Original Article

Assessment of factors predicting the nutritional status of geriatric people in Tabuk, Saudi Arabia

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ABSTRACT

Background: On a global level, geriatric malnutrition is a substantial problem as it has many adverse health outcomes including increased morbidity and death rates, in addition to poor health-related quality of life. This study aims to assess the nutritional status of patients attending geriatric clinics at hospitals. **Material and Methods:** An observational cross-sectional study was conducted in Tabuk city, northern Saudi Arabia, among geriatric patients aged over 60 years who attended geriatric clinics throughout the study period (December, 2022 to February, 2023). A validated self-administered questionnaire was used in data collection. It includes demographic, habitual, and medical characteristics of the participants, anthropometric data (weight and height), and the validated short form of Mini Nutritional Assessment tool to assess their nutritional status. **Results:** The study included 307 geriatric patients out of targeted 362 (response rate = 84.8%). The age of almost half of them (49.2%) ranged between 60 and 69 years, and males constituted 56.4% of them. Overall, 17.3% of the participants were malnourished, whereas 41.4% were at risk of malnutrition. Results of multivariate logistic regression analysis revealed that compared to married participants, widowed participants were at higher significant risk for malnutrition [adjusted odds ratio (aOR): 2.59, 95% confidence interval (CI): 1.01–6.85, $P = 0.049$]. Compared with participants who were living alone, those living with their spouse were at 86% lower risk for malnutrition (aOR: 0.14, 95% CI: 0.03–0.62, $P = 0.010$). Overweight and obese subjects were at significant lower risk for malnutrition as compared to underweight subjects (aOR: 0.04, 95% CI: 0.01–0.44, $P = 0.008$ and aOR: 0.05, 95% CI: 0.01–0.54, $P = 0.013$, respectively). Participants who never practiced exercise or practiced it irregularly were at higher risk for malnutrition as opposed to those who practice physical activity regularly (aOR: 3.45, 95% CI: 1.42–8.38, $P = 0.006$ and aOR: 3.60, 95% CI: 1.48–8.77, $P = 0.005$, respectively). Patients with more than three chronic disease/heath problems were at 4-fold risk for developing malnutrition as compared to those without history of chronic diseases/health problems (aOR: 4.0, 95% CI: 1.31–12.17, $P = 0.015$). **Conclusion:** Malnutrition is a public health problem affecting a considerable proportion of geriatric people in Tabuk, southern Saudi Arabia, with some modifiable risk factors associated with malnutrition.

Keywords: Geriatric people, malnutrition, prevalence, risk factors, Saudi Arabia

Introduction

Individuals aged 60 years and over are the fastest growing age group all over the world.[1,2] The World Health Organization (WHO) has predicted that aging populations will present new challenges to health care.[3] The health of the elderly will be an important issue defining the health status of a population and considered an integrated part of the primary healthcare services. As the number of elderly increases, their health needs will increase too.[3–5]

Aging is associated with multimorbidity, and this was found to be higher in developing countries.[6] Therefore, for estimating malnutrition, health policies should address this subgroup of the population. Malnutrition of the elderly is defined as "faulty or inadequate nutritional status (or) undernourishment characterized by insufficient dietary intake, poor appetite, muscle wasting, and weight loss (both under- and overweight are considered as

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malnutrition statues)". If overlooked, malnutrition leads to poor health and decreased quality of life. It is highly prevalent among geriatric outpatient clinics and is usually associated with defective functional status and poor quality of life.[6]

On a global level, geriatric malnutrition is a substantial problem. Its prevalence ranges between 15 and 29%.[7-10] In 2014, the increase in the number of people in this group was triple that of the whole population. Between 1994 and 2014, the number of elderly doubled, with two thirds living in less developed regions of the world. By 2050, it is expected that the number of elderly dependent adults in Saudi Arabia will equal the number of dependent children for the first time.[4,6]

Malnutrition among elderly has many adverse health outcomes including increased morbidity and death rates, prolonged hospitalization,[11] functional impairment,[12] poor health-related quality of life,[13] increased rate of infectious diseases, anemia, electrolyte imbalances, fatigue, and muscle wasting.[14,15] Additionally, it has been found that rate of falls increased among undernourished elderly people who are either living in long-term care facility or hospitalized.[16]

Despite its high prevalence and well-documented adverse effects, malnutrition remains underidentified in this vulnerable group.[6] Therefore, this study was conducted to assess the nutritional status of patients attending geriatric clinics at Tabuk's hospitals in Saudi Arabia.

