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Original Research Article

A community based cross-sectional study to assess malnutrition among elderly population residing in urban and rural areas of a district in Karnataka, India

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ABSTRACT

Background: The geriatric age group is the fastest-growing segment of the population in most of the countries. Malnutrition has emerged as an important problem among elderly. Nutritional status of the elderly population is seldom focused upon. This study was conducted to evaluate malnutrition among elderly population and its association with sociodemographic correlates and to compare the nutritional status of elderly living in the urban and rural areas of a district in Karnataka.
Methods: A cross-sectional study was conducted among 102 urban and 102 rural residents of Dharwad district for a period of 4 months using pre-designed and structured questionnaire which include details of sociodemographic data and nutritional status which was assessed using the Mini Nutritional Assessment (MNA) questionnaire.
Results: The prevalence of malnutrition was found to be 18.6 %. Among 204 subjects, 42.6% were well nourished and 38.7% were at risk of malnutrition. Elderly living in rural are more malnourished than urban areas. And 12.7% of elderly living in urban area were obese, whereas only 7.8% of rural elderly were obese. A significant association was found between nutritional status with age, literacy and the socioeconomic status of the elderly.
Conclusions: High prevalence of under-nutrition (at risk of malnutrition and malnutrition) was found in our study. With higher percentages in elderly living in rural area, among illiterates and with low socioeconomic status. This study emphasizes increased need to give attention to the nutritional needs of elderly and also to screen and support elderly with malnutrition.

Keywords: Elderly population, Karnataka, MNA, Nutritional status, Urban and rural area

INTRODUCTION

Ageing is an irreversible biological phenomenon which starts at conception and ends after death. Ageing involves physical changes like metabolic, hepatic, gastrointestinal, renal, skeletal, neurological, immunological as well as physiological changes.[1] In January 1999, Government of India adopted 'National Policy on Older Persons' which defines 'senior citizen' or 'elderly' as a person who is of age 60 years or above.[2]

Between 2000 and 2050, the proportion of the world's population more than 60 years will be doubled from about 11% to 22% and is expected to increase from 605 million to 2 billion over the same period.[3] According to the 2011 census, the population of elderly is 8.6% and

7.7% of the total population in India and in Karnataka respectively.[4]

Nutrition is a key component in maintaining good health, mobility and quality of life of the elderly individuals. Early detection of nutritional deficiency or abnormality is important for avoiding chronic conditions or diseases.[5]

Malnutrition is a broad term commonly used as an alternative to undernutrition but technically it also refers to overnutrition.[6] Elderly people are more commonly vulnerable to malnutrition which includes physiological and functional changes that occur with age, lack of financial support and inadequate access to food.[7]

The nutrition and health of the elderly are often neglected. The magnitude of malnutrition among elderly in India is under reported. The few studies that have been done showed that more than 50% of the older population are underweight and more than 90% has an energy intake below the recommended allowance.[8]

Constant monitoring of the nutrition of older people is important in order to maintain good nutritional status and prevent the development of malnutrition.[9]

Unfortunately, not much explanation has been given for the precise estimate of under-nutrition among elderly in research. An evaluation of nutritional status is important to create the database to assist with the initiation of important programs and formulation of policies.[7]

To determine the nutritional status of elderly, the Mini-Nutritional Assessment (MNA) is one of the most recognized screening instruments and is used all around the world.[10] Since its first publication in 1996, MNA has been validated with high sensitivity, specificity and reliability. It is an easy way to detect malnourished people or those at risk of malnutrition.[10,11] The MNA has also been used successfully in follow-up evaluation of outcome, nutritional intervention, nutritional education programs, and physical intervention programs in elderly persons.[12] However, comparative data on the nutritional status of urban and rural elderly are limited. The objectives of the study were to assess malnutrition among elderly and its association with sociodemographic correlates and to compare the nutritional status of elderly staying in urban and rural areas of Dharwad district in Karnataka, India.

METHODS

***Study design**:* Community based cross-sectional study.

Study area: Four wards in Hubli city and four villages (Mishrikoti, Ugginakeri, Hullikatti in Kalaghatgi Taluk and Noolvi village in Hubli Taluk)of Dharwad district were randomly selected.

