

CLINICAL USEFULNESS OF THE MINI NUTRITIONAL ASSESSMENT (MNA) SCALE IN GERIATRIC MEDICINE

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Abstract: Objective: This study was undertaken to estimate the prevalence of malnutrition in elderly patients hospitalized with an acute illness, as well as to assess the clinical usefulness of standardized nutritional assessment upon admission by means of the MNA scale. Design: A prospective study. Setting: A large size regional university hospital. Subjects: There were 175 patients (113 women and 62 men) with a mean age of 79.7 ± 8.5 years admitted for an acute problem. Death occurred in 11 patients (6.3%). Methods: Upon admission, demographic (age, gender, origin) and medical (disease, drugs) data were recorded for each patient; the MNA questionnaire (score: 0-30) was administered and Katz score (7-28) calculated. At hospital discharge, data included Katz score, outcome (death/survival), and destination. Results: The mean MNA score was 20.5 ± 5.1 and the prevalence of severe malnutrition (MNA <17) was 21.7%. Further, 48.6% of elderly were at risk of malnutrition (MNA between 17 and 24). There was no association between MNA and age or gender, but underweight was a sign of low MNA values ($P < .001$). MNA scores were inversely related to Katz scores at both admission and hospital discharge ($P < .001$). Patients originating from nursing homes had a poorer nutritional status than those living at home (MNA: 18.4 against 22.3, $P < .001$). The number of drugs taken per patient (5.2 ± 2.8) was found to be correlated with MNA ($P = .049$). MNA scores were on average significantly higher ($P < .001$) in survivors (20.9) than in nonsurvivors (14.1). Conclusions: The study clearly demonstrates the high prevalence of malnutrition and the clinical usefulness of the MNA scale in geriatric medicine. The MNA score upon admission reflects the patient's nutritional condition, degree of autonomy (Katz score), living conditions and current treatment. It is also predictive of patient's outcome (death or survival).

Key words : ageing, MNA, malnutrition, Katz score

Introduction

Malnutrition is a condition afflicting a large proportion of elderly in Western industrialized countries (1-3). This can be attributed to a number of risk factors, including social isolation, financial difficulties, monotonous diets, illnesses affecting psychological and physical well-being, and polymedication. The consequences and physiopathological implications of malnutrition are now well established: increased morbidity (frequent falls, deficient immunity, higher risk of infection, loss of autonomy) as well as increased mortality (4-7).

The prevalence of elderly malnutrition is difficult to estimate since there is no consensus on the methods used to assess nutritional status (8). To standardize nutritional assessment of geriatric patients, Guigoz et al. (9, 10) proposed the « Mini Nutritional Assessment » (MNA) scale. The prevalence of elderly malnutrition appears to vary according to the patient's origin: it ranges from 5 to 10 % for patients living at home and from 30 to 60% for patients living in nursing homes or hospitals. Moderate to severe malnutrition can be observed in 30 to 50 % of geriatric hospitalized patients (11, 12). Reilly

(13), as well as others, showed a significant relationship between nutritional status upon admission and length of hospital stay : hospitalization was 10% longer for undernourished patients admitted for the same pathologies. Moreover, 6.5% of undernourished patients died during hospitalization, whereas the death rate was only 1.7% for other patients.

For over 25 years, clinicians have observed that malnutrition prevails in over 30 to 50 % of elderly patients hospitalized for an acute disease. In general, however, it is recognised that insufficient attention is paid to the treatment of this condition (14-16). It is therefore necessary, as stated by Rubenstein (17), to approach the elderly patient with a standardized geriatric evaluation. Ideally, the latter should include assessment of the cognitive function by the Mini Mental State (MMS) (18), the degree of autonomy by the Katz scale (19) as well as of the nutritional status by the MNA.