Material and Methods

An observational cross-sectional study was carried out in Tabuk city, which is located 2200 feet above the sea level. It has a population of 910,030 (2017 estimated census).[17] The study was conducted among geriatric patients (males and females) aged over 60 years who attended geriatric clinics at King Fahd Specialist and King Khalid Civil throughout the study period (December, 2022 to February, 2023).

The sample size required for our study was estimated according to the following formula:

•$n = Z^2 P (1-P)/D^2$

n: The estimated sample size

p: Prevalence of malnutrition (overt/at risk) among elderly patients (38.2%).[3]

Z: confidence level at 95% (a standard value of 1.96)

D = margin of error at 5% (a standard value of 0.05)

$N = 1.96^2\ 0.38 \times 0.0.62/0.05^2$

The sample size was a minimum of 362 patients.

The patients were equally distributed over the involved two hospitals, King Fahd Specialist and King Khalid Civil hospitals. The systematic random sampling technique was adopted to select five individuals with inclusion criteria from those attending the geriatric clinics of the two hospitals every working day (the sampling interval was decided according to the total number of patients attaching geriatric clinics in each hospital).

A validated self-administered questionnaire was used in data collection. For illiterate participants and those who were not able to read and write, a questionnaire interview was adopted by the researcher or a trained nurse.

This tool comprises the following parts: Section A includes demographic, habitual, and medical characteristics of the participants (age, gender, nationality, marital status, highest educational level, occupation, income, residence, living status, history of chronic diseases/problems, smoking, and practicing physical exercise), and Section B includes the anthropometric data (weight and height). Weight was measured to the nearest 0.1 kg while the patient was lightly clothed. Height was measured to the nearest 0.1 cm while the patient was standing without shoes on a stadiometer. Body mass index was calculated as the patient's weight in kg divided by the square of the patient's height in cm.[18]

Section C includes the validated short form of Mini Nutritional Assessment tool (MNA-SF).[19] It was introduced in 1994 and has a sensitivity of 96% and 98% specificity of 98%.[20] The maximum score of the MNA is 14. Those who scored less than 8 were considered malnourished, while those scored between 8 and 11 were considered at risk of malnutrition, and subjects who scored 12 and above are considered well nourished. The Arabic version was published by Nestlé Nutrition Institute and is freely available online.[21]

The data were coded and entered using the statistical Package for Social Science software program (SPSS), version 28 for statistical description and analysis. Continuous variables were expressed as means and standard deviation (SD), whereas categorical variables were expressed as numbers and percentages. Chi-square test of association or Fischer exact test (univariate analysis) was used to examine the significance of categorical variables. Multivariate logistic regression analysis was carried out to identify predictors of malnourishment, including significant factors from the univariate analysis as the first step in the model and omitting nonsignificant factors afterward. Results of multivariate logistic regression analysis were expressed as adjusted odds ratio (AOR) and their 95% confidence interval (CI), and a P value less than 0.05 was used to specify statistical significance. In multivariate logistic regression analysis, the category of at risk of malnutrition was added to the malnutrition category in one group against well-nourished.

The official approval from Regional Research and Ethics Committee in Tabuk was obtained. In addition, formal approvals from the directors of the involved hospitals were obtained.

Written consent to participate was signed before data collection. For illiterate patients, a close family member was asked to sign the consent form after explanation to the patient.

Results

The study included 307 geriatric patients out of targeted 362 (response rate = 84.8%). Table 1 presents their demographic characteristics. The age of almost half of them (49.2%) ranged between 60 and 69 years, whereas that of 16.9% exceeded 80 years. Males constituted 56.4% of the respondents, and the majority of them (93.2%) were Saudi nationals. Almost two-thirds (63.5%) were married, and 47.6% were illiterates. About half (48.2%) of the patients were retired, and the monthly income of 62.6% of them was less than 5000 Saudi Royals/month). The majority of them (80.8%) live in urban areas with their spouse or children (93.1%). The rate of current smoking was 11.1%, and that of physical inactivity was 52.4%.

A vast majority of the respondents (92.2%) reported history of chronic diseases/health problems, mainly hypertension (62.2%), diabetes (51.8%), and vision problems (36.2%), Figure 1.