Study sample: Persons aged 60 years and above

***Study period**:* December 2014 to March 2015.

Inclusion criteria: Subjects with 60 years of age and above and permanent resident in that area and who gave consent for the study.

Exclusion criteria: Subjects who were critically ill for example cancer, end-stage renal disease or receiving artificial enteral or parenteral nutrition.

Sample size: Sample size(N) was calculated using the formula, $N=(Z)^2 pq/d^2$

Where, Z -statistic value for a level of Confidence ,at 95% Confidence level Z value is 1.96

p= 14% =0.14 [Prevalence of malnutrition in similar study[13] was 14%.]

q = 1-p = 0.86, d = absolute precision = 5%

$N = (1.96)^2 x0.14x0.86/ (0.05)^2 = 185.$

Assuming 10% non-response rate, the final sample size was calculated as 204. Hence 102 elderly from rural and 102 elderly from urban areas were taken by purposive sampling.

***Method of data collection**:* The data was collected from house to house visit. After taking informed oral consent, data was noted down by face to face interview using a pre-designed and well-structured questionnaire which included details of sociodemographic data and MNA questionnaire.

***Anthropometric measurements**:* The subjects were weighed with a standardized weighing machine to the nearest 0.1 kg and their standing height, mid arm (MAC) and calf circumferences (CCs) were measured to the nearest 0.1 cm by using a measuring tape.

Nutritional status assessment: was done by calculating 1) BMI. It is classified in to underweight (<18.5%), normal weight (18.5-24.9), overweight(25-29.9) and Obese (30 and above) 2) Mini Nutritional Assessment Questionnaire. MNA includes 18 non-invasive items distributed between 4 domains: (1) Anthropometry – 4 questions; (2) General assessment - 6 questions related to lifestyle, medication and mobility; (3) Dietary assessment - 6 questions related to the number of meals, food and fluid intake, and autonomy of feeding; (4) Subjective assessment – 2 questions regarding self-perception of health and nutrition. Each assigned a weighted score ranging from 0 to 3 points and has a total score of 30 points.

The sum of the MNA score classifies the individuals in the following manner:

- 24 and above: Normal nutritional status

- 17-23.5 : At risk of malnutrition,
- Less than 17: Malnutrition.

Statistical analysis

The data was entered in MS-Excel and analyzed in SPSS. Percentages, means, standard deviations and frequency tables were used as descriptive statistics. Non parametric tests like Chi-square test and Fisher exact test were used and Mann-Whitney U test was used for data that had a skewed distribution. Spearman's rank correlation was performed to measure the strength and direction of the association between total MNA scores with BMI, MAC and CC. To identify possible risk factors which are associated with poor nutritional status, univariate linear regression analysis was done with each factor and MNA score. Those factors that were found to be associated with the MNA score ($p<0.05$) were included in the multivariate regression model to identify their independent effect. The results with the p-value of <0.05 were taken as statistically significant.

RESULTS

Totally 204 subjects participated in this study with equal representation from Rural and Urban area i.e 102 subjects forms each group. The mean age of subjects was 67 years with Standard deviation 7.12. Table 1 shows about Socio-Demographic variables. About 62.3% of elderly were females. Most of them belonged to Hindus and were in age group between 60 to 69 years. About 56.8% were illiterates and majority of them belonged to Class IV and Class V according to modified B G Prasad Socio-economic classification.

Table 1: Sociodemographic data of study subjects.

Variables		Urban: n (%)	Rural: n (%)	Total: n (%)
Gender	Male	27 (26.5)	50 (49)	77 (37.7)
	Female	75 (73.5)	52 (51)	127 (62.3)
Age in years	60-69	63 (61.8)	78 (76.5)	141 (69.1)
	70-79	25 (24.5)	20 (19.6)	45 (22.1)
	80 & above	14 (13.7)	4 (3.9)	18 (8.8)
Religion	Hindu	75 (73.5)	85 (83.3)	160 (78.4)
	Muslim	27 (26.5)	17 (16.7)	44 (21.6)
Education	Illiterate	54 (52.9)	62 (60.8)	116 (56.8)
	Primary school	31 (30.4)	33 (32.4)	64 (31.4)
	Secondary school	8 (7.8)	4(3.9)	12 (5.9)
	Graduate & above	9 (8.8)	3 (2.9)	12 (5.9)
Present employment status	Employed	17 (16.7)	30 (29.4)	47 (23)
	Unemployed	85 (83.3)	72 (70.6)	157 (77)
Socio economic status	I	19 (18.6)	4 (3.9)	23 (11.3)
	II	29 (28.4)	11 (10.8)	40 (19.6)
	III	28 (27.5)	13 (12.7)	41 (20.1)
	IV	19 (18.6)	32 (31.4)	51 (25)
	V	7 (6.9)	42 (41.2)	49 (24)
Marital status	Married	101 (99)	100 (98)	201 (98.5)
	Unmarried	1 (1)	2 (2)	3 (1.5)
Family type	Nuclear	34 (33.3)	31 (30.4)	65 (31.9)
	Joint	68 (66.7)	71 (69.9)	139 (68.1)

