present study there was a statistically significant association between comorbidities like Diabetes mellitus, Systemic Hypertension, Coronary artery disease and overweight and obesity. Kritika et al [24] in their study found a higher prevalence of Diabetes (p value 0.010) and Hypertension(p value 0.023) among those who were overweight and obese and the difference was statistically significant and the findings were similar to the present study.

Sukkriang et al [25] in their study found a significant (p value<0.001) positive correlation between body weight, BMI, Mid arm circumference, calf circumference and MNA scores both short form and full . The findings were similar to the current study.

CONCLUSION

The prevalence of malnutrition among elderly in the current study was 12.17% but more of concern was those at risk of malnutrition contributed by 49.56% based on Mini Nutrition Assessment. Nutrition of elderly was often given less importance compared to the pediatric age group, both in most of time dependent on the reproductive age group. Appropriate and timely intervention of those at risk of malnutrition could improve the quality of life of elderly people and could prevent excess burden on community

LIMITATION

The study was conducted in a single health subcentre of rural field practice area of Chengalpattu Medical College. In future, research involving the whole district as well as comparison of prevalence and factors associated, between rural and urban areas would give greater insight about malnutrition in elderly people.

RECOMMENDATIONS

- Caregivers must be educated regarding the right quantity, quality and timing of food intake by the elderly population.
- Screening activities at the base level would help in identifying the malnourished and those at risk of malnutrition at the earliest.
- Both undernutrition and obesity were of concern among elderly and health promoting activities emphasizing on healthy eating like increasing protein and fibre rich diet and reducing fat and sugar and healthy lifestyle like brisk walking daily, regular exercise for 30 minutes ,4-5 times per week, yoga and meditations as recommended by National Programme for Health Care of Elderly would be of immense help to achieve healthy and graceful aging.
- Establishing Nutrition Centres for older people especially in rural areas to meet out their nutritional requirements with supply of small grain millets at a cost affordable by the older population or at free of cost for older people below poverty line, would help those who were not able to afford food.

STATEMENT OF ETHICS

No. IEC-CMC/Approval/19/2021, Institutional Ethics Committee, Chengalpattu Medical College, Chengalpattu.

CONFLICTS OF INTEREST

Nil

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