

ORIGINAL ARTICLE

Nutritional status and associated comorbidities among the elderly in Doiwala block, DehradunKritika¹, DeepShikha², Jayanti Semwal³, Shaili Vyas⁴, Ruchi Juyal⁵, Hem Chandra Sati⁶¹Post Graduate Resident, ²Assistant Professor, ³Professor & HOD, ⁴Assistant Professor, ⁵Associate Professor ⁶Lecturer and Statistician, Department of Community Medicine, HIMS, Swami Rama Himalayan University, Swami Ram Nagar, Doiwala, Dehradun, 248140, Uttarakhand

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Abstract

Background: Ageing is an irreversible biological process which starts from conception and ends after death. Elderly population is at risk of under nutrition due to physical, cognitive as well as functional decline. Increasing ill health and increasing disability are linked with nutritional risk indicators. Nutritional deficiencies in geriatric age group are common and often subclinical thus escaping the desired interventions. Hence, this study was undertaken to collect information on nutritional status and associated comorbidities of this population. **Aims & Objectives:** 1. To assess the nutritional status and associated morbidities among the elderly. 2. To suggest appropriate measures to improve their health. **Material methods:** A cross-sectional study was conducted among the elderly people in the field practice area of Rural Health Training Centre (RHTC), HIMS, Dehradun for a period of 3 months. A total of 192 individuals of ≥ 60 years were interviewed. Pre-structured Mini Nutritional Assessment (MNA) questionnaire was used. Data are presented as mean values and standard deviations and significance level chosen at $p < 0.05$. **Result:** Out of total 192 elderly (≥ 60 years) interviewed, 48.4% were males and 51.6% were females. The mean weight (Kg) was 54.65 ± 13.44 (25-94) and mean BMI (Kg/m^2) was 22.30 ± 5.08 (12.57-44.64). According to MNA there were 20.83 % malnourished and 43.7 % were at risk of malnutrition and this was positively associated with age ($p = 0.004$) and female gender ($p = 0.0001$). According to MNA-SF (MNA short form), 17.2 % were malnourished while 45.3% were at risk of malnutrition and followed the same pattern of age and sex as in MNA. BMI analysis showed that 21.8% were malnourished, 15.4% were overweight and 7.4% were obese. Comorbidities were found to be more in malnourished group as compared to the well-nourished. **Conclusion:** Due to the high prevalence of elderly who were malnourished or at risk of malnutrition, a more detailed evaluation, regular follow up & dietary intervention to reverse the situation is required.

Key Words:

Elderly; Mini Nutritional Assessment; nutritional status; comorbidities

Introduction

Ageing is an irreversible biological process which starts from conception and ends after death. Worldwide, the proportion of elderly people is constantly increasing. According to the United Nations, in 2025, it is estimated that the population aged 60 years or older will be 1.2 billion and 2 billion in 2050 (representing about 22% of the world population) (1).

Elderly population is at risk of under nutrition due to physical, cognitive as well as functional decline. Increasing ill health and increasing disability are linked with nutritional risk indicators. The potential risk factors of malnutrition are multiple: reduced food intake due to loss of appetite, episodes of fasting, poor dentition, swallowing difficulties, inability to eat independently, digestive disorders, chronic diseases and depression (2), (3). Poor

nutritional status is associated with higher risks of morbidity and mortality in elderly people (4).

Despite the high prevalence of malnutrition among the elderly, nutritional problems are not yet acknowledged by health professionals as a priority for the elderly. The need for nutritional assessments and interventions is particularly crucial in this age group.

Conventional malnutrition assessment techniques include anthropometry, dietary recall and laboratory investigation. The prevalence estimates of malnutrition in elderly are highly variable due to the use of different tools and different settings. To determine nutritional status, the Mini-Nutritional Assessment (MNA) is one of the most recognized screening instruments and is used all around the world; especially for elderly people. It is an easy and inexpensive way to detect malnourished people or those at risk of malnutrition, i.e., MNA is easy to administer, patient/subject-friendly, inexpensive (laboratory investigations are not required), very sensitive (96%), highly specific (98%) and reproducible. (2), (5), (6).

Nutritional deficiencies in geriatric age group are common and often subclinical thus escaping the desired interventions and hence this study was undertaken to collect information on nutritional status and associated co-morbidities of this population.