According to MNA (Figure 1), 18.6% (n=38) of subjects were classified as malnourished. 38.7% (n=79) were at risk for malnutrition and 42.7% of them were well nourished. More proportion of Rural elderly were Malnourished (28.4%) and at risk of Malnutrition (40.2%) when compared to Urban elderly where 8.8% were Malnourished and 37.3% were at risk of Malnutrition. The association was statistically significant ($\chi2 = 16.721$, df=2, $p<0.001$) (Figure 2).

A significant association ($p<0.05$) was found between the nutritional status with age group and literacy level in both urban and rural areas, where more proportion of elderly aged more than 70 years and illiterates were malnourished. The association of Socio-economic status and nutritional status is found to be statistically significant only in the rural area. No significant association was found between nutritional status with gender, religion, present employment status, marital status and type of family (Table 2). Malnutrition was also

found to be more in elderly who were dependent on others (55.2%) than those who are independent (44.8%).

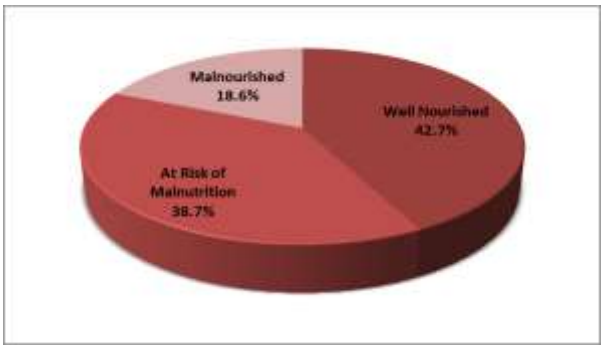
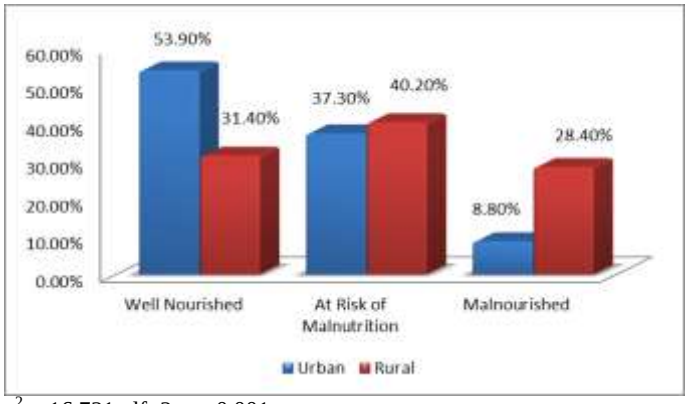


Figure 1: Distribution of subjects according to nutritional status.



χ^2 = 16.721, df=2, p <0.001.

Figure 2: Nutritional status among elderly in urban and rural area.

Table 2: Association of nutritional status with sociodemographic data among study subjects.