The frequency of overweight and obesity among them was 31.7% and 15.8%, respectively, whereas that of underweight was 4.6%, Figure 2.

Assessment of nutritional status

A severe decrease in food intake over the past 3 months due to loss of appetite, digestive problems, chewing, or swallowing difficulties was reported by 10.1% of the geriatric patients, while weight loss greater than 3 kg was reported by 12.4% of them. As regards mobility, bed or chair bound was observed among 14.3% of them. Almost one-quarter of them (22.5%) suffered from psychological stress or acute disease in the past 3 months, while 2.9% had severe dementia or depression. A body mass index of less than 19 kg/m² was observed among 9.4% of the respondents, Table 2.

Overall, 17.3% of the participants were malnourished, whereas 41.4% were at risk of malnutrition, Figure 3.

Factors associated with geriatric malnutrition
Demographic, social, and medical factors
From Table 3, it is shown that older individuals (>80 years) were more likely to have malnutrition compared to those aged between 70 and 80 years and those aged between 60 and 69 years (46.2% versus 12.5% and 10.6%), respectively ($P < 0.001$). As regards marital status, malnutrition was the highest reported among widowed individuals (30.9%) and the lowest among married individuals (10.8%), $P < 0.001$. Regarding educational level, the highest level of malnutrition was observed among illiterate patients (24%) and the lowest rate was observed among secondary school educated patients (7.5%), $P = 0.042$. A third of the participants living alone compared to only 7.8% of those living with their spouse were malnourished, $P < 0.001$. Participants who never practiced physical exercise were more

Table 1: Demographic and habitual characteristics of the participants (*n*=307)		
Variables	**Frequency**	**Percentage**
Age (years)		
60-69	151	49.2
70-80	104	33.9
>80	52	16.9
Gender		
Male	173	56.4
Female	134	43.6
Nationality		
Saudi	286	93.2
Non-Saudi	21	6.8
Marital status		
Married	195	63.5
Divorced	15	4.9
Widowed	97	31.6
Educational level		
Illiterate	146	47.6
Primary school	63	20.5
Intermediate school	29	9.4
Secondary school	53	17.3
University	16	5.2
Occupation		
Working	13	4.2
Not working	49	16.0
Retired	148	48.2
House wife	97	31.6
Income (SR/month)		
<5000	192	62.6
500-10000	64	20.8
10001-15000	40	13.0
>15000	11	3.6
Residence		
Rural	59	19.2
Urban	248	80.8
Living status		
Alone	15	4.9
With spouse	154	50.1
With children	132	43.0
With others	6	2.0
Smoking status		
Never smoke	173	56.3
Current smoker	34	11.1
Ex-smoker	100	32.6
Practicing physical exercise		
Yes, regular	50	16.3
Yes, irregular	96	31.3
Never	161	52.4

likely to develop malnutrition compared to those practicing physical exercise, regular or irregular (26.1% vs 4.0% and 9.4%, respectively), $P < 0.001$. Participants with history of more than three chronic diseases were more likely to develop malnutrition opposed to those without chronic disease or with three diseases or less (28.8% vs 4.2% and 9.3%, respectively), $P < 0.001$, Table 3.

