



PREDICTORS AND PROGNOSIS OF MALNUTRITION IN OLD PATIENTS IN THE REGION OF MONASTIR (TUNISIA)

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Abstract: *Objective:* To identify risk factors associated with malnutrition in old patients and to assess the prognosis of malnourished ones in the region of Monastir (Tunisia). *Methods:* a cross sectional study was done with 662 elderly (225 inpatients and 437 outpatients). The nutritional status was classified by the MNA (Mini Nutritional Assessment) into: malnourished, risk of malnutrition and without malnutrition (adequate). The prognosis of malnourished patients was evaluated using the pronostic inflammatory and nutritional index (PINI), and the Geriatric nutritional risk index (GNRI). *Results:* Among the assessed elderly, 33 (14.7%) inpatients and 11 outpatients (2.5%) were malnourished with a prevalence of 6.7% (CI95% = 4.8 - 8.6). The multivariate analysis showed that inpatients, singles and with comorbidities were significantly more likely to develop a malnutrition (adjusted odds ratio ranged from 2.18 to 7.25). Results of the prognosis scores showed that 35.2 and 25% of malnourished patients were at higher risk of complications according to PINI and GNRI respectively. *Conclusion:* We suggested that nutritional status should ideally be assessed in every patient. Screening systematically for malnutrition at high risk in-and outpatient departments should be considered. We also feel that our findings highlight the need for a nutritional intervention trial among at risk and malnourished hospitalized patients.

Key words: Malnutrition, aged, risk factors, prognosis, Tunisia.

Introduction

Elderly people are known to be at a greater risk of malnutrition, particularly those having diseases or illnesses and high prevalence of protein energy. Malnutrition in geriatric patients has been reported by several studies (1) and routine screening of patients to identify risk of malnutrition in elderly has been recommended by many organizations (World Health Organization, NHS Quality Improvement Scotland...) (2, 3). Despite these facts, malnutrition in old age is often not diagnosed properly in many health care settings, including general practice and hospital outpatients and inpatients, resulting in a failure to meet the nutritional needs of the elderly (4, 5).

According to literature, the mini nutritional assessment was a useful screening tool for in and outpatient's elders at risk of malnutrition (6). It is associated with poor clinical outcomes and is able to

predict functional decline. Together with rapid-turnover visceral proteins (albumin, prealbumin, C-reactive protein...) have been shown to correlate with gravity and impact of malnutrition (7).

In Tunisia, geriatric population is growing very fast following the increase in life expectancy. The increase of this population will be followed by the emergence of various problems in health care and services. So incidence of malnutrition is likely to be very high in them and the need for nutritional assessments and interventions is particularly crucial in our context (8). However, nutritional problems are not yet acknowledged by health professionals as a priority for the elderly.

The objective of our study was to identify risk factors associated with the development of malnutrition in old patients and to assess the prognosis of malnourished ones in the region of Monastir (Tunisia).

Methods

Setting and sampling

We conducted a cross sectional study from Mars to August 2009 in the region of Monastir which included 5% of the Tunisian population. Its sanitary structure comprises a university hospital and 15 primary health

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care centers (PHC).

In order to include inpatient and outpatient, the study was carried out at the university hospital and three randomly selected PHC. In hospital, all patients 65 years-of-age or older admitted to any of the internal medicine, cardiology and pulmonology departments were screened to determine nutritional status. The same approach was used for PHC outpatients.

Assuming a rate of elderly malnutrition of 82.9% for inpatients and 43.8% for outpatients based on prior literature (8), we calculated that the study would require a sample of 225 inpatients and 394 outpatients to achieve a precision of +5% (based on a 0.05 probability of a type 1 error).

Nutritional assessment

We used the Arabic version of the Mini Nutritional Assessment (MNA) short and complete form. It was developed to evaluate the risk of malnutrition in the elderly in general practice and upon admission to a nursing home or hospital. It consists of a general health assessment, a dietetic assessment, anthropometric measurements, the patient's subjective assessment, and global evaluation. In our study anthropometric measurements were done by trained staffs.

