Evaluation of Nutritional Status in Elderly Patients attending a Tertiary Care Hospital in South India

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Abstract

Background: Malnutrition is often overseen and not considered in a treatment program for the elderly patient. The present study aimed to evaluate the prevalence of malnutrition among elderly patients attending the out-patient department of a tertiary care hospital.

Methodology: A Cross-sectional study was done to assess the nutritional status of 1000 elderly patients ($\geq$65 years) attending the Geriatric medicine out-patient department in a tertiary care hospital in Chennai, Tamil Nadu, India between May and July 2011. The subjects were interviewed using the Mini Nutritional Assessment (MNA) Questionnaire. The results were tabulated and analysed.

Results: According to the MNA score, the prevalence of malnutrition in elderly patients was 31.3%, those at risk of malnutrition was 54.8% and those normally nourished was 13.9%. The mean MNA-Short Form (screening) score was 8.7±2.3 (2-14) and the mean Total Assessment score was 17.8±3.3 (6-26). The correlations between the total MNA score and the anthropometric variables– BMI (r=0.438, p<0.001), mid-arm circumference (r=0.388, p<0.001) and calf circumference (r=0.408, p<0.001) were all significant. The sensitivity and specificity of the MNA was 93% and 68% respectively. The results of the study also showed that older age and being a woman were associated with lower MNA scores.

Conclusion: More than 85% of the elderly patients are either at risk or malnourished. The focus should be to evaluate the nutritional status of the elderly at their very first approach to medical help to improve their ability to overcome disease and enhance their clinical outcome.

Keywords: Nutritional status, elderly, patients, malnutrition, MNA, Chennai.

Introduction

It has been projected that 'By 2050, number of elders will exceed the number of younger persons for the first time in the history[1]. This has been attributed to improved life expectancy, public health programs, medical advances, health services, improved living and lifestyle circumstances. However, current statistics for the elderly in India gives a prelude to a new set of medical, social, and economic problems that could arise if a timely initiative in this direction is not taken[1].

Malnourishment in the older population is reported to be a consequence of inadequate food intake, underlying illness, gender (with women being at higher risk) and economic vulnerability[2,3]. Malnutrition is often overseen and not considered when a treatment program for the elderly patient is

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planned. Thus the problem is further aggravated due to lack of awareness and due importance not being given, on the part of the individual as well as the medical person attending, about the deleterious effects of malnutrition and its clinical outcome.

There is no gold standard for evaluating nutritional status[4]. It is difficult to determine undernutrition or at risk for undernutrition, because there is a lack of consensus on how to define under nutrition[5]. This has led to a variety of different diagnostic criteria as well as the use of different reference values[6].

The Mini Nutritional Assessment (MNA) test is a simple, non-invasive, well-validated screening tool for malnutrition in elderly persons and is recommended for the rapid assessment of nutritional status in elderly patients in out-patient clinics and hospitals[7]. In 1991, French, Swiss, and U.S. researchers developed the MNA which has been recommended by the European Society for Clinical Nutrition and Metabolism, as it has high sensitivity, reproducibility and inter-observer agreement; is also easy and not too time-consuming to perform[8,9].

In India, a comparative study of nutritional status of the elderly population showed that among old age home residents, 19.4% of subjects were malnourished and 57.4% were at risk of malnutrition. The prevalence of malnutrition by MNA was 2%, those at risk of malnutrition were 14.7% in free-living elderly as reported by Pai et al[10]. The conclusions of another study among free-living rural elderly of south India as evaluated by the MNA, showed that more than 60% of the subjects had low MNA scores indicating that inadequate protein-energy intake is frequent and requires more attention[11].

Early detection of malnutrition is essential to allow targeted nutritional intervention and should be a key component of the geriatric assessment. The present study is intended to assess the nutritional status in the elderly population using the Mini Nutritional Assessment and to record the magnitude of malnutrition prevailing among the elderly out-patients in Government General Hospital, Chennai, besides identifying those at potential risk of malnutrition.