Body mass index

Underweight subjects were more likely to have malnutrition (53.8%) compared to normal (22.1%), overweight (4.4%), and obese subjects (8.9%), $P < 0.001$, as illustrated in Table 4.
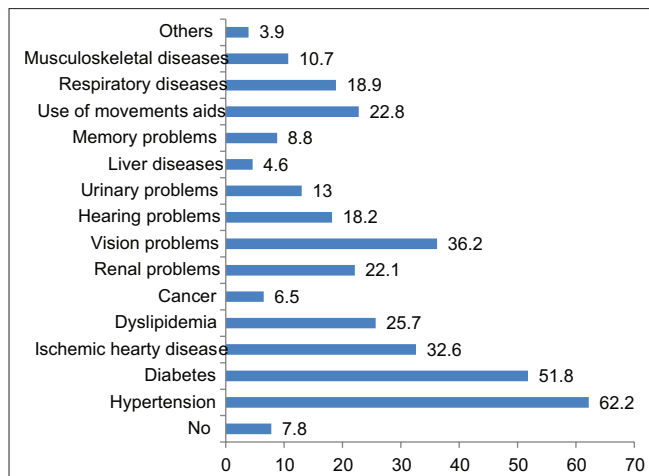
Figure 1: History of chronic diseases/health problems among the respondents (*n* = 307)
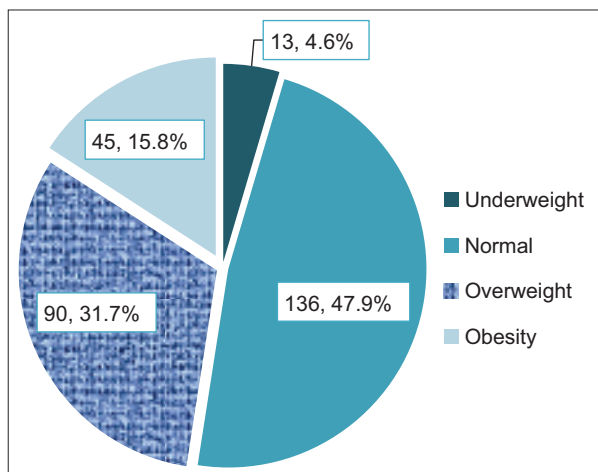

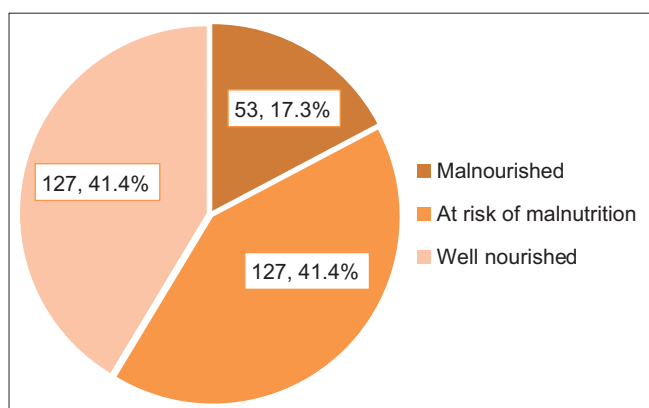**Figure 2:** Body mass index of the participants (*n* = 284)

Figure 3: Nutritional status of the geriatric patients based on MNA-SF

Multivariate logistic regression analysis

Results of multivariate logistic regression analysis revealed that compared to married participants, widowed participants were at higher significant risk for malnutrition [adjusted odds ratio (aOR): 2.59, 95% confidence interval (CI): 1.01–6.85, $P = 0.049$]. Compared with participants who were living alone, those living

Table 2: Response of the participants to the questions of Mini Nutritional Assessment tool		
	Frequency	Percentage
Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?		
Severe decrease in food intake	31	10.1
Moderate decrease in food intake	106	34.5
No decrease in food intake	170	55.4
Weight loss during the last 3 months		
Weight loss greater than 3 kg	38	12.4
Does not know	114	37.1
Weight loss between 1 and 3 kg	49	16.0
No weight loss	106	34.5
Mobility		
Bed or chair bound	44	14.3
Able to get out of bed/chair but does not go out	71	23.1
Goes out	192	62.6
Has suffered psychological stress or acute disease in the past 3 months?		
Yes	69	22.5
No	238	77.5
Neuropsychological problems		
Severe dementia or depression	9	2.9
Mild dementia	31	10.1
No psychological problems	267	87.0
Body Mass Index (BMI) (weight in kg)/(height in m^2)		
BMI less than 19	29	9.4
BMI 19 to less than 21	39	12.7
BMI 21 to less than 23	73	23.8
BMI 23 or greater	166	54.1

with their spouse were at 86% lower risk for malnutrition (aOR: 0.14, 95% CI: 0.03–0.62, $P = 0.010$). Overweight and obese subjects were at significant lower risk for malnutrition as compared to underweight subjects (aOR: 0.04, 95% CI: 0.01–0.44, $P = 0.008$ and aOR: 0.05, 95% CI: 0.01–0.54, $P = 0.013$, respectively). Participants who never practiced exercise or practiced it irregularly were at higher risk for malnutrition as opposed to those who practice physical activity regularly (aOR: 3.45, 95% CI: 1.42–8.38, $P = 0.006$ and aOR: 3.60, 95% CI: 1.48–8.77, $P = 0.005$, respectively). Patients with more than three chronic diseases/health problems were at 4-fold risk for developing malnutrition as compared to those without history of chronic diseases/health problems (aOR: 4.0, 95% CI: 1.31–12.17, $P = 0.015$). Participants' age and educational level were not significantly associated with malnutrition after controlling for the confounding effect, Table 5.