The present study was designed with two objectives in mind: (1) using the MNA scale, to estimate the prevalence of malnutrition in elderly patients hospitalized in geriatric units, and (2) to assess the clinical usefulness of the MNA by

studying the relationship between severity of malnutrition and degree of autonomy as evaluated by the Katz scale. Should such a relationship exist, the prevention of elderly dependency could benefit from an active nutritional treatment during hospitalization. A Katz scale evaluation upon admission and at hospital discharge is an easy way for nursing and medical staff to assess and control the quality of care accomplished during hospitalization. We also recorded the number of drugs consumed by each patient upon admission and looked for a relationship with nutritional status. We approached the problem of psychosocial dependency in elderly by recording the patient's origin as well as his/her later destination. Finally, we tried to find out whether malnutrition and other data collected were predictive of outcome (death or survival).

Materials and Methods

Study population

The present study included 175 consecutive patients admitted between December 1994 and February 1995 for an acute pathology in the geriatric department of the Centre Hospitalier Régional (CHR) de la Citadelle, Liège, Belgium. The department hosts 100 beds of acute care and has a turn over of about 2000 hospitalizations per year. Patients transferred from other hospitals or having stayed more than 24 hours in emergency room were excluded from the study.

Demographic and clinical data

In addition to age and gender, the origin of the elderly patient was recorded as follows: home alone, home with spouse, home with family, nursing home or transfer from another ward. The same categories were used to indicate his/her destination at hospital discharge, unless the patient had died during hospitalisation. The number of drugs consumed was recorded upon admission. Drugs were classified as non-steroidal anti-inflammatory drugs (NSAID), antibiotics, sedatives, thyroid hormones, digitalis, laxatives, steroids and calcium. Pathologies affecting the patients were also noted. Presenting acute diseases included infections, inflammatory diseases, cancer, thyroid disease, osteoarticular, gastroenterological, neurological, respiratory, cardiovascular, or nephrological disorders, diabetes, dementia, falls, fractures and others.

Katz scale

On the second day of hospitalization, as well as at about hospital discharge, the patient's degree of autonomy was assessed by the Katz scale. The Katz scale is a reliable instrument used for measuring the patient's abilities to perform activities of daily living, specifically eating, dressing, bathing, moving, toileting, fecal and urinary continence. Each item being graded 1 to 4, the overall Katz score ranges between 7

and 28; high values reflect major dependency and low values satisfactory condition. An item (1-4) assessing the cognitive function was added and studied separately.

MNA scale

The nutritional status of each patient was assessed by a trained geriatrician during the first days of hospitalization using the MNA questionnaire. The latter includes a comprehensive anthropometric assessment, data about general condition and dietary habits, and a self-evaluation of health and nutritional status. In a previous study of our group, we demonstrated the good inter-observer agreement of the MNA scale (20) and hence its reliability in clinical practice.

Patients were weighed undressed and on an empty stomach. Height was calculated using age and knee height (KH) according to Chumlea's formula: $64.2 - 0.04 \text{ age} + 2.02 \times \text{KH}$ for men and $84.9 - 0.24 \text{ age} + 1.83 \times \text{KH}$ for women (21). To measure KH, patients were laid in supine position with their left leg elevated, forming a right angle between the thigh and leg. Brachial circumference was measured on the forearm halfway between the apex of the olecranon and the acromion. Calf circumference was measured where the circumference was largest. All measurements were taken only once on left limbs with a tape measure. When it was too difficult to question the patient (dementia, problem of language, etc), the MNA items were completed with the aid of a relative. In such cases, the subjective assessments of nutritional status and of health were arbitrarily scored 0.5 and 1, respectively.

In the MNA questionnaire a mark is attributed to each item, thus yielding an overall MNA score ranging between 0 and 30. Following Guigoz et al., patients were classified into three risk categories according to their MNA scores: malnourished ($\text{MNA} < 17$), at risk of malnutrition ($17 \leq \text{MNA} < 24$), and well nourished ($\text{MNA} \geq 24$).