Materials & Methods

A cross-sectional study was conducted in the Department of Geriatric Medicine, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai-600003 between May and July 2011. The study population comprised of 1000 elderly individuals both male and female, aged 65 years and above attending the Geriatric Medicine Out-Patient Department. Those having the ability to communicate and the strength to carry through an interview were included after obtaining informed consent. Subjects with cancer, end-stage renal disease or terminal illness and those receiving artificial enteral or parenteral nutrition were excluded. The Study was approved by the Institute Ethical Committee, Madras Medical College, Chennai-600003.

Nutritional Assessment

The assessment was carried out using the Mini Nutritional Assessment scale which is an 18-item questionnaire comprising four categories - Anthropometric measurements, Dietary intake, Global assessment & Subjective assessment. The scoring categorizes the elderly subjects in the following manner-The Mini Nutritional Assessment-Short Form (MNA-SF) comprising 6 items out of the 18 with a subtotal maximum score of 14. Score ≥12 meant normal Nutritional Status. Only those with a score ≤11 with possible malnutrition underwent Complete Assessment with 12 additional questions adding to a total score of 30. A score of ≥24 meant adequate nutritional status, a score between 17 - 23.5 meant risk of malnutrition and score of< 17 indicated protein-calorie malnutrition. Each patient underwent a clinical examination including measurement of weight, height, mid-arm circumference (MAC) and calf circumference (CC). Demographic, social support, employment status information and data on self-reported morbidity were collected during the interview.

Statistical Analyses

Data analyses were performed using the SPSS statistical software package version 19 for Windows (SPSS Inc.; Chicago, IL). Descriptive results were presented as means, standard deviation, frequencies and percentage. Chi-Square test, Pearson correlation coefficient, Student *t*-test and Spearman's rank correlation coefficients were employed as appropriate. P values lower than 0.05 were considered statistically significant.

Results

A total of 1000 elderly subjects were studied which included 500 males and 500 females. Their ages ranged from 65 and 95 years; mean age was 70.0 ± 5.3 years. Figure 1a shows the distribution of

elderly subjects according to age and gender. The most frequent medical condition among the participants were hypertension (56.9%), diabetes (37%), both diabetes and hypertension (24%), cardiovascular problems (12.5%), respiratory problems (10%), cerebrovascular problems and paresis (2.9%) and others such as joint pains, myalgia, giddiness, thyroid problems, headache, etc (27.9%).

Figure 1. Distribution of subjects according to age and gender and Nutritional status by Mini Nutritional Assessment

The MNA-SF (screening) scores ranged from 2 to 14 (mean 8.7 ± 2.3). Out of 1000, 123 (12.3%) were found to be normally nourished, and for the remaining 877 subjects, the Assessment was continued and completed. The mean Total Assessment score was 17.8 ± 3.3 (range between 6 and 26). According to the total MNA score (screening and assessment for the 877 subjects) → 313 (35.7%) were assessed to be malnourished, 548