Discussion

One of the essential needs of the geriatric population is appropriate nutrition; thus, failure to identify malnutrition among them in a proper time could result in severe illness and consequent deterioration of their quality of life.[22] Despite the increase in their proportion in the Saudi population as a result of improvement of living and economic status as well as health facilities, this subject was rarely investigated in the Kingdom of Saudi Arabia. Therefore, the current study was carried out to

Table 3: Demographic, social and medical factors associated with geriatric malnutrition			
	Nutritional status		P*
	Malnourished n=53 n (%)	At risk of malnutrition n=127 n (%)	Well-nourished n=127 n (%)	
Age (years)				
60-69 (n=151)	16 (10.6)	59 (39.1)	76 (50.3)	<0.001
70-80 (n=104)	13 (12.5)	49 (47.1)	42 (40.4)	
>80 (n=52)	42 (46.2)	19 (36.5)	9 (17.3)	
Gender				
Male (n=173)	26 (15.0)	69 (39.9)	78 (45.1)	0.262
Female (n=134)	27 (20.1)	58 (43.3)	49 (36.6)	
Nationality				
Saudi (n=286)	52 (18.2)	115 (40.2)	119 (41.6)	0.178
Non-Saudi (n=21)	1 (4.8)	12 (57.1)	8 (38.1)	
Marital status				
Married (n=195)	21 (10.8)	82 (42.1)	92 (47.2)	<0.001
Divorced (n=15)	2 (13.3)	6 (40.0)	7 (46.7)	
Widowed (n=97)	30 (30.9)	39 (40.2)	28 (28.9)	
Educational level				
Illiterate (n=146)	35 (24.0)	63 (43.2)	48 (32.9)	0.042
Primary school (n=63)	8 (12.7)	24 (38.1)	31 (49.2)	
Intermediate school (n=29)	3 (10.3)	15 (51.7)	11 (37.9)	
Secondary school (n=53)	4 (7.5)	20 (37.7)	29 (54.7)	
University (n=16)	3 (18.8)	5 (31.2)	8 (50.0)	
Occupation				
Working (n=13)	1 (7.6)	6 (46.2)	6 (46.2)	0.064
Not working (n=48)	15 (31.3)	21 (43.7)	12 (25.0)	
Retired (n=148)	21 (14.2)	57 (38.5)	70 (47.3)	
House wife (n=97)	16 (16.5)	42 (43.3)	39 (40.2)	
Income (SR/month)				
<5000 (n=192)	40 (20.8)	84 (43.8)	68 (35.4)	0.109
500-10000 (n=64)	9 (14.1)	24 (37.5)	31 (48.4)	
10001-15000 (n=40)	3 (7.5)	16 (40.0)	21 (52.5)	
>15000 (n=11)	1 (9.1)	3 (27.3)	7 (63.6)	
Residence				
Urban (n=248)	40 (16.2)	104 (41.9)	104 (41.9)	0.559
Rural (n=59)	13 (22.0)	23 (39.0)	23 (39.0)	
Living status				
Alone (n=15)	5 (33.3)	5 (33.3)	5 (33.3)	<0.001
With spouse (n=154)	12 (7.8)	59 (38.3)	83 (53.9)	
With children (n=132)	34 (25.8)	60 (45.4)	38 (28.8)	
With others (n=5)	1 (20.0)	3 (60.0)	1 (20.0)	
Smoking status				
Never smoke (n=173)	26 (15.0)	75 (43.4)	72 (41.6)	0.217
Current smoker (n=34)	3 (8.8)	16 (47.1)	15 (44.1)	
Ex-smoker (n=100)	24 (24.0)	36 (36.0)	40 (40.0)	
Practicing physical exercise				
Yes, regular (n=50)	2 (4.0)	11 (22.0)	37 (74.0)	<0.001
Yes, irregular (n=96)	9 (9.4)	45 (46.8)	42 (43.8)	
Never (n=161)	42 (26.1)	71 (44.1)	48 (29.8)	
History of chronic diseases				
No (n=24)	1 (4.2)	9 (37.5)	14 (58.3)	<0.001
Yes, less than 3 diseases (n=151)	14 (9.3)	55 (36.4)	82 (54.3)	
Yes, more than 3 diseases (n=132)	38 (28.8)	63 (47.7)	31 (23.5)	

*Chi-square test

assess the nutritional status among geriatric patents attending geriatric clinics in Tauk, northern Saudi Arabia.

