

# Nutritional status and its associated factors among the geriatric population in outpatient clinics of a tertiary care hospital in Karachi, Pakistan

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## ABSTRACT

**Context:** Elderly malnourishment remains a largely unexplored area, despite having a significant effect on the level of mortality and morbidity. This study aims to explore the level of malnourishment and identify those at risk of malnourishment among the elderly population presenting to a teaching hospital in Karachi. **Aims:** To assess nutritional status and its associated factors among the elderly population. **Settings and Design:** This study was conducted in outpatient clinics of family medicine at a teaching hospital and its outreach primary care centres from December 2020 to December 2021. The study design was cross-sectional. **Materials and Methods:** The prevalence of malnourishment and at risk of malnourishment with its associated factors were assessed using the Mini-Nutritional Assessment (MNA) scale as a screening tool among the elderly population (65 years and above) presenting to the family medicine OPDs of a teaching hospital. **Statistical Analysis:** Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 21. **Results:** A total of 191 patients were recruited into the study, and the majority of them were males (66.5%). Median age and body mass index (BMI) of participants were 70 (IQR = 74-65) years and 24 (IQR = 27-21) kg/m<sup>2</sup>, respectively. The median MNA scores were 23.5 (IQR = 20.5-26). A total of 92 (48.2%) participants were found to have a normal nutritional status, 81 (42.4%) were found to be at a risk of malnourishment, and 18 (9.4%) were malnourished. On the multivariable regression model, BMI and ability to manage finances were significantly associated with malnourishment. **Conclusion:** This study shows an alarmingly high rate of the elderly population at risk of developing malnourishment, and financial independence and increasing BMI were associated with a decreased risk of malnourishment.

**Keywords:** Elderly population, malnourishment, MNA, nutritional status

## Introduction

The geriatric population, defined chronologically as 65 years or above, is rising in both developing and developed countries.<sup>[1]</sup> The

elderly population of Pakistan is 11.3 million, which is expected to increase to 43.3 million by 2050.<sup>[2]</sup>

Due to the increased prevalence of chronic diseases among the elderly such as diabetes, hypertension, cardiac diseases, arthritis and polypharmacy compounded by social, emotional and financial constraints, this part of society is quite prone to develop malnourishment and functional decline.<sup>[3]</sup>

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This is reflected by the results of a study using MNA scale published in 2018 in Lithuania, which shows 51.5% of the participants were found to have a normal nutritional status, 43.2% were found to be at a risk of increased malnourishment, and 5.3% were malnourished.<sup>[4]</sup>

In addition, functional autonomy, which refers to the ability of performing basic as well as complex instrumental activities, is also markedly diminished, posing a higher risk of malnourishment, functional dependence and overall decreased quality of life among the elderly population. There have been many studies among the hospitalized patients to assess the nutritional status in order to correlate it to favourable and unfavourable effects on the success and recovery from various ailments, but we were unable to find many researches on the elderly living in the community.<sup>[5,6]</sup>

A study was conducted among the elderly in Islamabad, Pakistan, in 2015, which included 300 subjects: 48.7% of the respondents had normal nutrition, 8% were malnourished, and 43.3% were at a risk of malnourishment.<sup>[7]</sup>

Another study conducted in 2015 in Karachi, Pakistan, included 200 elderly participants, and the results showed that 30% of all participants had a severe functional decline and were at a risk of malnourishment. The prevalence of malnourishment was found to be 14.5%, while 33.5% were at a risk of developing malnourishment. The results of the study also commented on the limited nature of the study while stressing that more research is required in this quarter.<sup>[8]</sup>

There has been extensive research on malnourishment among children under five years in Pakistan but we find scarce data on the level of malnourishment among the elderly population. Better health care has ensured that the mean age of population has increased, bringing along the unique challenges of old age. Ageing is an independent factor in the development of chronic diseases, making our elderly particularly vulnerable to weight loss, muscle mass and strength decline, leading eventually to frailty syndrome that can have a considerable impact on recovery from acute illness and general quality of life.<sup>[9,10]</sup> Malnutrition is an important factor in determining the clinical outcomes, ability to cope with active disease, trauma and surgery, and in turn affecting the morbidity and mortality in acute and chronic diseases.<sup>[11]</sup> Therefore, it is imperative to assess the prevalence of malnourishment among the elderly Pakistani population in order to better focus its impact on diseases, hospitalization, surgeries and overall quality of life. We conducted this study on the elderly population using the Mini-Nutritional Assessment scale (MNA scale) presenting to a teaching care hospital in Karachi, Pakistan.<sup>[12]</sup>

## Materials and Methods

### Study design and setting

This study was conducted in family medicine clinics of a teaching care hospital located at the main campus and five

outreach centres in various areas of Karachi. The study was conducted from December 2021 to July 2022. The study design was cross-sectional.