Aims & Objectives

1. To assess the nutritional status and associated morbidities among the elderly
2. To suggest appropriate measures to improve their health

Material and Methods

Study design: Community based, cross sectional study. **Selection of study area:** There are 8 villages under the field practice area of Rural Health Training Centre (RHTC) of the Department of Community Medicine (Himalayan Institute of Medical Sciences, Dehradun) out of which one village (10%) was randomly selected for study purpose. **Study duration:** 3 months. **Selection of the subjects:** *Inclusion criteria:* a) Age ≥60 years, b) Permanent residents (≥5 years), c) Written informed consent. *Exclusion criteria:* a) Not willing to participate in the study, b) Critically ill. **Sample size:** Out of total 394 elderly, 197 (50%) were randomly selected out of which 5 subjects were excluded due to non-response

or critically ill health. **Study tools:** a) Mini Nutritional Assessment questionnaire (MNA), b) Mini Nutritional Assessment - Short Form (MNA-SF), c) Anthropometric tools: weighing machine (Weight measurement), stadiometer (Height measurement), measuring tape (Mid arm circumference & Calf circumference measurement), d) Questionnaire on socio-demography and health problems, e) Clinical examination

Mini Nutritional Assessment (MNA): Baseline nutritional status was defined and graded according to the MNA. This instrument consists of eighteen questions in four groups addressing anthropometry (BMI, weight loss, mid-upper arm and calf circumferences), general state (medications, mobility, presence of pressure ulcers, lifestyle and presence of psychological stress or neuropsychological problems), dietary assessment (autonomy of feeding, quality and number of meals, fluid intake) and self-perception about health and nutrition. When all items are completed, a maximal score of thirty points is achievable and threshold values are set as follows

SCORE	NUTRITIONAL STATUS
24-30	Normal
17-23.5	At risk of malnutrition
0-17	Malnourished

Mini Nutritional Assessment- Short Form (MNA-SF)

It is a shortened screening version of the MNA with only 6 questions with the strongest correlation to the full MNA. Maximum point is 14 and scoring is done as:

SCORE	NUTRITIONAL STATUS
12-14	Normal
8-11	At risk of malnutrition
0-7	Malnourished

Anthropometric measurements: All anthropometric measurements were taken twice and an average of the two measurements was calculated. Height was recorded using a stadiometer and weight was recorded on a calibrated scale to the nearest 100 g. BMI was calculated as weight (kilograms) divided by height (meters) squared and classified according to World Health Organization categories. Calf circumference was measured to the nearest 0.5 cm at the largest circumference of the calf with the knee and ankle bent at 90-degree angles. Mid-arm circumference (MAC) was measured as the circumference of the right upper arm (centimeters).

Socio-demographic and health related information

These included: age in 4 categories:

CATEGORY	AGE (years)
Young old	60 – 65
Old old	66 – 75
Oldest old	76 – 99
Centenarians	≥ 100

gender, marital status, education, occupation, income, number of family members, socio-economic status, any present or past health related condition.

Clinical examination

Thorough general and systemic clinical examination was done to detect any acute or chronic health related condition including signs of malnutrition (skin, hair, nails, vitamin and mineral deficiency, distribution of subcutaneous tissue, signs of peripheral neuropathy). All medications in use were noted.

Statistical analysis: Statistical analysis was performed using SPSS software (version 22.0). Means, standard deviations and frequency tables were used as descriptive statistics. To verify the association of categorical variables with the outcome i.e. malnutrition and risk of malnutrition defined by MNA, MNA-SF and anthropometry, chi-square test was applied, p values of < 0.05 were considered statistically significant.

Ethical issues and consent: Permission was taken from the ethical committee of Swami Rama Himalayan University for conducting the study. Written informed consent was taken from each participant.

Results

A total of 192 elderly (99 females and 93 males), after excluding 5 study subjects due to non-response or critically ill health, were taken for the study purpose.

Significant gender differences were found in socio-demographic variables: more number of elderly males were literate, working and practiced substance abuse as compared to elderly women but there were more widows than widowers showing that elderly women outlive elderly men [Table-1](#) [Table 2](#) shows that the mean BMI and MNA scores went on decreasing (deteriorating nutritional status) with increasing age.

According to MNA there were 20.83 % malnourished elderly and 43.7 % were at risk of malnutrition whereas MNA-SF screening showed 17.2 % elderly as malnourished and 45.3% at risk of malnutrition. BMI

analysis showed that 21.8% were underweight (out of which 51.1% were in Grade 1, 27.9% in Grade 2 and 20.9% in Grade 3 of underweight categories), 15.4% were overweight and 7.4% were obese. ([Figure 1](#), [Figure 2.1](#) & [Figure 2.2](#)).