Prevalence of malnutrition

The current study revealed a prevalence of malnutrition of 17.3%, whereas 41.4% were at risk of malnutrition based on the validated Arabic version of MNA-SF. Various results have been identified from different regions all over the world utilizing different data collection tools with variable cutoff values as well as different demographic (particularly age) characteristics and different participants' categorization (particularly history of hospitalization). These aforementioned factors could explain partially the difference between these studies regarding malnutrition prevalence.

Table 4: Association between participants' body mass index and geriatric malnutrition (n=284)

BMI (n=391)	Nutritional status			P*
	Malnourished n=45 n (%)	At risk of malnutrition n=120 n (%)	Well-nourished n=119 n (%)	
Underweight (n=13)	7 (53.8)	53 (8.5)	1 (7.7)	<0.001
Normal (n=136)	30 (22.1)	67 (49.3)	39 (28.7)	
Overweight (n=90)	4 (4.4)	34 (37.8)	52 (57.8)	
Obesity (n=45)	4 (8.9)	14 (31.1)	27 (60.0)	

*Chi-square test

Table 5: Predictors of malnutrition among the participants: Multivariate logistic regression analysis

	Adjusted odds ratio	95% confidence interval	P
Marital status			
Married[a]	1.0	---	0.097
Divorced	4.42	0.04-1.31	0.049
Widowed	2.59	1.01-6.85	
Living status			
Alone[a]	1.0	---	0.010
With spouse	0.14	0.03-0.62	0.901
With children	0.92	0.24-3.46	0.810
With others	0.70	0.04-12.67	
Body mass index			
Underweight[a]	1.0	---	0.182
Normal	0.21	0.02-2.06	0.008
Overweight	0.04	0.01-0.44	0.013
Obese	0.05	0.01-0.54	
Practicing physical exercise			
Yes, regular[a]	1.0	---	0.005
Yes, irregular	3.60	1.48-8.77	0.006
Never	3.45	1.42-8.38	
History of chronic diseases			
No[a]	1.0	---	0.936
Yes, less than 3 diseases	0.96	0.34-2.70	0.015
Yes, more than 3 diseases	4.0	1.31-12.17	

[a]Reference category. Variables removed from the final model (not significant): Age and educational level

Limited local studies were conducted regarding prevalence and predictors of malnutrition among elderly individuals in the Kingdom of Saudi Arabia. In Jeddah (2016), among elderly persons in an outpatient clinic of a teaching hospital, only 5.3% of those aged 60 years and more had overt malnutrition and almost one-third (32.9%) were at risk of being malnourished.[4] In another study performed in Jeddah in 2017 among hospitalized elderly patients utilizing the MNA-SF, a total of 76.6% patients were either malnourished or at risk of malnutrition.[6]

Several studies have been conducted on a worldwide level. In Iran (2021), a community-based cohort study was conducted to assess the nutritional status of the geriatric population (60 years and older) using the MNA questionnaire and revealed that 73.3% of the participants had normal nutrition (score ≥ 24), while 0.9% and 25.8% were malnourished (score < 17) and at high risk of malnutrition (score: 17–23.5), respectively.[23] Also, in Iran (2020), among community-dwelling people aged 60 and overusing MNA tool, poor nutrition was reported among 28.1% of the participants.[24] Previously in Iran (2019), among the elderly aged 60 years and older covered by the social security organization, 25% were at risk of malnutrition and 6% were malnourished.[25] In India (2020), among geriatric patients aged ≥65 years, using MNA tool, the nutritional status of 47.6% of patients was normal, while 48.8% of patients were at risk of malnutrition and 3.5% were malnourished.[26] In Lebanon (2017), 45.5% of the elderly population were at risk of malnutrition, whereas the prevalence of malnutrition was only 2.8%.[23,27] In Turkey (2021), among elderly patients aged 65 years and more who attended outpatient clinics of a hospital, the prevalence of malnutrition was 3.3% and that of at risk of malnutrition was 24.7%.[24,28] Also, in another Turkish study (2015), the prevalence of malnutrition among elderly people (65 years and above) was 19%, whereas 29.1% of them were at risk of malnutrition.[25,29] In Norway (2016), among those aged ≥65 years and being admitted to an acute geriatric ward, nearly one in two patients was at risk of malnutrition, while one in four was malnourished.[30] In India (2015), the prevalence of malnutrition was 15%, whereas the at risk of malnutrition was observed among 55% of elderly people aged over 60 years.[31] In Sri Lanka (2018), the malnutrition prevalence was 12.5% of elderly individuals and malnutrition risk was reported in 52.5% of them.[32] Globally, the overall pooled prevalence was 22.8% in 2010.[33]

