ORIGINAL ARTICLE

Assessment of nutritional status of elderly population living at high altitude regions of India utilizing Mini Nutritional Assessment (MNA) methodology

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Abstract

Background: Malnutrition is associated with increased risk of morbidity and mortality amongst elderly population. Lack of scientific evidence exists on the status of malnutrition amongst elderly population residing at high altitude regions of Uttarakhand, India. **Materials and methods:** A community based cross-sectional study was conducted in high altitude regions of District Nainital. A total of 980 elderly subjects were selected from 30 clusters identified using population proportionate to size sampling method**.** Nutritional status of the elderly population was assessed using Mini Nutritional Assessment (MNA) tool. Data was entered in MS Excel 2007 and analyzed using SPSS version 20.0. **Results:** The results of MNA revealed that 14.3% of the elderly subjects were malnourished. High prevalence of malnutrition was found among subjects who were illiterate (74.5%), financially dependent (75.2%), belonged to low monthly income (43.3%) had poor appetite (71.6%) and chewing problems (63.1%); (p<0.0001). **Conclusions:** High prevalence of malnutrition was present amongst the elderly population in India. There is a need for timely assessment of malnutrition for maintenance of nutritional status and prevention of chronic diseases.

Keywords

Introduction

According to the Population Census 2011, Government of India, there are nearly 104 million elderly persons (aged 60 years or above) in India. Majority (71%) of the elderly live in rural India with limited access to health care facilities (1). Elderly population in particular are at high risk of malnutrition due to physiological, psychological, functional and dietary changes related to ageing such as chewing problems and decrease in the quantity of overall food consumption (2, 3). Malnutrition further increases the susceptibility to illness, morbidity and decreases the quality of life. Hence, there is a need to reduce the nutrition related vulnerability among the elderly population.

Mini Nutritional Assessment (MNA) tool has been identified as a simple and quick tool to evaluate the nutritional status of elderly individuals at areas with limited access to health care facilities. Earlier studies have been conducted to assess the prevalence of malnutrition amongst elderly living in plain regions of India using MNA tool (4-9). However, the status of malnutrition and its associated risk factors amongst elderly population living in high altitude regions of the country have not been well explored.

Aims & Objectives

The present study was conducted to assess the prevalence of malnutrition and its associated risk factors amongst elderly population living in high altitude regions of Uttrakhand, India

Material & Methods

A community based cross-sectional study was conducted during 2016 in District Nainital, Uttarakhand state, India. The district is situated at an altitude of 2084 meters. A total of 980 elderly subjects in the age group of 60 and above were enrolled from 30 clusters (villages) identified by using population proportionate to size (PPS) sampling methodology. After reaching the village, the village president member was contacted. From the selected village, one lane was selected randomly. From the selected lane, one household was selected randomly. The survey was initiated from the selected first household and contiguously covered all the required number subjects from that cluster. Thirty elderly subjects were identified from each cluster by house-to-house visit with the help of village level health and nutrition functionaries. However, they did not participate in data collection. Only one elderly participant was chosen from each house based on willingness to participate. The following exclusion criteria were adopted: (i) subjects who were unable to comprehend the questions objectively; and (ii) subjects who had auditory problems leading to non- response. The objectives and procedure of data collection was explained to each subject. An informed written consent was obtained from each subject prior to data collection.

The research team consisting of 3 research assistants and 1 laboratory technician were given 2 weeks of formal training, which was repeated for 2 days at the end of each month during the study period. The investigators provided supportive supervision and continued education to the research team. The flowchart of the methodology is presented in (Figure 1).

Data collection parameters:

I.   **Socio demographic profile**: An oral questionnaire was administered to obtain information on socio demographic profile like age, gender, caste, religion, financial dependency, educational qualification, occupation, family monthly income, type of house, type of family, marital status and living arrangement.