### Inclusion and exclusion criteria

Inclusion criteria:

People of either gender of age 65 years or older and willing to participate were included.

Exclusion criteria:

1. Functional class IV
2. Patients with musculoskeletal diseases, which might account for the decreased body mass index (BMI)
3. Patients on total parenteral nutrition (TPN)

### Ethical consideration

The ethical review board of the hospital approved the study before data collection (Ref App#0548-2020LNH-ERC).

Written and informed consent from the participants was obtained.

Data are kept confidential. Privacy was given to patients while filling the questionnaire.

### Sample size calculation and sampling technique

The sample size was calculated using OpenEpi software with confidence interval of 95% and precision of 5%.

Using a previous study as reference <sub>6</sub> to estimate the prevalence of malnourishment in the elderly, which showed a prevalence of 14.5% as being malnourished, a sample size of 191 was calculated.

### Study instrument

The study proforma is composed of two sections: The first section includes patients' socio-demographic profile including age, gender, residence, education and comorbidities.

The second part was the nutritional assessment of the elderly. The MNA scale<sup>[12]</sup> was used to assess the prevalence of malnourishment and at-risk population. Its scoring is as follows: MNA contains a total of 18 items exploring intake of food decline over the previous three months, weight loss, mobility, psychological stress, neuropsychological problems, BMI, living independently, daily usage of three or more medicines, presence of pressure ulcers, daily complete meals, daily protein ingestion, daily vegetable and fruit intake, fluid intake daily, mode of feeding, self-view of nutrition, comparison of self-nutrition with others of same age, midupper arm circumference and calf circumference. The total score of the tool ranges from 17 to 30. A score of <17, 17–23.5 and 24–30 is labelled as malnourished, at risk of malnourishment and normal nutritional status, respectively.

## Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was employed to perform data analysis. Variables based on categories were summarized as frequencies and percentages. The study variable of numerical nature was expressed as median with interquartile range (IQR) as they were following non-Gaussian distribution. The Shapiro–Wilk test was applied to assess normality assumption. Categorical variables were compared among patients' status of malnutrition through Chi-square or Fisher's exact test. Quantitative variables were compared among three groups of malnutrition using the Kruskal–Wallis test. Ordinal logistic regression was used to evaluate the association of study variables with malnutrition. Variables with  $P < 0.25$  in the univariate analysis were put in a multivariable regression model. Statistical significance was set at  $P$  value  $\leq 0.05$  on the multivariable regression model.

## Guidelines for reporting

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed in the preparation of the manuscript.<sup>[13]</sup>

## Results

A total of 191 patients were recruited into the study. Participants' median age and BMI were 70 (IQR = 65–73) years and 4.8 29 and 24 (IQR = 21.8–27.7) kg/m<sup>2</sup>, respectively. The majority comprised males ( $n = 127$ , 66.5%). Most of the participants belonged to the middle class ( $n = 114$ , 59.7%), while 67 (35.1%) belonged to the upper class, and 10 (5.2%) belonged to the lower class. A total of seven (3.7%) participants had no formal education; 19 (9.9%) had education between primary and matriculation; 77 (40.3%) had an intermediate education; 75 (39.3%) completed graduation; 13 (6.8%) had a postgraduate degree; 71 (37.2%), 48 (25.1%), 15 (7.9%) and 10 (5.2%) had hypertension, diabetes, hypothyroid and ischaemic heart disease; 149 (78%) were living independently; 118 (61.8%) were managing financial matters independently; 38 (19.9%) were managing their day-to-day purchases; and 35 (18.3%) were incapable of handling their financial matters. Table 1 displays the response of study participants on MNA items.