(62.5%) were in the risk zone of malnutrition and 16 (1.8%) were well nourished. Evaluation of nutritional status of the entire cohort into three categories, clearly shows that, out of the total 1000 elderly population studied, 313 (31.3%) were assessed to be malnourished, 548 (54.8%) were at risk for malnutrition and 139 (13.9%) were found to be well nourished, as shown in Figure 1b. Table 1 and Table 2 show the Age wise prevalence of nutritional status according to the Screening and Assessment Scores respectively. The correlation between the MNA score and the studied items is shown in Table 3.
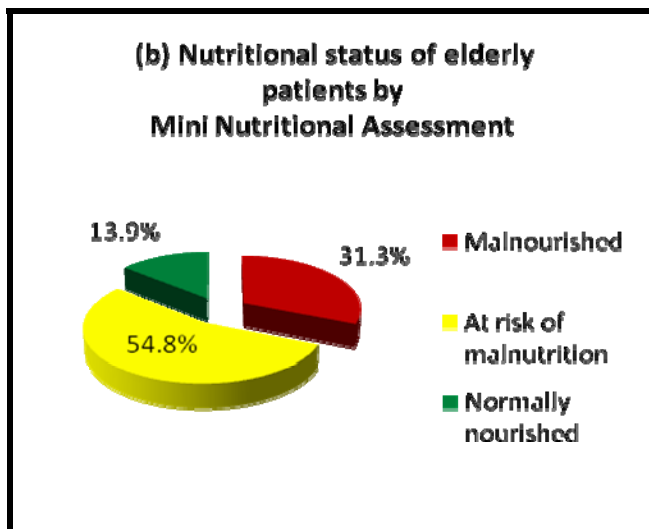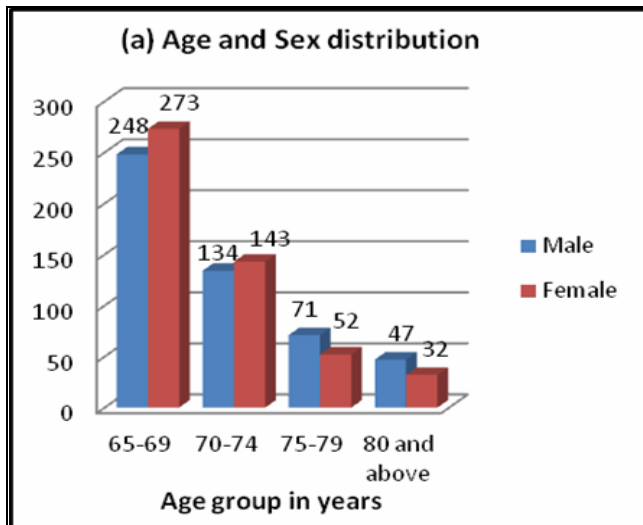
Table 1. Age wise prevalence of nutritional status according to Mini Nutritional Assessment - Short Form (screening)

Age group (years)	Positive Malnutrition (≤11) n (%)	Normal nutritional status (≥12) n (%)	Total n(%)
65-69	446 (85.6)	75 (14.4)	521 (100)
70-74	239 (86.3)	38 (13.7)	277 (100)
75-79	115 (93.5)	8 (6.5)	123 (100)
80 & above	77 (97.5)	2 (2.5)	79 (100)
Total	877 (87.7)	123 (12.3)	1000 (100)

*P value 0.004

Table 2. Age wise prevalence of nutritional status according to Mini Nutritional Assessment - Total

Age group (years)	Malnourished (<17) n(%)	At risk of malnutrition (17-23.5) n(%)	Adequate nutritional status (≥24) n(%)	Total n(%)
65-69	141(31.6)	294(65.9)	11(2.5)	446(100)
70-74	84(35.1)	151(63.2)	4(1.7)	239(100)
75-79	50(43.5)	64(55.7)	1(0.9)	115(100)
80 & above	38(49.4)	39(50.6)	0(0)	77(100)
Total	313(35.7)	548(62.5)	16(1.8)	877(100)

*P value 0.024

Almost half (46.8%) of the subjects reported to have a moderate decrease in food intake over the past three months, and 3.1% had severe decrease (p-value 0.007). Among those aged 80 years and above, 58.2% had a moderate decrease in food intake. While 78.3% of the participants were not aware of their weight development during the last three months, 15.9% reported no weight loss (p-value <0.001). Less than 2% of the individuals were bed or chair bound, 31.9% were able to get out of

bed or chair and remaining 66.4% had no mobility problems (p value<0.001). Over 68% (92% of the malnourished and 67.3% of those at risk of malnutrition) seemed to have suffered from acute disease or psychological stress in the past three months (p value<0.001). Nearly one-third (37%) were assessed as having some neuropsychological problem, i.e., mild dementia, depressed moods, etc. (p-value 0.001).