II. **Mini Nutritional Assessment (MNA) tool**: MNA tool was utilised to diagnose the risk of malnutrition in geriatric population. The MNA is used for elderly population and it has a sensitivity of 96%, specificity of 98% and positive predictive value of 97% (10). The tool has four components; (i) Anthropometric parameters (Body Mass Index, Medial Calf Circumference, Mid Upper Arm Circumference and weight loss); (ii) General assessment of lifestyle, medication and mobility; (iii) Dietary Assessment; and (iv) Subjective assessment of self- perception of health and nutrition. The answer for each question corresponded to a value. The boxes with the appropriate answers for each question were marked. The scores for all questions were totaled to obtain the final screening score. The MNA tool categorised the subject the nutritional status of a subject as satisfactory nutritional status (MNA score: >23.5); "at risk" of malnutrition (MNA score: 17-23.5) and malnutrition (MNA score: <17).

The research was approved by the ethical committee of All India Institute of Medical Sciences, New Delhi.

Sample size: Assuming the prevalence of malnutrition to be 50%,(5) the desired sample size (N) was calculated with the formula: $N=z^2{}_{crit} P(1-P)/d^2$ where z is standard normal variate corresponding to 5% level with 50% prevalence rate, 95% confidence level, 5% relative precision, design effect of 2, and 15% nonresponse; the total sample size was 883 and rounded up equivalent to 900 after considering. However, we included 980 elderly subjects in the study.

Statistical analysis: The statistical software package IBM SPSS Statistics for Windows version 20.0 was utilized for conducting the statistical analysis of the data. The χ2 test was applied with 95% CI to assess the association of various parameters with malnutrition and satisfactory nutritional status among the geriatric population. A P value less than 0.05 was considered as statistically significant.

Results

A total of 980 elderly subjects were included in the present study, of which 35.6% (n=349) were males and 64.4% (n=631) were females. Majority (59.2%) of the subjects were in the age group of 60-70 years. The socio demographic characteristics of the study population have been published earlier (11, 12).

Prevalence of malnutrition was 14.3% amongst the elderly subjects. MNA classified 22.4% elderly subjects as having satisfactory nutritional status and 63.3% were "at risk" of malnutrition (Table 1).

We combined the data of "At Risk" of Malnutrition and Satisfactory nutritional status into a single category to identify factors associated with malnutrition amongst geriatric population. Malnutrition was found to be significantly higher amongst subjects who were more than 80 years of age, illiterate, financially dependent and low family monthly income, subjects with poor appetite and chewing problem (all p<0.001) (Table 2).

Discussion

India's elderly population is also growing rapidly and accounted for 8.1% of total population in 2011. Nutritional assessment in elderly population is essential to prevent nutrition-related chronic morbidity and mortality. The present study documented prevalence of malnutrition of 14.3% amongst elderly population in Uttarakhand. Previous studies conducted in plain regions of India have documented varied prevalence of malnutrition from 8% to 53.7% (4-9).

We found that the prevalence of malnutrition was significantly higher with advancing age, possibly due to degenerative physiological changes related to aging. In

the present study, malnutrition may have resulted due to loss of appetite (71.6%), difficulty in chewing (63.1%) leading to consumption of less than 2 meals in a day (73.1%). This was also found in previous studies (2, 13).

Low socioeconomic status (SES) and financial dependency were found to be significantly associated with malnutrition amongst elderly population. Low SES along with financial dependency have been reported to affect the dietary choices and the overall expenditure on food (14, 15). Consistent with our findings, other studies also reported that malnutrition was most commonly observed among elderly who are economically insecure (16-18) and dependent (15, 19, 20).

Education, often used as a proxy for socioeconomic status has been significantly associated with many health outcomes (21). We found that subjects who were illiterates had a significantly higher prevalence of malnutrition as compared to those with formal schooling. Illiteracy in Indian elderly has been reported to influence the nutrient intake and the overall nutritional status possibly due to lack of nutritional knowledge regarding healthy diet and lifestyle (22). Similar findings were also observed in earlier studies (23,24).

In concordance with earlier studies (2, 8, 23), we found that majority (63.3%) of the elderly subjects were "at risk" of malnutrition (40.7% females and 22.6% males).

Conclusion

The present findings revealed high prevalence of malnutrition amongst the elderly population due to lack of financial support, age related physiological and functional changes and inadequate access to food.