The median MNA scores were 23.5 (IQR = 20.5–26). A total of 92 (48.2%) participants were found to have a normal nutritional status, 81 (42.4%) were found to be at a risk of malnourishment, and 18 (9.4%) were malnourished. Table 2 shows the comparison of participants' properties among different groups of nutritional status. BMI was significantly different among the three groups of nutritional status with a decreasing trend from normal to malnourished group ( $P < 0.001$ ). The prevalence of malnourishment was significantly higher among those who were incapable of managing their financial matters than those who were managing their finance independently or managing day-to-day purchases ( $P = 0.007$ ). Malnourishment frequency

was significantly higher among those who were not living independently ( $P = 0.040$ ).

Table 3 displays the univariate and multivariable association of factors with malnutrition. In the univariate analysis, increasing BMI was associated with lower risk of malnourishment. The odds of being malnourished were lower in males as compared to females. The likelihood of being malnourished was significantly 9-lower among those who were managing their finances independently and managing only day-to-day purchases as compared to those who were incapable of handling their financial issues. On the multivariable model, BMI and ability to manage finances were significantly associated with malnourishment.

## Discussion

The results show a frequency of 9.4% malnourishment among the geriatric population, while 42.4% were at a risk of developing malnourishment. These results are comparable to previous studies conducted in Islamabad and Karachi in 2015, which showed a prevalence of 8% and 14% malnourishment, while 33% and 43.3% were at risk, respectively.<sup>[7,8]</sup> There is a lack of any further studies conducted in Pakistan. The results of our study are considerably higher than those found in a study conducted in 2020 in Iran on community-dwelling elderly population, which showed a prevalence of 3.0% of the participants suffering from malnutrition, while 25.1% were at risk of malnutrition<sup>[14]</sup>, and another study conducted in Turkey on 102 participants showed 38.2% of the participants as being malnourished, while 18.6% were at high risk of malnutrition.<sup>[15]</sup> These differences may reflect a change in demographic characteristics and nutritional patterns among the elderly population in general.

Our study showed that females were more malnourished as compared to males. These findings are comparable to a systemic review conducted on 68 research articles in April 2019<sup>[16]</sup>; a possible reason for this finding could be poor nutrition in all age-groups among the females, global increased life expectancy among the female population, financial dependence, adverse life events and the difference in calf circumference and midupper arm circumference among the two genders, which can affect the results of the study. Our study could not find any association between education level of the participants and level of malnourishment but studies show that low educational level poses a risk for malnourishment. The lack of this association in our study might be due to the participation of literate population. This finding can be explained by a better understanding of healthy nutritional habits among those with better educational status.<sup>[17]</sup>

Similarly, a low socioeconomic status was found to be related to higher risk of malnourishment in this study. In 2020, a meta-analysis was conducted for ascertaining the association between socioeconomic status and malnourishment. The authors investigated the relation of four socioeconomic factors, namely living alone, marital status, monthly income and educational

**Table 1: Frequency of MNA items among study participants**

Variables	Groups	Frequency	Percentage
Reduced dietary intake throughout the previous 3 months	Severe decrease	32	16.8
	Moderate decrease	51	26.7
	None	108	56.5
Loss of weight over the past three months	>3 kg	38	19.9
	Does not know	23	12.0
	1-3 kg	22	11.5
	No weight loss	108	56.5
Mobility	Bedbound	2	1.0
	Able to get out of bed, does not go out	19	9.9
	Goes out	170	89.0
Has suffered psychological distress	Yes	40	20.9
	No	151	79.1
Neurophysiologic problems	Severe dementia	12	6.3
	Mild dementia	35	18.3
	No psychological problems	144	75.4
Body mass index	<19	14	7.3
	19-20.9	19	9.9
	21-22.9	31	16.2
	23 or above	127	66.5
Lives independently	No	42	22
	Yes	149	78
Uses>3 prescription drugs in a day	No	87	45.5
	Yes	104	54.5
Pressure sores	No	184	96.3
	Yes	7	3.7
Number of full meals in a day	1 meal	0	0.0
	2 meals	57	29.8
	3 meals	134	70.2
Dairy product consumption per day	Yes	141	73.8
	No	50	26.2
2 or>serving of legume or eggs per week	Yes	163	85.3
	No	28	14.7
Intake of meat and fish daily	Yes	133	69.6
	No	58	30.4
Consumed two or more servings of fruits and vegetables per day	Yes	152	79.6
	No	39	20.4
How much fluid consumed per day	3-5	51	26.7
	>5	140	73.3
Feeding mode	Unable to eat without assistance	5	2.6
	Self-fed with difficulty	24	12.5
	Self-fed without problem	162	84.8
Self-view of nutritional status	Malnourished	38	19.9
	Uncertain	16	8.4
	No nutritional problem	137	71.8
How does the patient consider health status	Not as good	30	15.7
	Does not know	19	9.9
	As good	52	27.2
	Better	90	47.1
Midupper arm circumference	<21	8	4.2
	21-22	11	5.8
	>22	172	90.1
Calf circumference	<31	54	28.3
	≥31	137	71.7