Variables**	Urban				Rural			
	Well nourished	At risk of malnutrition	Malnourished	'p' value	Well nourished	At risk of malnutrition	Malnourished	'p' value
Male	18 (66.7)	6 (22.2)	3 (11.1)	>0.05†	14 (28)	20 (40)	16 (32)	>0.05 †
Female	37 (49.3)	32 (42.7)	6 (8)		18 (34.6)	21 (40.4)	13 (25)	
Age in years								
60-69	43 (68.2)	19 (30.2)	1 (1.6)	**<0.05** †	30 (38.5)	33 (42.3)	15 (19.2)	**<0.05** †
70-79	8 (32)	14 (56)	3 (12)		2 (10)	7 (35)	11 (55)	
80&above	4 (28.6)	5 (35.7)	5 (35.7)		0 (0)	1 (25)	3 (75)	
Religion								
Hindu	38 (50.7)	31 (41.3)	6 (8)	>0.05 †	24 (28.3)	33 (38.8)	28 (32.9)	>0.05 †
Muslim	17 (63)	7 (25.9)	3 (11.1)		8 (47.1)	8 (47.1)	1 (5.8)	
Education								
Illiterate	23 (42.6)	23 (42.6)	8 (14.8)		18 (29)	21 (33.9)	23 (37.1)	
Primary School	16 (51.6)	14 (45.2)	1 (3.2)		11 (33.3)	18 (54.5)	4 (12.1)	
Secondary School	7 (87.5)	1 (12.5)	0 (0)	**<0.05***	1 (25)	1 (25)	2 (50)	**<0.05***
Graduate & above	9 (100)	0 (0)	0 (0)		2 (66.7)	1 (33.3)	0 (0)	
Present employment status								
Employed	13 (76.5)	3 (17.6)	1 (5.9)		12 (40)	14 (46.7)	4 (13.3)	
Unemployed	42 (49.4)	35 (41.2)	8 (9.4)	>0.05*	20 (27.8)	27 (37.5)	25 (34.7)	>0.05*
Socio economic status								
I	16 (84.2)	3 (15.8)	0 (0)		2 (50)	2 (50)	0 (0)	
II	18 (62.1)	10 (34.5)	1 (3.4)		8 (72.7)	1 (9.1)	2 (18.2)	
III	14 (50)	14 (50)	0 (0)	>0.05*	9 (69.2)	3 (23.1)	1 (7.7)	**<0.05***
IV	6 (31.6)	7 (36.8)	6 (31.6)		9 (28.1)	12 (37.5)	11 (34.4)	
V	1 (14.3)	4 (57.1)	2 (28.6)		4 (9.5)	23 (54.8)	15 (35.7)	
Marital status								
Married	55 (54.5)	37 (36.6)	9 (8.9)		30 (30)	41 (41)	29 (29)	
Unmarried	0 (0)	1 (100)	0 (0)	>0.05*	2 (100)	0 (0)	0 (0)	>0.05*
Family type								
Nuclear	23 (67.6)	10 (29.5)	1 (2.9)	>0.05†	9 (29)	14 (45.2)	8 (25.8)	>0.05†
Joint	32 (47.1)	28 (41.2)	8 (11.8)		23 (32.4)	27 (38)	21 (29.6)	

† Chi square test * Fisher's exact test. ** Percentages are written in bracket.

Using BMI as the only indicator (Table 3), more proportion of elderly living in urban area were obese (12.7%) and overweight (31.4%) compared to elderly living in rural area where 7.8% are obese and 13.7% are overweight and the association was found to be statistically significant ($\chi 2 = 13.147$, df=3, $p<0.01$).

Table 3: Distribution of elderly according to body mass index.

BMI	Urban	Rural	Total
<18.5 (under-weight)	10 (9.8%)	20 (19.6%)	30 (14.7%)
18.5-24.9 (Normal weight)	47 (46.1%)	60 (58.9%)	107 (52.5%)
25-29.9 (over-weight)	32 (31.4%)	14 (13.7%)	46 (22.5%)
>30 (obese)	13 (12.7%)	8 (7.8%)	21 (10.3%)
Total	102 (100%)	102 (100%)	204 (100%)

($\chi 2 = 13.147$, df=3, $p<0.01$).

The anthropometric measurements and MNA scores of the subjects according to the residence are depicted in Table 4. The median of BMI, mid arm circumference, calf circumference and MNA scores were significantly more in urban elderly than rural elderly.

Table 4: Anthropometric measurements and MNA scores among urban and rural elderly.

Measurements	Urban:Median (Q_1-Q_3)	Rural:Median (Q_1-Q_3)	p value*
BMI	24.1 (22.22-27.63)	21.72 (18.88-24.73)	<0.001
Mid Arm Circumference	26 (23-28)	24 (21.5-27)	<0.05
Calf Circumference	32 (30-33)	30 (28-33)	<0.05
MNA Score	24 (19-26.5)	20 (16.3-24.1)	<0.001

* Mann-Whitney U test.