Recommendation

Implementation of low cost, prevention-based interventions to decrease the risk factors such as poor dietary intake, loss of appetite and chewing problem possibly may reduce the prevalence of malnutrition among elderly population in India.

MNA tool being simple and quick in evaluating the nutritional status of the elderly population may be useful in identifying those at risk of developing malnutrition. This will ensure timely intervention and maintenance of appropriate nutritional status.

Relevance of the study

High prevalence of malnutrition (14.3%) exists amongst the elderly subjects living at high altitude regions with limited access to healthcare facilities. Majority (63.3%) of the elderly population were "at risk" of malnutrition suggesting the need for formulation of strategies to improve and maintain their nutritional status.

Authors Contribution

AG: Literature Search, Data collection, Analysis, Interpretation, Manuscript writing and Review.
UK: Study Concept and Design, Literature Search, Data collection, Analysis, Interpretation, Manuscript Review.

RB: Data collection, Analysis, Interpretation, Manuscript Review.

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Tables

TABLE 1 DISTRIBUTION OF ELDERLY SUBJECTS AS PER MINI NUTRITIONAL ASSESSMENT (MNA) TOOL (N=980)

Grades of MNA	Male No. (%) N=349	Female No. (%) N=631	Total No. (%) N=980
Malnutrition (<17)	45 (4.6)	95 (9.7)	140 (14.3)
"At Risk" of Malnutrition (17-23.5)	222 (22.6)	399 (40.7)	621 (63.3)
Satisfactory (>23.5)	82 (8.4)	137 (14)	219 (22.4)
Total	349 (35.6)	631 (64.4)	980 (100)

TABLE 2 FACTORS ASSOCIATED WITH MALNUTRITION AMONG GERIATRIC SUBJECTS (N=980)

	Parameters	Malnutrition (n=140)	Satisfactory nutritional status* (n=840)	P value
Age	60-70 71-80 >80	83(58.9) 44(31.2) 17(9.9)	783(93.3) 48(5.7) 8(1.0)	<0.001
Gender	Male Female	45(31.9) 96(68.1)	304(36.2) 535(63.8)	0.322
Type of family	Nuclear Joint Extended	41(29.1) 97(68.8) 3(2.1)	239(28.5) 558(66.5) 42(5.0)	0.319
Education	High school and above Middle school Primary school Illiterate	6(4.3) 7(4.9) 23(16.3) 105(74.5)	124(14.8) 89(10.6) 213(25.4) 413(49.2)	<0.001
Occupation	Skilled Unskilled worker Unemployed	32(22.7) 25(17.7) 84(59.6)	189(22.5) 209(24.9) 441(52.6)	0.156
Income	13874 and above 9249-13,873 5547-9248 1866-5546 <1865	3(2.1) 1(0.7) 20(14.2) 61(43.3) 56(39.7)	123(14.7) 78(9.3) 123(14.7) 344(41.0) 171(20.4)	<0.001
Socio economic class	Upper Middle Lower	0(0.0) 34(24.1) 107(75.9)	16(1.9) 214(25.5) 609(72.6)	0.227
Financial Dependency	Yes No	106(75.2) 35(24.8)	460(54.8) 379(45.2)	<0.001
Marital Status	Married Single/divorced/Separated	71(50.4) 70(49.6)	506(60.3) 333(39.7)	0.026
Living arrangement	Living with someone Alone	133(94.3) 8(5.7)	804(95.8) 35(4.2)	0.420

	Parameters		Malnutrition (n=140)	Satisfactory nutritional status* (n=840)	P value
Loss of appetite	No		40(28.4)	667(79.5)	<0.001
	Yes		101(71.6)	172(20.5)	
Chewing problem	No		52(36.9)	595(70.9)	<0.001
	Yes		89(63.1)	244(29.1)	
Number of Meals in a day	3 full meals daily		28(19.9)	278(33.1)	
	2 full meals daily		103(73.1)	554(66.1)	<0.001
	1 full meal daily		10(7.0)	7(0.8)	
*This also includes subjects which are "at risk" of malnutrition					

Figures

FIGURE 1 FLOWCHART OF THE METHODOLOGY