status with the development of malnourishment and found a nearly twofold increased risk (OR: 1.83; 95% CI: 1.73–1.93;  $P < 0.001$ ).<sup>[17]</sup> The reason for this might be an inability to obtain

sufficient nutritious food and lack of proper meal. These results are in uniformity with another study published in 2020, which was conducted in Iran. It reported a lower risk of malnourishment

**Table 2: Comparison of participants' characteristics among different groups of nutritional status**

Variables	Groups	Malnourishment status			P
		Normal n (%)	At risk n (%)	Malnourished n (%)	
Age (in years) <sup>#</sup>	-	70 (65-73)	70 (65-73)	69 (67-75)	0.707
BMI (in kg/m <sup>2</sup> ) <sup>#</sup>	-	26.1 (23.7-27.9)	23.8 (21.2-27.6)	21.7 (18.4-23.8)	**<0.001
Gender	Male	68 (53.5)	49 (38.6)	10 (7.9)	0.103
	Female	24 (37.5)	32 (50)	8 (12.5)	
Socioeconomic status	Lower class	6 (60)	4 (40)	0 (0)	0.883
	Middle class	55 (48.2)	49 (43)	10 (8.8)	
	Upper class	31 (46.3)	28 (41.8)	8 (11.9)	
Education	Illiterate	3 (42.9)	2 (28.6)	2 (28.6)	0.697
	Primary to matriculation	11 (57.9)	8 (42.1)	0 (0)	
	Intermediate	40 (51.3)	33 (42.3)	5 (6.4)	
	Graduation	35 (47.3)	32 (43.2)	7 (9.5)	
	Postgraduate	5 (38.5)	8 (61.5)	0 (0)	
Comorbidity					
Hypertension	-	35 (49.3)	32 (45.1)	4 (5.6)	0.379
Diabetes	-	20 (41.7)	22 (45.8)	6 (12.5)	0.501
Ischaemic heart disease	-	6 (66.7)	2 (22.2)	1 (11.1)	0.597
Hypothyroid	-	7 (70)	2 (20)	1 (10)	0.283
Ability to manage finance	Independently manage	61 (51.7)	49 (41.5)	8 (6.8)	0.007
	Manage only day-to-day purchases	21 (55.3)	16 (42.1)	1 (2.6)	
	Incapable of handling	10 (28.6)	16 (45.7)	9 (25.7)	
Live independently	Yes	76 (51)	63 (42.3)	10 (6.7)	*0.040
	No	16 (38.1)	18 (42.9)	8 (19)	

<sup>#</sup>Non-normal numerical variables are presented as median with IQR, I: Fisher's exact test was applied, \*Significant at  $P<0.05$ , \*\*Significant at  $P<0.01$

**Table 3: Association of participants' features with malnutrition**

Participants' features	Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Age (in years)	1 (0.9-1.1)	0.902	-	-
BMI (in kg/m <sup>2</sup> )	0.9 (0.8 – 0.9)	*0.004	0.8 (0.8-0.9)	**<0.001
Gender				
Male	0.5 (0.3-0.9)	*0.035	0.6 (0.3 – 1.3)	0.207
Female	Ref		-	-
Educational status				
Illiterate	1.7 (0.3-10.1)	0.552	-	-
Primary to matriculation	0.5 (0.1-2.1)	0.359	-	-
Intermediate	0.74 (0.24-2.3)	0.600	-	-
Graduate	0.9 (0.29-2.8)	0.858	-	-
Postgraduate	Ref		-	-
Socioeconomic status				
Lower class	0.5 (0.1-1.9)	0.316	-	-
Middle class	0.8 (0.5-1.5)	0.664	-	-
Upper class	Ref		-	-
Ability to manage finance				
Independently manage	0.3 (0.1 – 0.6)	**0.001	0.2 (0.1 – 0.5)	**<0.001
Manage only day-to-day purchases	0.2 (0.1 – 0.6)	**0.002	0.2 (0.1 – 0.6)	**0.002
Incapable of handling	Ref		Ref	
Live independently				
No	2 (1– 3.8)	*0.040	1.9 (0.9 – 3.8)	0.070
Yes	Ref		Ref	