Total MNA scores significantly positive correlated with BMI, mid arm circumference, calf circumference and total number of meals taken per day in both urban and rural area (Table 5).

Table 5: Correlation coefficients for MNA score according to residence.

	Urban		Rural	
	r *	(p value)	r *	(p value)
Age	-0.460	(<0.001)	-0.362	(<0.001)
BMI	0.574	(<0.001)	0.643	(<0.001)
Mid Arm Circumference	0.646	(<0.001)	0.704	(<0.001)
Calf Circumference	0.561	(<0.001)	0.572	(<0.001)
Number of meals per day	0.497	(<0.001)	0.308	(0.002)

* Spearman's rank correlation.

Table 6: Showing factors associated with MNA scores in univariate and multivariate linear regression.

Variable	Univariate analysis	Multivariate regression analysis
	p-Value	Unstandardized β (p-Value)
Age	<0.001*	3.327 (<0.001) **
Sex	0.353	-0.054 (0.388)
Socio economic status	<0.001*	3.333 (<0.001) **
Literacy	<0.001*	1.432 (0.004) **
Number of meals per day	<0.001*	2.710 (<0.001) **
Change in food intake	<0.001*	4.642 (<0.001) **
Chronic disease	0.057	
Financial independence	0.001*	1.478 (0.003) **
Residence	<0.001*	1.647 (0.002) **

Multivariate regression model using stepwise approach, adjusted for age and sex; *$p < 0.05$ (level of significance set for factors to be included in multivariate model); **$p<0.05$.Factors associated with the MNA scores ($p<0.05$) identified by univariate linear regression included age, socio-economic status, literacy, financial independence, the number of meals, adequate food intake and residence (Table 6). Multivariate regression analysis, adjusted for age and sex, was performed with these factors using a stepwise approach. It infers that the independent factors associated with higher MNA score were the lower age group, higher socio-economic status, higher literacy level, 3 meals per day, good food intake, financial independence and residence in the urban area. Factors such as living alone, gender and presence of chronic disease were not found to be significantly associated with MNA score.

DISCUSSION

The present study analyzed the nutritional status of elderly population. According to MNA classification, 18.6% were malnourished in our study, which is similar to a study done in Rajasthan and Iran where Malnutrition comprised about 11.6% and 12% respectively.[14,15] Our results revealed more elderly to be at risk of malnutrition

than actually malnourished. This finding has been seen among elderly from rural area of West Bengal, India.[8]

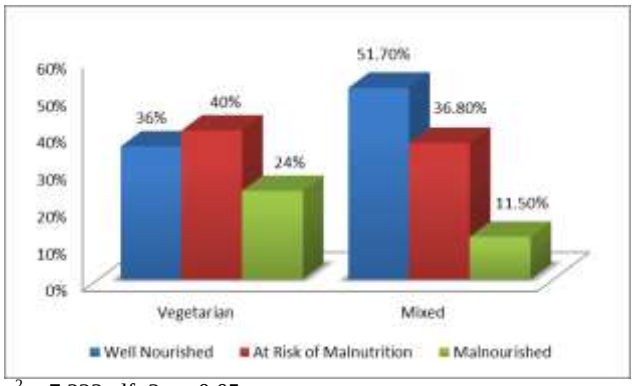
A significant association was found between the Nutritional status and the residence of elderly where more proportion of elderly were 'malnourished' and 'at risk of malnutrition' in rural than in urban area which is similar to study by Shivaraj M et al and Aliabadi M et al.[14,15] In this study, 28.4% of rural elderly were malnourished which is almost similar to a study done in the rural area of West Bengal where 29% were malnourished.[8] A study done by Mohapatra SC et al shows that more percentage of rural elderly were taking energy less than recommended daily allowance than urban elderly.[16] In the previous study, majority of elderly indicated that decreased appetite was the cause for low food intake which can be attributed to Malnutrition.[8]