Data analysis

Means and standard deviations (SD) were used to describe quantitative variables whereas proportions were used for categorical findings. Mean values were compared by one-way analysis of variance or the classical Student t-test. Proportions were compared by the chi-square test for contingency tables. Classical regression analysis and correlation coefficient were used to measure the association between variables. All results were considered to be significant at the 5% critical level ($P < .05$).

Results

Demographic data

The overall characteristics of the 175 patients included in the study are displayed in Table 1. The average age was 79.7 ± 8.45 years and there were 62 men (35.4%) and 113 women (64.6%).

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Women (80.6 ± 8.6 years) were only slightly older than men (78.1 ± 8.0 years) ($P=.063$). The mean weight was 62 ± 14.6 kg in women and 67 ± 12.2 kg in men ($P=.021$). The women's height as calculated by Chumlea's formula was 152 ± 5.7 cm, whereas for men it was 166 ± 6.5 cm ($P<.001$). The body mass index (BMI) was also significantly different (26.6 ± 5.6 for women against 24.3 ± 4.0 for men, $P=.004$). Almost 80% of patients originated from private homes and 20% from nursing homes. After hospitalization, only 48% returned home, 46.7% were transferred to a nursing home or to another ward, and 6.3% had died.

Table 1

Characteristics of 175 elderly patients admitted to hospital with an acute disease

| | | |
|--------------------------------|------------|------------|
| Age (years) | 79.7±8.45 | |
| Gender (M/F) | 62/113 | |
| Height (cm) | 157±8.90 | |
| Weight (kg) | 63.8±14.0 | |
| BMI (kg/m ²) | 25.8±5.16 | |
| Origin/Destination | | |
| Home alone | 50 (28.6%) | 21 (12%) |
| Home with spouse | 54 (30.9%) | 41 (23.4%) |
| Home with family | 32 (18.3%) | 22 (12.6%) |
| Nursing home | 37 (21.1%) | 57 (32.6%) |
| Transfer | 2 (1.1%) | 23 (13.1%) |
| Death | - | 11 (6.3%) |
| No of drugs | 5.17±2.83 | |
| No of presenting diseases | 2.34±1.09 | |
| MNA (0-30) | 20.5±5.12 | |
| Katz score (7-28) | | |
| admission | 20.3±7.04 | |
| hospital discharge | 15.6±7.74 | |
| Cognitive function score (1-4) | | |
| admission | 2.17±1.12 | |
| hospital discharge | 1.90±1.07 | |

Medications and pathologies

The mean number of drugs taken per patient upon admission was 5.2 ± 2.8 . Only 4% of the patients were without any medication, whereas 1.1% were taking over 13 different drugs! Sedatives (62%) followed by digitalis (26%), NSAID (24%), laxatives (18%), antibiotics (17%) and thyroid hormones (17%) were the most frequent drugs prescribed. Men consumed significantly less drugs than women (4.5 ± 2.8 versus 5.5 ± 2.8 ; $P=.023$). A significant correlation ($P=.014$) was found between the number of drugs prescribed per patient and the number of presenting diseases upon admission. The mean number of presenting diseases per patient was 2.3 ± 1.1 , thus yielding a ratio of about 2 drugs per pathology. The most frequent

disorders reported were cognitive deterioration ($n=55$), infections ($n=52$), neurological problems ($n=52$), gastroenterological disorders ($n=37$) and falls ($n=35$).

Functional ability

As seen from Table 1, the average Katz score was 20.3 ± 7.04 upon admission and 15.6 ± 7.74 at hospital discharge ($P<.001$). Hence, functional ability was considerably improved during hospitalization. There was no significant difference between men and women upon admission ($P=.095$). At hospital discharge, however, Katz score was significantly lower for men than for women (13.6 ± 7.8 versus 16.6 ± 7.5 , $P=.011$). The average score obtained for « eating » was 2.40 ± 1.92 upon admission and 1.92 ± 1.09 at departure ($P<.001$). Likewise, there was a marked improvement for the cognitive function (2.17 ± 1.12 against to 1.90 ± 1.07 ; $P<.001$).