The short MNA sums to a total of 14 points, if the patient was scored 11 or below the possibility of malnutrition is present we must proceed with the rest of the assessment. The complete form classes the elderly as well-nourished, at risk of malnutrition or undernourished if the score is more than 24 points, 17 to 23.5 and less than 17 points, respectively. For undernourished patients we do biological exams (albumin, prealbumin, C-reactive protein and Orosomucoide) to assess the endogenous or exogenous aspect of undernourishment.

The last step in the Nutritional assessment was index calculation. In fact we calculate the pronostic inflammatory and nutritional index (PINI), and the Geriatric nutritional risk index (GNRI) that are correlated with severity of the malnutrition.

Operative definitions

PINI scoring = $(\text{C-reactive protein} \times \text{Orosomucoide}) / (\text{Albumin} \times \text{Prealbumin})$. According to the value of PINI, patients were classified in five categories (9).

- PINI <1 no risk
- $1 \leq \text{PINI} \leq 10$: lower risk
- $11 \leq \text{PINI} \leq 20$: moderate risk
- $21 \leq \text{PINI} \leq 30$: high risk
- PINI >30: vital risk

GNRI scoring = $1.519 \times (\text{Albumin}) + 41.7 \times (\text{present/ideal body weight})$. With GNRI four grades of

nutrition-related risk were defined, major risk (GNRI: <82), moderate risk (GNRI: 82 to <92), low risk (GNRI: 92 to ≤98), and no risk (GNRI: >98) (10, 11).

Statistical analysis

Statistical analyses were conducted using SPSS for Windows version 17 and p-value < 0.05 was considered to be statistically significant. Univariate analysis was conducted using t-tests for continuous variables and χ^2 for categorical variables. A multivariate stepwise logistic regression was used to identify associated factors to malnutrition. The dependent variable was presence or absence of malnutrition. Explicative variables with a univariate test value ≤0.25 were included. The final retuned variables were those significant at the level of 5%.

Ethical approval

This study was submitted and approved by the Human Research Ethics Committee of our institution. The work began after the patient was informed of the purpose of the study and agreed to participate, signing an informed consent form.

Results

Patient's characteristics

The sample consists of 662 elderly (225 inpatients and 437 outpatients) with a mean age (SD) of 73.2 years (5.8). Baseline characteristics are shown in table 1. Females were preponderant in outpatients group (69.4%). Two participants out of three (in and outpatients) were aged less than 76 years. Women were more represented in the group of outpatients (69.4%). Patient's comorbidities were recorded in 94.6% and cardiovascular diseases were more represented (75.8%).

Of the 225 inpatients and 437 outpatients, a higher level of medication was observed in 84 (37.4%) and 139 (31.8%) of cases. According to the value of the body mass index, 19 (8.1%) inpatients and 12 (2.6%) outpatients were underweight.

Nutritional assessment

The MNA score related to global, diet, subjective and objective assessments were evaluated. The mean MNA short form (SD) was 11.6 (2.4) and 223 (33.7%) have a short score less than 12. For patients with short form MNA about 11 and less, the complete form was done. Mean of this latter was 19.8 (4). According to the complete form 33 (14.7%) inpatients and 11 outpatients (2.5%) were malnourished with a prevalence of 6.7% (CI95% = 4.8 – 8.6). From others patients, 142 (21.5%)





were at risk of malnutrition and 476 (71.8%) were wellnourished (table 2).

Table 1

Baseline characteristics of the study sample (N = 662).