Table 3. Item-total score correlations (Spearman rank correlation coefficients, r_s) for Mini Nutritional Assessment

Item no.	Item content	r_s	P value*
1	Changes in dietary intake	0.428(**)	<0.001
2	Weight loss	0.207(**)	<0.001
3	Mobility	0.335(**)	<0.001
4	Psychological stress or acute disease	0.394(**)	<0.001
5	Neuropsychological problems	0.279(**)	<0.001
6	BMI	0.458(**)	<0.001
7	Lives independently	-0.009	0.780
8	More than three prescriptions per day	0.036	0.282
9	Pressure sores or skin ulcers#	.	.
10	Full meals per day	0.301(**)	<0.001
11	Protein intake	0.301(**)	<0.001
12	Fruits or vegetables	0.171(**)	<0.001
13	Fluid	0.120(**)	<0.001
14	Mode of feeding	0.066	0.050
15	Self-view of nutritional status	0.634(**)	<0.001
16	Health status in comparison with other people of the same age	0.639(**)	<0.001
17	Mid-arm circumference	0.406(**)	<0.001
18	Calf circumference	0.399(**)	<0.001

*P value<0.05 is significant. **Correlation is significant at the 0.01 level (2-tailed). #Constant value[All patients had No pressure sore or ulcer]

Four out of 5 subjects who lived in old age home were found to be at risk of malnutrition, and one fell under the category of malnourished (p-value 0.71). Eighty-four percent of the subjects take more than three prescriptions per day (p-value 0.20), which included 87.8% of the females and 80% of the males. Figure 2 depicts the level of consumption by nutritional status. The highest proportion of the subjects, i.e., 77.8% consumed two full meals per day, and 25.9% of the malnourished group survived on one meal per day (p value<0.001). However, it is notable that though substantial proportions of those categorized as undernourished or at risk of malnourishment consumed two or three full meals a day, the content of their meals may be nutritionally inadequate as the protein consumption (Figure 2b) was relatively less. No significant difference was found in the daily consumption of proteins between males and females. 94% of the subjects reported consuming minimum two servings of fruits or vegetables per day (Figure 2c). The absence of daily consumption of fruits or vegetables was found in 10.5% of the malnourished (p value<0.001). Only 30.1% of the individuals consumed more than one litre of fluid per day. Reduced fluid intake per day was most pronounced in the malnourished and those at risk of malnutrition as shown in Figure 2d. Almost all of them (99.8%)were self-fed.
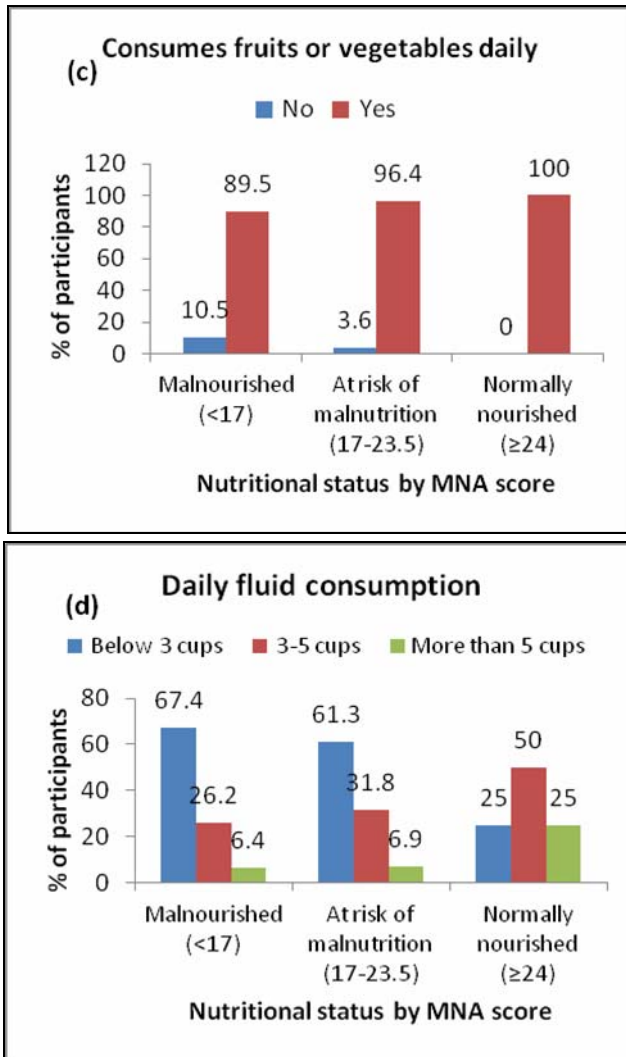