BMI=Body mass index; CI=Confidence interval; OR=Odds ratio; Ref=Reference category. \*Significant at  $P<0.05$ , \*\*Significant at  $P<0.05$

among the elderly who manage their finance independently (OR: 0.625; CI: 0.233-0.938).<sup>[18]</sup>

According to the previously existing literature, living alone was found to be a significant factor in the development of

malnourishment.<sup>[17,18]</sup> This study also found an association between living independently and the risk of development of malnourishment. This finding could possibly be due to the psychosocial factors such as eating alone, preparing food, buying groceries and taking care to take nutritious food.



The trends of muscle mass decline show an accelerated muscle mass loss associated with active disease process, while ageing alone promotes a slower rate of muscle mass decline. Unintentional weight loss, a hallmark of malnourishment, is frequently seen in the elderly and is inevitably linked to loss of skeletal muscle mass, strength and function, termed as sarcopenia. Sarcopenia has an adverse impact on physical functioning, and concurrence of both sarcopenia and malnourishment has given origin to the term ‘sarcopenia malnourishment syndrome’.<sup>[19,20]</sup> This along with decreased dietary intake can lead to low bone mineral mass in the elderly, thereby increasing the fall risk and accelerating risk of osteoporosis and osteoporotic fractures. Risk of falls, osteoporotic fractures and subsequent risk of disability and loss of independence can diminish the quality of daily life considerably.<sup>[21,22]</sup> Our study used BMI, calf circumference and midupper arm circumference to assess malnourishment, which were found to be directly proportional to malnourishment. Those with malnourishment had the lowest BMI, CC and MAC, while the highest values were among those with no nutritional deficit. These findings are in collaboration with the findings of a Chinese study conducted by X.Hu and *et al.*, which also used the MNA test.<sup>[15]</sup>

Malnutrition considerably impairs the process of wound healing,<sup>[23]</sup> promoting the development of chronic wounds that add to the healthcare burden of both the patients and healthcare system.<sup>[24]</sup>

There are several reasons of malnourishment among the elderly. Reduced taste and smell, decreased appetite and limited dietary choices might contribute to decreased oral intake. Acute illness, presence of several comorbidities, poor dentition and visual impairment can also exacerbate the condition. Psychosocial factors are also important to take note of, such as eating/living alone, ability to cook, shopping accessibility, illness and low income.<sup>[25,26]</sup> It is a recognized factor that psychosocial factors have an adverse impact on the nutritional status of the elderly in all settings.<sup>[27]</sup>

### Strengths and limitations

This study has several limitations. Firstly, it was conducted in a hospital setting, where the population has a high probability of suffering from various comorbidities, resulting in low BMI and nutritional level. Secondly, it depicts the experience of just one institution.

### Conclusion

This study shows an alarmingly high rate of the elderly population at risk of developing malnourishment, and financial independence and increasing BMI were associated with a decreased risk of malnourishment.

### Key message and recommendations

Based on the study findings, it would be prudent to suggest that:

1. Early screening of malnourishment among the elderly should

be implemented at the primary care level to identify the at-risk population.

2. Further community-based, large-scale, multi-centred studies are warranted to explore the burden of malnourishment and its associated factors among the elderly population.
3. There is a need of well-designed trials to identify treatment effects of malnourishment. There should be more research in terms of treatment targeting specific underlying causes of malnourishment.<sup>[24]</sup> This can be brought about by employing a broad interdisciplinary approach for a longer period, along with the identification of factors contributing to malnourishment, thereby developing a causation-oriented multimodal treatment.<sup>[20]</sup>

### Declaration of patient consent

The authors attest that they have all necessary patient permission paperwork on file. The patient(s) has/have granted permission in the form for his/her/its photographs and other clinical data to be published in the journal. The patients are aware that while every attempt will be made to keep their identities hidden and their names and initials kept confidential, anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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