The study shows significant association of MNA scores with age, gender, education and occupation. Under nutrition was found to be more in elderly females, illiterates and those who were not working and it went on increasing with advancing age. More percentage of elderly belonging to lower class and BPL were found to be malnourished as compared to those belonging to upper and middle socio-economic classes [Table 3](#)

The study reveals significant association between MNA scores and morbidity status (morbidity, multi-morbidity, psychiatric illness, eyesight and pallor) in the study population. More percentage of undernourished elderly were suffering from morbidity, multi-morbidity, psychiatric illness, poor eyesight and anaemia (clinically assessed by pallor) [Table 4](#)

Significant association of hypertension and diabetes mellitus with BMI was observed, both diseases were found to be more in obese and overweight elderly [Table 5](#)

Discussion

In the present study, malnutrition was determined by using MNA, MNA-SF and BMI.

The prevalence of under nutrition in elderly in our study according to BMI (21.8%) is in conformity with the findings of Karmakar et al (25%) in their study in Eastern India (7) and Saikia AM, study done in Guwahati (22.2%) (8) whereas the prevalence of over nutrition in our study was found to be 22.8% which was slightly higher than these two studies where the prevalence was 12.5% and 14.5% respectively. Studies done by Vedantam et al (9) in rural South India & Natrajan BS et al (55%) in rural community of Tamil Nadu (10) showed higher prevalence of under nutrition (32%) as compared to ours. A study done by Baweja et al in Western Rajasthan showed lower prevalence of under nutrition (7.1%) than in our study (11).

Present study shows that 20.8% of the elderly were malnourished and 43.7% were at risk of malnutrition as per MNA scores. A slightly low prevalence, i.e. 14 % of malnutrition was shown by Vedantam et al. but showed a higher prevalence (49%) for the category of at risk of malnutrition. A lower prevalence of

malnutrition (11%) and higher prevalence of at risk of malnutrition (62%) among the elderly was shown by Baweja et al in Western Rajasthan as compared to our study.

A large study done in Spain showed lower percentages of malnutrition and at risk of malnutrition (4.3% and 25.4% respectively) (12).

Older age was associated with lower MNA scores in our study, this finding has been shown in some previous studies (13), (14) while some others have shown that age has no effect on nutritional status (4), (15). We observed that the older subjects were less active and often reported reduced appetite and reduced food intake. It is apparent that increased focus on nutritional status is required as the age of the elderly increases.

In our study higher prevalence of over nutrition (overweight and obesity), i.e. 22.8% could be attributed to lifestyle and dietary factors in rural area.

Malnutrition and at risk of malnutrition categories were found to be associated with multi-morbidity, psychiatric problems, visual impairment, anemia and neurological diseases, the same results were shown in a study by Saka et al (Turkey) (16).

The factors associated with poor nutritional status were in agreement with most of the recent studies conducted on malnutrition showing that older age (17), (14), (12), (18), gender (being female) (12), (18), (15), (19), (20), marital status (widowed) (14), (21), lower education (14), (22), lower income (12), (15), low BMI (17), (22), depressive symptoms (13) and dementia (23), (19) were associated with poor nutritional status.

Conclusion

This study showed high prevalence of elderly who were malnourished or at risk of malnutrition. It also showed the multidimensional background of malnutrition. Significant association was found between nutritional status and morbidities.

Recommendation

Due to the high prevalence of elderly who were malnourished or at risk of malnutrition, a more detailed evaluation, regular follow up & dietary intervention to reverse the situation is required. Geriatric clinics may be set up at PHC level. Practitioners should be encouraged to develop screening strategies according to these characteristics, even among subjects with a high BMI. Research efforts and nutrition education

strategies should be directed towards health of the elderly to develop nutritional guidelines promoting successful aging.

Limitation of the study

The sample size was not large enough; the results of this study may not be necessarily generalized.

Relevance of the study

In the light of this study, the elderly population is a nutritionally vulnerable group. Malnutrition in this age group is common, multifactorial and has serious consequences but it is inadequately recognized and addressed. This study encourages the use of comprehensive tools such as the MNA for nutritional assessment.

Authors Contribution

All the authors have made substantial contribution to the design of the study, collection, analysis and interpretation of data as well as preparation of manuscript.