(a) No. of full meals taken daily

(b) Daily protein consumption
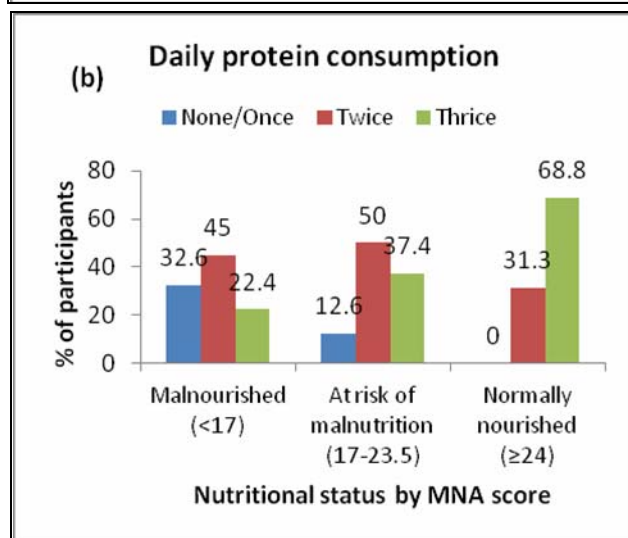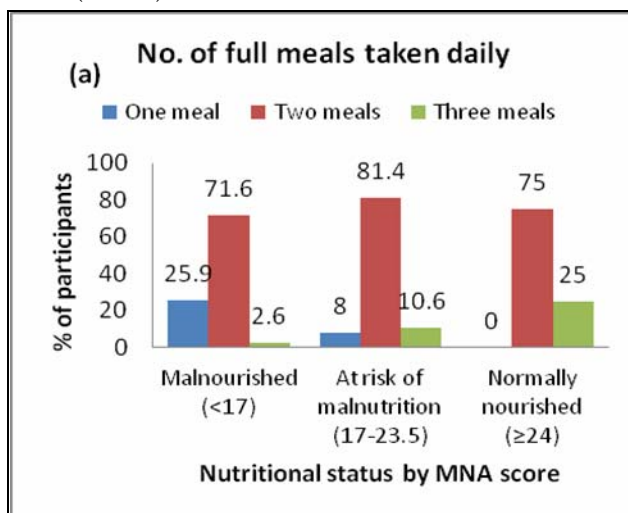
Figure 2. Level of consumption of elderly outpatients of Rajiv Gandhi Government General Hospital, Chennai according to Nutritional status as evaluated by Mini Nutritional Assessment (MNA). (a) Daily meal consumption; (b) Daily protein consumption; (c) Daily consumption of fruits or vegetables; (d) Daily fluid consumption.

The self-perception of health status revealed that 53.5% of the whole and 58.8% of the females considered themselves as being malnourished and 17.8% were uncertain of their health status (p value<0.001). Nearly 83% of those categorized as malnourished by this study were able to identify themselves as being malnourished. When comparing themselves with other people of their age, 46.6% found themselves as good as or even better than others while 43.4% had a negative response regarding their general health and nutritional status. The mean Mid-arm Circumference (MAC) among males was 24.7±3.0 cm and that among females was 23.7±2.9 cm. The mean Calf Circumference (CC) among males was
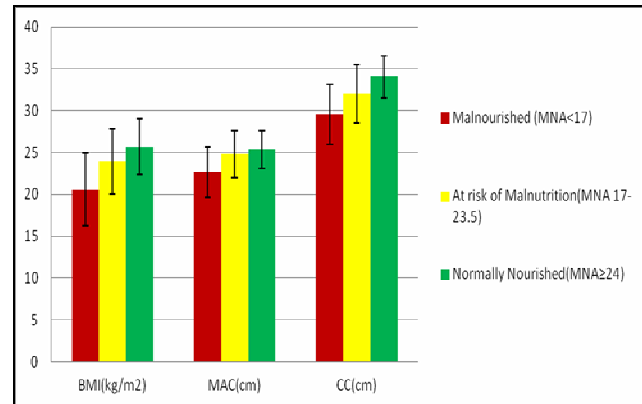
32.0±3.6 cm and that among females was 31.1±3.8 cm.