Associated factors

The univariate analysis in the present study revealed that older individuals (aged 80 years and over) were more likely to be malnourished compared to younger; however, this effect has disappeared after controlling for confounders in multivariate analysis. Other studies found an association between age of geriatric people and malnutrition.[4,23,34,35]

Many studies have demonstrated that geriatric women were more likely to be malnourished than men,[4,22,24,31,34,36] elderly women in the current study. However, in the present study, we did not find a gender difference regarding malnutrition.

Geriatric people with a lower body mass index (underweight) in the present survey expressed a higher rate of malnutrition compared to overweight and obess subjects. The same has been reported in a study carried out in Spain among hospitalized patients aged 65 years and over,[34] in Iran among the elderly aged 60 years and older covered by the social security organization,[22] and also in Cyprus[37] and Turkey.[29] On the other hand, Mitri et al. (2017)[27] reported an association of malnutrition with a high body mass index.

In the present study, elderly persons living alone were at higher risk for malnutrition compared to those living with their spouse. In agreement with this finding, Cin P et al. (2021)[28] in Iran reported that geriatric patients living alone were at higher risk of malnutrition compared to others. Also, in Iran (2020), Bakhtiari A observed that people living alone were at higher risk for malnutrition than their peers.[24]

In the present study and in agreement with others in USA,[38] we observed an association between elderly widowhood status and malnutrition.

It is clear from this study that an elderly person practicing regular physical activity was at lower risk for malnutrition as opposed to those who never practice physical activity. The association between physical inactivity and malnutrition was also observed in other studies.[31,37]

In this study, patients with more than three chronic diseases/health problems were at higher risk for malnutrition compared to those without history of chronic diseases. In another Saudi study, malnutrition was highly prevalent among hospitalized elderly and was associated with increased length of stay and mortality.[6] In Iran (2020), patients with history of chronic diseases were at almost double risk for malnutrition compared to those without chronic diseases.[24]

Strengths and limitations

The main strengths of the present study are its unique nature in northern Saudi Arabia. Also, a relatively enough sample is a strength point of the study. However, some important limitations should be expressed. Being a single healthcare facility study could impact the generalizability of findings over other sectors and places in the Kingdom of Saudi Arabia. Some important factors that could affect the nutritional status of geriatric people were not investigated in the current study, including psychiatric status, mainly depression, and presence of dental/oral problems. Using a self-reported tool in assessing malnutrition is another limitation as it could lead to subjective bias; however, it is a valid tool used in several previous studies. Despite those limitations, this study's results would help health authorities in Tabuk, Saudi Arabia, to improve the nutritional status of geriatric people.

In conclusion, malnutrition is a public health problem affecting a considerable proportion of geriatric people in Tabuk, southern Saudi Arabia, particularly widowed, living alone, underweight subjects, those who never practiced exercise or practiced it irregularly, and patients with more than three chronic diseases/ health problems. Based on this study's findings, decision makers have to introduce awareness raising programs for elderly people about nutrition and dietary intake. Screening of elderly individuals routinely for nutritional status at primary healthcare centers and outpatient clinics of hospitals to discover malnutrition at earlier stages is needed; the Arabic short form of MNA can be utilized in this regard, and referral of elderly individuals with malnutrition or at risk of malnutrition to nutritionists for continuing the care is needed. In addition, further multicentric studies, including all possible factors that could impact geriatric nutritional status, are needed to better clarify the situation.

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Conflicts of interest

There are no conflicts of interest.

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