Variable	Inpatients (n = 225)	Outpatients (n = 437)
Age (years), n (%)		
65 – 75 years	155 (69.4)	300 (68.6)
Over than 75 years	70 (30.6)	137 (33.4)
Sex, n (%)		
Female	110 (49)	303 (69.4)
Male	115 (51)	134 (30.6)
Co-morbidities, n (%)		
No	12 (5.4)	37 (8.4)
Yes	213 (94.6)	400 (91.6)
Medication, n (%)		
No medication	25 (11.1)	29 (6.5)
Medication <3	116 (51.5)	269 (61.7)
Medication ≥3	84 (37.4)	139 (31.8)
Marital status, n (%)		
Single	103 (45.8)	227 (51.9)
Married	122 (54.2)	210 (48.1)
Body mass index (kg / m ²), n (%)		
< 18.5 (underweight)	19 (8.1)	12 (2.6)
18.5 – 22.9 (normal)	66 (29.3)	67 (15.4)
23 – 24.9 (overweight)	47 (20.9)	116 (26.5)
≥ 25.0 (obese)	93 (41.7)	242 (55.5)

Table 2

Results of the nutritional assessment using the MNA score for aged in and outpatients in the region of Monastir (Tunisia)

Scores	Inpatients (n = 225)	Outpatients (n = 437)	Total patients (N = 662)
MNA short form, n (%)			
≤ 11	121 (53.6)	103 (23.5)	224 (33.8)
> 11	104 (46.4)	334 (76.5)	438 (66.2)
MNA global, n (%)			
< 17	33 (14.7)	11 (2.5)	44 (6.7)
17 – 23.5	72 (32.1)	70 (16)	142 (21.5)
24 and more	120 (53.2)	356 (81.5)	476 (71.8)

Determinants of malnutrition

Recorded in Table 3 is univariate analysis of associated factors to malnutrition. Patients with comorbidities, large number of medication used were more likely to experience malnutrition (OR = 2.70 and 1.85 respectively). Single patients and those admitted in the university hospital (inpatients) were also more likely to be malnourished. However, patient's age and sex were not correlated to the nutritional status.

Risk factors for malnutrition were identified by the use of a multivariate logistic regression model (Table 4). The results showed that inpatients, singles and with comorbidities were significantly more likely to develop a malnutrition. In fact, after adjustment for marital status and comorbidities, inpatients were more exposed to

malnutrition (adjusted odds ratio [aOR] = 7.25; 95%CI = 3.54 – 14.85). After adjustment for patient type, single patients and those with comorbidities were also significantly more exposed to malnutrition (aOR = 2.18 and 3.47 respectively).

Table 3

Patients characteristics related to malnutrition.

Variable	OR	CI95%	p-value
Age (years)			0.170
65 – 75 years		–	
Over than 75 years	1.54	0.82 – 2.89	
Sex			0.620
Male	1	–	
Female	0.85	0.46 – 1.59	
Co-morbidities			0.035
No	1	–	
Yes	2.70	1.07 – 6.84	
Medication			0.020
No medication	1	–	
Medication <3	1.85	0.61 – 5.56	
Medication ≥3	4.54	1.05 – 21.29	
Marital status			0.027
Married	1	–	
Single	2.01	1.08 – 3.73	
Type of patient			<0.001
Outpatients	1	–	
Inpatients	6.70	3.31 – 13.55	

Table 4

Predictors of in and outpatient's malnutrition. Results of a multivariate logistic regression.

Variable	OR	CI95%	p-value
Co-morbidities			0.014
No	1	–	
Yes	3.47	1.28 – 9.36	
Marital status			0.018
Married	1	–	
Single	2.18	1.14 – 4.16	
Type of patient			<0.001
Outpatients	1	–	
Inpatients	7.25	3.54 – 14.85	

Tableau 5

Prognosis of malnourished patients (n = 44).

	PINI (%)	GNRI (%)
No risk	38.7	46.2
Lower risk	6.5	14.5
Moderate risk	12.7	14.3
High / vital risk	35.2	25

Prognostic of malnourished patients

According to PINI score, 35.2% of malnourished patients were at higher risk of morbid complications or at risk of death. The GNRI score showed that 25% of malnourished patients (n = 11) have a higher morbidity





risk (table 5).

In this part we showed that the means age of patients with higher morbidity risk was 80.1 ± 4.5 years and 71.9 ± 3.2 years ($p = 0.032$).