Figure 3. BMI, Mid-arm Circumference and Calf Circumference in the three MNA categories.

Figure 3 shows that when the patients in the three MNA categories were compared regarding BMI, Mid-arm Circumference and Calf Circumference, they differed significantly from each other. Correlation coefficients for the three anthropometric values vs MNA are given in Table 4. BMI and the two extremity circumferences were significantly correlated with MNA. When using BMI <24 kg/m², 60.8% subjects showed positive for malnutrition, and when compared with the MNA score for malnutrition (<17), it gave a sensitivity of 0.93 and a specificity of 0.68. Correctly classified subjects were 0.66.

Table 4. Correlations between total MNA score and nutritional status criteria (Spearman rank correlation coefficients, r_s)

Criterion	r_s	P value
MAC	0.388(**)	<0.001
CC	0.408(**)	<0.001
BMI	0.438(**)	<0.001

** Correlation is significant at the 0.01 level (2-tailed). P value<0.05 is significant

Out of the study group, maximum females at 89.4% and males at 65.2% were dependent on their children, family, relatives or friends for their daily living More specifically, 76.4% of the elderly patients lived with their family, 14.9% lived with their spouse, 8.1% alone and 0.6% accommodated in old age homes. Table 5 shows results of Hierarchical linear progression analyses. In these analyses, demographic indicators (i.e. sex and age) were entered in the first step, information regarding employment status and social support in

the second step and a block of health indicators (co-morbid illnesses) was entered in the third step. These analyses indicated that demographic indicators accounted for approximately 1% of the variation in MNA scores and that older age (-ß) and being a woman (-ß) were associated with lower MNA scores (Table 5). Furthermore, the block of employment status and social support accounted for additional 2% of MNA variation. Among these variables, retired (ß) and living with family (ß) were significantly associated with higher MNA scores. Finally, the block of self-reported health indicators accounted for an additional 6% of the variation at the mean level of the demographic, employment and social support information. All health problems (-ß) except diabetes and hypertension were significantly associated with lower MNA scores.

Table 5. Hierarchical linear progression examining demographic, employment status, social support and health indicators as predictors of nutritional status expressed by MNA scores

	Predictors	ß	T	P value	R^2	The change significance of R^2 change
1.	Demographic indicators					
	Sex (Men=1; Women=2)	-0.029	0.8	0.409		
					0.010	0.011
	Age in years	-0.088	2.6	0.009		
2.	Employment	0.122	3.5	0.001	0.022	
						0.001
	Social Support	0.010	0.3	0.760		
3.	Health indicators					
	Diabetes	0.073	2.0	0.043		
	Hypertension	0.070	1.9	0.064		
					0.067	
	Cerebrovascular problems	-0.050	1.5	0.142		
						0.000
	Cardiovascular problems	-0.046	1.3	0.181		
	Respiratory problems	-0.151	4.2	0.000		
	Others	-0.021	0.5	0.595		

DISCUSSION

The World Health Organization cites malnutrition as the greatest single threat to the world's public health. Improving nutrition is widely regarded as the most effective form of aid. This study shows that more than half (54.8%) of elderly patients attending the Out-patient Department of the Geriatric Medicine in Rajiv Gandhi Government General Hospital, Chennai were assessed to be at risk of malnutrition according to Mini Nutritional Assessment (MNA) score, along with 31.3% who were found to be malnourished, totaling to a magnitude of nearly 85% of elderly people with a grim nutritional profile. Since no nutritional assessment technique can clearly distinguish changes induced by disease or ageing per se, in this study, we chose MNA as the diagnostic tool because this instrument has been developed primarily for the nutritional assessment of the elderly.