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Tables

TABLE 1 GENDER WISE DISTRIBUTION OF SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY POPULATION

Socio-demographic variables	Gender		
	Male (n=93)	Female (n=99)	Total (n=192)
▪ Age (years)			
60 – 65	60 (64.5%)	55 (55.6%)	115 (59.9%)
66 – 75	20 (21.5%)	30 (30.3%)	50 (26.0%)
76 – 99	12 (12.9%)	13 (13.1%)	25 (13.0%)
>100	1 (1.1%)	1 (1.0%)	2 (1.0%)
▪ Marital status			
Married	83 (89.2%)	54 (54.5%)	137 (71.4%)
Widow/separated/divorced	20 (10.8%)	78 (45.5%)	98 (28.6%)
▪ Education			
Literate	59 (63.4%)	16 (16.2%)	75 (39.1%)
Illiterate	34 (36.6%)	83 (83.3%)	117 (60.9%)
▪ Occupation			
Working	54 (58.1%)	6 (6.1%)	60 (31.3%)
Not working	33 (35.5%)	87 (87.9%)	120 (62.5%)
Pension	6 (6.5%)	6 (6.1%)	12 (6.3%)
▪ Socio-economic status			
Upper & middle class	23 (24.7%)	22 (22.2%)	45 (23.4%)
Lower class	70 (75.3%)	77 (77.8%)	147 (76.6%)
▪ Substance abuse			
Yes	51 (54.8%)	15 (15.2%)	66 (34.4%)

No	42 (45.2%)	84 (84.8%)	126 (65.6%)
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TABLE 2 MEAN BMI AND MNA SCORES OF THE STUDY POPULATION BY AGE GROUPS

Variables	Age group (years)			
	60-65 (n=115) Mean±SD	66-75 (n=50) Mean±SD	76-99 (n=25) Mean±SD	>100 (n=2) Mean±SD
BMI (Kg/m ²)	22.7±4.8	22.0±5.4	21.0±5.9	18.8±1.4
MNA score	21.9±4.6	20.8±4.6	19.2±4.6	8.0±9.9
MNA-SF score	10.6±2.7	10.2±2.5	9.36±2.7	3.5±4.9

TABLE 3 DISTRIBUTION OF MNA SCORES ACCORDING TO SOCIO-DEMOGRAPHY

Socio-demographic variables		Nutritional status according to MNA scores			p values
		Normal	At risk	Undernourished	
Age groups (years)	60-65 (n=115)	49 (42.6%)	50 (43.5%)	16 (13.9%)	0.004
	66-75 (n=50)	14 (28.0%)	24 (48.0%)	12 (24.0%)	
	76-99 (n=25)	5 (20.0%)	10 (40.0%)	10 (40.0%)	
	≥100 (n=2)	0 (0.0%)	0 (0.0%)	2 (100.0%)	
Sex	Male (n=93)	46 (49.5%)	31 (33.3%)	16 (17.2%)	0.0001
	Female (n=99)	22 (22.2%)	53 (53.5%)	24 (24.2%)	
Education	Illiterate (n=117)	26 (22.2%)	59 (50.4%)	32 (27.4%)	0.0001
	Literate (n=27)	42 (56.0%)	25 (33.3%)	8 (10.7%)	
Occupation	Working (n=60)	34 (56.7%)	21 (35.0%)	5 (8.3%)	0.0001
	Not working (n=120)	27 (22.5%)	58 (48.3%)	35 (29.2%)	
	Pension (n=12)	7 (58.3%)	5 (41.7%)	0 (0%)	
Socioeconomic status (income based)	Upper & middle (n=45)	22 (48.9%)	14 (31.1%)	9 (20.0%)	0.075
	Lower & BPL (n=147)	46 (31.3%)	70 (47.6%)	31 (21.1%)	

TABLE 4 MORBIDITY STATUS OF THE STUDY POPULATION ACCORDING TO MNA SCORES

Morbidity status		Nutritional status according to MNA scores			p values
		Normal	At risk	Undernourished	
Morbidity (at least one)	Present	56 (82.4%)	83 (98.8%)	40 (100%)	0.0001
	Absent	12 (17.6%)	1 (1.2%)	0 (0%)	
Multi - morbidity	Present	43 (63.2%)	71 (84.5%)	35 (87.5%)	0.002
	Absent	25 (36.8%)	13 (15.5%)	5 (12.5%)	
Psychiatric illness	Present	19 (27.9%)	39 (46.6%)	30 (75.0%)	0.0001
	Absent	49 (72.1%)	45 (53.6%)	10 (25.0%)	
Eyesight	Good	28 (41.2%)	22 (26.2%)	7 (17.5%)	0.022
	Poor	40 (58.8%)	62 (73.8%)	33 (82.5%)	
Anemia (pallor)	Present	14 (20.6%)	55 (65.5%)	35 (87.5%)	0.0001
	Absent	54 (79.4%)	29 (34.5%)	5 (12.5%)	