Discussion

The main objective of the current study was to calculate the prevalence of malnourished in and outpatient's elderly in the region of Monastir and particularly to identify risk factors that could be the target for future intervention programs.

Results of this study showed that among elderly in-and outpatients in Monastir 6.7% (CI95% = 4.8 – 8.6) were malnourished. We showed also that this prevalence is higher in inpatient (14.7%) than outpatients (2.5%). Results about the prevalence of malnutrition in outpatients are in line with the results of yet published data from others studies (12, 13). In fact, hospitalization is a factor that aggravates protein-energy malnutrition among older people and led to higher prevalence in hospitalized patients (14).

The evaluation of patient's nutritional status was based on the MNA questionnaire. This latter is a dietary assessment tool that was validated in many different populations (15). The use of MNA screening tool was justified in the groups of in-and outpatients (12).

The prevalence of in-and outpatients malnutrition varies depending on a number of factors that includes patients' diagnoses, age, the nutrition parameters, and the screening and assessment tools used. Many studies across continents have cited that the prevalence of malnutrition is particularly high among older adults and those with specific diseases known to affect nutritional intake and status. Different comorbidities were considered common cause of unintentional weight loss and under-nutrition in older adults (16). For example, a greater prevalence of malnutrition was observed in dialysis patients as well as those with cardiovascular events and inflammatory conditions than patients without these antecedents (17). Results of our study were concordant with literature. In fact, comorbid conditions were significantly higher in the group of malnourished patients.

As researches indicate, social factors affect nutritional status. They include living alone and financial concerns such as poverty or low-income (18, 19). We also identified single status as predictor of malnutrition in elderly. Indeed, loneliness is a significant predictor of anorexia nervosa and results in the decreased intake of food (20).

According to many studies, patient's age is determinant of his nutritional status. Results showed that the proportions of subjects in risk categories of malnutrition increased with advanced ageing and malnutrition is more prevalent in very older patients (80 years and older) (21). In our research, patient's age does not identified as predictor of malnutrition. However,

according to prognosis scores, malnourished patients over than 80 years have significantly high risk of morbidity and mortality. Our results suggest that these patients should receive corrective or preventative measures for malnourishment.

In sex case opinions are controversial. Women's were more likely to develop malnutrition than men in some studies (22). Others studies suggest than sex does not favor the risk of malnutrition in aged (23). In our study there is no significant relation between sex and the risk of malnutrition. Observed sex difference in some researches was probably related to lower socio-economic status, greater tendency to report health problems or higher expectations of health and function in women when compared to men.

Conclusion

In conclusion, our study results indicate that malnutrition in aged in-and outpatients is a public health concern. The nutritional status was predicted by patient type, comorbidities and marital status.

We suggested that nutritional status should ideally be assessed in every patient. Screening systematically for malnutrition at high risk in-and outpatient departments should be considered. We also feel that our findings highlight the need for a nutritional intervention trial among at risk and malnourished hospitalized patients.