Using MNA, Kaiser et al. report an overall prevalence of malnutrition as 22.8% and at risk of being malnourished as 46.2% from the retrospective pooled analysis of all previously published data while Persson et al. reported prevalence of 26% of PEM using MNA among acute geriatric patients[12,13]. Thomas et al describe malnutrition to have reached epidemic proportions in a sub-acute care facility in St. Louis, USA, with the prevalence of either malnourished or at risk of malnutrition among its geriatric patients reported as more than 90% while it was 69% as reported by Reyes JG et al among elderly who required hospital admission[14,15]. Although the results of studies conducted in Asia in elderly patient population are in conformity with our study regarding the percentage of people at risk of malnutrition; it was found that the proportion currently undernourished in our setup was higher(31.3%) than that found in Chinese (19.6%) and Japanese (19.9%) population[16,17].

A study in Turkey showed a decrease in MNA score with an increase in age, similar to findings in our study where the Hierarchical linear progression highlighted that demographic indicators accounted for a significant variation in the MNA score and that older age and being a woman was related to lower MNA scores[18]. The present study also presents a matter of increased concern in females making a higher percentage among the undernourished and at risk of malnutrition, with increased significant co-morbid illness and prescriptions of drugs per day. This may be mainly attributed to their reduced awareness about the importance of health, their social and economic support, less seeking of timely medical help among various causes[19].

We demonstrated that the total MNA score showed a significant correlation with the anthropometric markers - Mid-arm circumference and Calf circumference. With BMI also, there was a significant correlation, thus in conformity with Thomas et al. who found a high correlation of MNA

scores only with BMI[14]. By identifying those at risk of malnutrition, it may be possible to provide adequate and immediate nutritional support to prevent further deterioration. In this study, the use of the BMI alone to identify malnutrition would have overestimated the percentage of subjects at risk for malnutrition by 16%, in comparison with the percentages indicated by the MNA, while Ranhoff et al reported that BMI detected only 75% of the correctly classified subjects as malnourished in elderly patients[20]. The results of the MAC and CC also illustrate the limitations of using anthropometry as the only tool in assessing nutritional status, as both these methods failed to identify a large number (60% and 37%, respectively) of older people at risk of malnutrition in comparison with the results obtained from the MNA in this and other studies[7].

According to Vellas et al., the best indication for the questionnaire application is the assessment of frail older persons, as those with functional limitations, living alone or the very old (aged 85 years or older) living in the community[7]. Several studies have highlighted the prevalence of malnutrition in the community and in the hospitalized elderly people. The critical point is to identify such patients at their very first entry into the hospital, so that their morbidity added to their underlying malnutrition does not lead to further deterioration of their health condition, thereby enabling timely and cost-effective intervention, as evidenced by Murphy et al[21]. We thus recommend that all patients attending the out-patient department be assessed for their nutritional status using the simple and reliable Mini Nutritional Assessment and those found to be undernourished or at risk of malnutrition have to be subjected to further assessment to evaluate their specific deficiency and treat accordingly.

Limitations

The current findings are correlational only and that no firm conclusions about the causality may be drawn based on the findings of this cross-sectional study. MNA is a tool to identify those at risk of malnutrition who can benefit from early intervention. Further studies are necessary to assess the extent to which these nutritional disturbances are reversible. Also, further investigations should be conducted to determine whether the MNA can correctly identify those elderly who are likely to benefit from nutritional support and whether nutritional intervention can modify the MNA score in patients at risk of malnutrition or already malnourished.

Conclusion

More than 85% of the elderly patients are either at risk or malnourished. Among older persons, chronic illness rather than ageing has a greater negative impact on nutritional status. Social support and employment status are directly associated with nutritional status.

Acknowledgement

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