Nutritional status

The mean MNA score was 20.5 ± 5.12 and the median 21.5 (extremes: 13-29). We found that 38 (21.7%) were definitely malnourished, 85 (48.6%) were at risk of malnutrition, and 52 patients (29.7%) presented a satisfactory nutritional status. When comparing patients' characteristics with respect to the three MNA risk categories, following observations were made (see Table 2). MNA was not related to age, gender and height. By contrast, significant differences were found for weight and BMI.

When looking at patient's origin, we found that the nutritional status of elderly coming from nursing homes was worse than of those living in private dwellings ($P=.009$). This finding, however, could not be confirmed for the patient's destination after hospitalization ($P=.102$). We therefore cross-classified patients according to their origin and destination (including death) and computed MNA mean scores (\pm SDs) for each sub-class. As seen from Table 3, almost one third of elderly from private homes were transferred to a nursing home or hospital, whereas all elderly originating from nursing homes returned to a nursing home or hospital unless death occurred. Thus, when combining all patients transferred to nursing homes or hospitals, MNA scores were on average similar to those returning to private homes (20.3 ± 4.9 against 21.7 ± 4.6 , $P=.080$). It follows that MNA can hardly be used as a hint for future placement unless the patient comes from a nursing home.

An inverse relationship was established between MNA scores and Katz scores both at admission ($P<.001$) and at hospital discharge ($P<.001$); the higher the MNA score (satisfactory nutritional status), the lower the Katz score (better functional ability). The same significant relationship was found for the «eating» item of the Katz scale and for the "cognitive function" assessment.

Table 2
Characteristics of 175 elderly patients hospitalized with acute disease according to MNA risk category

| | MNA category | | | P |
|---------------------------|--------------------|---------------------------------|----------------------|-------|
| | Malnourished (<17) | At risk of malnutrition (17-24) | Well-nourished (≥24) | |
| n | 38 (21.7%) | 85 (48.6%) | 52 (29.7%) | |
| Age (years) | 78.9±8.2 | 80.2 ±9.1 | 79.6±7.7 | .708 |
| Gender (M/F) | 14/24 | 27/58 | 21/31 | .580 |
| Height (cm) | 157±10 | 156±8.0 | 160±9.0 | .025 |
| Weight (kg) | 55.8±13.0 | 62.9±12.4 | 71±13.8 | <.001 |
| BMI (kg/m ²) | 22.5±4.8 | 26.0±4.8 | 27.8±5 | <.001 |
| Origin | | | | |
| private home | 24 (63.2%) | 65 (76.5%) | 47 (90.4%) | |
| nursing home/ward | 14 (36.8%) | 20 (23.5%) | 5 (9.6%) | .009 |
| Destination | | | | |
| private home | 14 (45.2%) | 37 (45.7%) | 33 (63.5%) | |
| nursing home /ward | 17 (54.8%) | 44 (54.3%) | 19 (36.5%) | .102 |
| No. of drugs | 6.1±2.5 | 5.1±3.0 | 4.6±2.7 | .049 |
| No of presenting diseases | 2.53±1.16 | 2.39±0.95 | 2.12±1.23 | .176 |
| MNA | 12.8±3.2 | 20.7±2.0 | 25.8±1.5 | - |
| Katz score | | | | |
| admission | 23.6±5.9 | 20.7±6.5 | 17.2±7.5 | <.001 |
| hospital discharge | 21.3±7.2 | 16.0±7.4 | 10.7±5.3 | <.001 |
| Cognitive function | | | | |
| admission | 2.68±1.14 | 2.15±1.06 | 1.81±1.09 | .001 |
| hospital discharge | 2.68±1.16 | 1.89±.99 | 1.35±.74 | <.001 |
| Outcome (% death) | 7 (18.4) | 4 (4.7) | 0 (0) | .001 |

Table 3
Relationship between patient's origin, destination and MNA scores (n=175 patients)

| | Patient's origin | |
|-----------------------|-------------------------|-----------------------------|
| | Private home (n=136) | Nursing home/ward (n=39) |
| Patient's destination | | |
| Private home | 84 (61.8%) 21.7±4.6 | 0 (0%) - |
| Nursing home/ward | 44 (32.4%) 21.5±4.2 | 36 (92.3%) 18.5±5.3 |
| Death | 8 (5.9%) 14.4±6.3 | 3 (7.7%) 13.2±4.2 |

We found a significant decrease of the number of drugs consumed according to MNA category (P=.049). Low MNA scores were more often associated with consumption of laxatives (P=.001), sedatives (P<.001), and steroids (P=.017).