TABLE 5 ASSOCIATION OF HYPERTENSION AND DIABETES MELLITUS WITH BMI

Morbidity	BMI Categories				p values
	Underweight (n=43)	Normal (n=106)	Overweight (n=29)	Obese (n=14)	
Hypertension	9 (20.9%)	28 (26.4%)	14 (48.3%)	7 (50.0%)	0.023
Diabetes mellitus	2 (4.7%)	10 (9.4%)	3 (10.3%)	5 (35.7%)	0.010

Figures

FIGURE 1 DISTRIBUTION OF NUTRITIONAL STATUS OF SUBJECTS ACCORDING TO MNA & MNA-SF

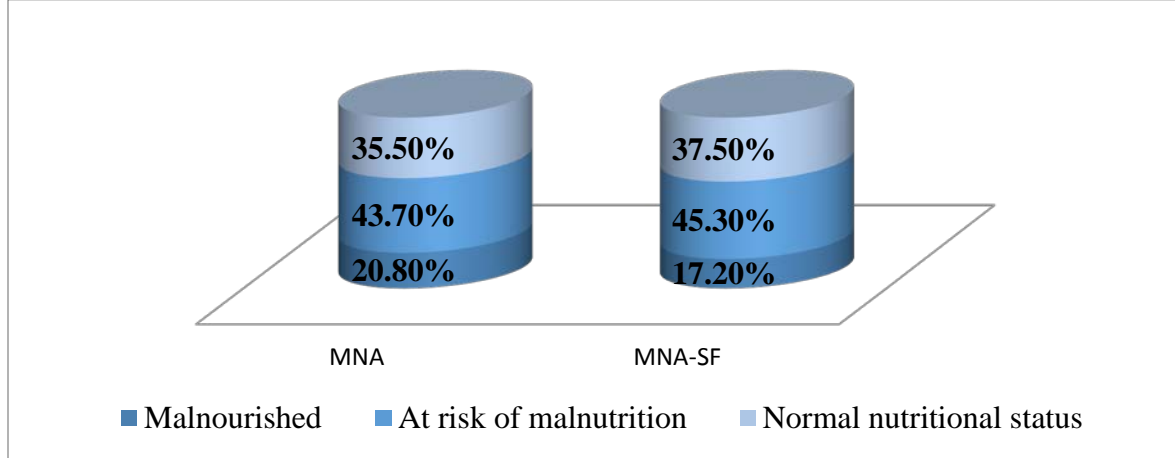


FIGURE 2 DISTRIBUTION OF NUTRITIONAL STATUS OF SUBJECTS ACCORDING TO BMI

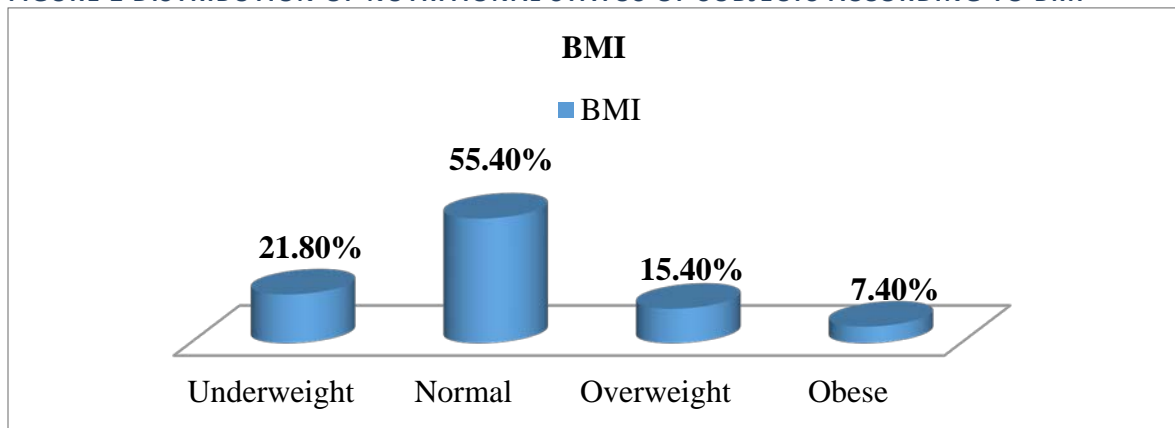


FIGURE 3 DISTRIBUTION OF UNDERWEIGHT ELDERLY ACCORDING TO BMI