References

1. Wham CA, Teh RO, Robinson M, Kerse NM (2011) What is associated with nutrition risk in very old age? *J Nutr Health Aging* 15:247-51.
2. World Health Organization, Geneva (2002) Keep fit for life. Meeting the nutritional needs of older persons. http://www.who.int/nutrition/publications/en/nut_older_persons_1.pdf. (Consulted the 23/05/2011).
3. Stratton RJ, Hackston A, Longmore D, Dixon R, Price S, Stroud M, King C, Elia M (2004) Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. *Br J Nutr* 92:799-808.
4. Sampson G (2009) Weight loss and malnutrition in the elderly. *Aust Fam Physician* 38:507-10.
5. Ribeiro RS, da Rosa MI, Bozzetti MC (2011) Malnutrition and associated variables in an elderly population of Criciúma, SC. *Rev Assoc Med Bras* 57:56-61.
6. Guigoz Y (2006) The Mini Nutritional Assessment (MNA) review of the literature—What does it tell us? *J Nutr Health Aging* 10:466-85.
7. Burritt MF, Anderson CF (1984) Laboratory assessment of nutritional status. *Hum Pathol* 15:130-3.
8. Lamloum H, Boukhis I, Ben Ghorbel I, Khanfir Smiti M, Houman MH, Lamloum M (2007) Evaluation du statut nutritionnel d'une population âgée hospitalisée. *Rev Med Interne* 28:s128. doi: 10.1016.
9. Carriere I, Dupuy AM, La Croux A, Cristol JP, Delcourt C (2008) Biomarkers of Inflammation and Malnutrition Associated with Early Death in Healthy Elderly. *J Am Geriatr Soc* 56:840-6.
10. Bouillanne O, Morineau G, Dupont C, Coulombel I, Vincent JP, Nicolis I, Benazeth S, Cynober L, Aussel C (2005) Geriatric Nutritional Risk Index: a new index for evaluating at-risk elderly medical patients. *Am J Clin Nutr* 82:777-83.
11. Cereda E, Limonta D, Pusani C, Vanotti A (2006) Assessing elderly at risk of malnutrition: The new Geriatric Nutritional Risk Index versus Nutritional Risk Index. *Nutrition* 22:680 – 682.
12. Leistra E, Neelemaat F, Evers AM, van Zandvoort MH, Weijs PJ, van Bokhorst-de van der Schueren AM, Visser M, Kruizenga HM (2009) Prevalence of undernutrition in Dutch hospital outpatients. *Eur J Intern Med* 20:509-13.





13. Neelemaat F, Kruizenga HM, De Vet HC, Seidell JC, Buttermann M, Bokhorst-de van der Schueren MA (2008) Malnutrition screening in hospital outpatients. Can the SNAQ malnutrition screening tool also be applied in this population? *Clin Nutr* 27:439–46.
14. Fanello S, Foucault S, Delbos V, Jousset N (2000) Evaluation of nutritional status in hospitalized aged persons. *Sante Publique* 12:83–90.
15. Guigoz Y, Lauque S, Vellas BJ (2002) Identifying the elderly at risk for malnutrition. The Mini Nutritional Assessment. *Clin Geriatr Med* 18:737–757.
16. Feldblum I, German L, Castel H, Harman-Boehm I, Bilenko N, Eisinger M, Fraser D, Shahar DR (2007) Characteristics of undernourished older medical patients and the identification of predictors for undernutrition status. *Nutr J* 26:37.
17. Kalantar-Zadeh K, Ikizler TA, Block G, Avram M, Kopple JD (2003) Malnutrition-Inflammation Complex Syndrome in Dialysis Patients: Causes and Consequences. *Am J Kidney Dis* 42:864–881.
18. Visvanathan R, Chapman, IM (2009) Undernutrition and Anorexia in the Older Person. *Gastroenterol Clin North Am* 38: 393–409.
19. Wham CA, Teh RO, Robinson M, Kerse NM (2011) What is associated with nutrition risk in very old age? *J Nutr Health Aging* 15:247–51.
20. Ramic E, Pranjic N, Batic-Mujanovic O, Karic E, Alibasic E, Alic A (2011) The effect of loneliness on malnutrition in elderly population. *Med Arh* 65:92–5.
21. Tsai AC, Chang JM, Lin H, Chuang YL, Li SH, Lin YH (2003) Assessment of the nutritional risk of >53-year-old men and women in Taiwan. *Public Health Nutr* 7:69–76.
22. Kvamme JM, Olsen JA, Florholmen J, Jacobsen BK (2011) Risk of malnutrition and health-related quality of life in community-living elderly men and women: The Tromsø study. *Qual Life Res* 20:575–582.
23. Anderson JJ, Suchindran CM, Roggenkamp KJ (2009) Micronutrient intakes in two US populations of older adults: lipid research clinics program prevalence study findings. *J Nutr Health Aging* 13:595–600.