Our study reveals that mean BMI was more in females (24.4±5.2) than males (21.82±3.8). Similar findings were present in a study by Meenu K et al in Punjab and also in rural Malawi where mean BMI of women was more than men.[17,18] According to the MNA classification, women were more malnourished than men according to studies done in rural West Bengal, Iran and in Minia, Egyptwhich is contrary to our study where more proportion of men were malnourished than women.[8,15,19]

It was observed that as the age advances, there was a significant increase in elderly with Malnutrition and at risk of malnutrition. Our findings were similar to the studies done at Allahabad, Tamilnadu, rural Bengal and Gauhati by Agarawalla R et al.[8,13,20] This could be due to decreased appetite and poor intake of food in aged people. But could also be an indication of worsening health which may have an influence on the nutritional status of older people. MNA scores showed a negative and significant correlation with the age which is similar to a study done in Nagpur.[21] This indicates that with an increase in age of elderly there is a decrease in MNA scores.

A statistically significant association was found between nutritional status and literacy level where more illiterates were malnourished than literates in both urban and rural areas. Similar results were found in Saikia AM et al, Aliabadi M et al and Shivraj M et al.[14,15,22] Illiteracy may be associated with lower income and decreased quality of life which may attribute to malnutrition.

Present employment status of elderly did not show any significant association with nutritional status. A similar association was found in the study by Sharma R.[21] Majority of elderly who belonged to lower socio-economic classes were at risk of Malnutrition and Malnourished which is similar to a study by Shivraj M et al.[14] The food intake is determined by the purchasing power and moreover, a person can be decisive about food intake if he or she is financially independent.[7] A significant association is found between nutritional status and diet (Figure 3). More proportion of elderly who took vegetarian diet are malnourished than those who took the mixed diet. And there is a significant correlation of increased MNA scores with those subjects who had more number of meals per day. A similar finding was reported in the studies done at Rural Bengal, Bangladesh and Tamilnaduwhere most of the elderly who were malnourished or at risk of malnourishment consumed only two or fewer meals per day.[8,13,23]



χ^2 = 7.222, df=2, p<0.05.

Figure 3: Distribution of nutritional status of elderly according to diet.

The present study also revealed that prevalence of malnutrition was more common in those dependent on others than self-dependent. Similar findings were present in Shivraj M and Aliabadi M et al.[14,15]

In our study, there is a significant positive correlation between MNA scores and BMI while age is negatively correlated. Our findings will go along with the study by Aliabadi M et al where total MNA scores were positively correlated with BMI (r = 0.43, p<0.01) and negatively with age (r = 0.14, p<0.01).[15] Along with BMI, Mid arm circumference and calf circumference , total MNA score is significantly correlated with the number of meals per day which is similar to a study done by Soini H et al.[24]

In our study, on multivariate regression analysis, higher MNA scores were significantly associated with lower age group, higher socio-economic status, higher literacy level, good food intake and financial independence which is similar to previous studies by Lahiri S et al and Vedantam A et al.[8,13] Even similar findings were found in rural Bangladesh, where longer education and higher per capita daily household expenditure were significantly associated with higher MNA scores.

Since MNA tool is used, it helps in both screening and assessment of malnutrition in community. Several limitations have to be considered in this study. Firstly, the present study was aimed principally on malnutrition, hence research including nutritional status in detail along with identification of other risk factors with greater perspective would have been more beneficial Secondly, purposive sampling reduces the generalizability and the

cross-sectional design which does not allow drawing a causal relationship.

CONCLUSION

In conclusion, current study contributes a high prevalence of malnutrition among elderly residing in rural area than in urban area. A significant association was found between nutritional status with age, literacy and socio-economsic status. And Risk factors of Malnutrition like decreased food intake and consumption of less number of meals per day was significantly correlated with MNA scores. Appropriate nutrition support can address the problem of under nutrition among elderly individuals living in the community and may contribute to health care cost reduction.

Recommendations

Our results conclude that more number of elderly are at risk of malnourishment. By using MNA tool, it can be easy to identify those who are malnourished and also who are at risk of malnutrition who can benefit from early intervention. There is a pressing need to identify early those at risk and to develop targeted nutrition intervention programmes for prevention of the effects of untreated malnutrition that can lead to morbidity and to ensure healthy ageing. These findings may suggest policy makers to plan appropriate intervention in order to improve the quality of life and increase successful ageing.

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