There was no significant relationship between MNA scores and other drugs (NSAID, antibiotics, digitalis, thyroid hormones). MNA categories did not differ with respect to average number of diseases afflicting patients.

Comparison of survivors and nonsurvivors

Of the 175 patients admitted for an acute pathology, 11 (6.3%) died during hospitalization (see Table 1). None was in the MNA "well-nourished" category, 4 were at risk of malnutrition and 7 definitely malnourished (see Table 2). Thus, the risk of death was 4.7% in the intermediate MNA category and 18.4% in the malnourished class. Survivors and nonsurvivors are compared in Table 4. MNA scores were significantly lower for deceased patients (14.1 ± 5.6) than for survivors (20.9 ± 4.8) (P <.001). We found significant differences for age (P = .045) and weight (P = .029) but not for gender, height and BMI. As already seen in Table 3, the death rate was not related to patient's origin. Katz's scores were significantly poorer in nonsurvivors (26.3 ± 2.9 against 19.9 ± 7.1 in survivors, P=.003). Similar conclusions were made for the status of the cognitive function. Overall, survivors and nonsurvivors consumed the same number of drugs and presented with the same number of diseases. However, a more

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detailed analysis revealed that nonsurvivors took more often laxatives (P = .045) and steroids (P = .002) and suffered more often from neoplasia (P = .009)

Table 4

Comparison of survivors and nonsurvivors among 175 elderly patients admitted to hospital with an acute disease

| | Survivors | Non survivors | P |
|---------------------------|-----------|---------------|-------|
| n | 164 | 11 | |
| Age | 79.4±8.4 | 84.7±7.9 | .045 |
| Gender (M/F) | 59/105 | 3/8 | .559 |
| Height (cm) | 158±8.9 | 152±8.0 | .052 |
| Weight (kg) | 64.4±13.8 | 54.9±13.8 | .029 |
| BMI (kg/m ²) | 26±5.2 | 23.6±4.7 | .136 |
| Origin | | | |
| private home | 128 (78%) | 8 (72.7%) | |
| nursing home/ward | 36 (22%) | 3 (27.3%) | .681 |
| No of drugs | 5.2±2.9 | 5.1±1.5 | .923 |
| No of presenting diseases | 2.4±1.1 | 2.2±1.3 | .627 |
| MNA | 20.9±4.8 | 14.1±5.6 | <.001 |
| Katz-score | | | |
| admission | 19.9±7.0 | 26.3±2.9 | .003 |
| end of stay | 14.8±7.3 | 27.4±2.1 | <.001 |
| Cognitive function | | | |
| admission | 2.10±1.11 | 3.09±1.04 | .005 |
| end of stay | 1.77±.97 | 3.82±.41 | <.001 |

Discussion

Increased morbidity and mortality have been repeatedly reported in malnourished elderly patients (22-23). As pointed out by Debry (24), it is difficult to compare research work in this field since criteria for assessing malnutrition varies between studies. The purpose of our study was to estimate the prevalence of malnutrition and to determine the clinical usefulness of the MNA scale in assessing the nutritional status of hospitalized geriatric patients. The MNA questionnaire developed by Guigoz et al. takes into account various factors influencing nutritional status in elderly patients (10).

As observed in other studies, we found that malnutrition prevailed in about 50% to 70% of geriatric hospital admissions (25). Specifically, our results showed that 48.6% of patients were classified at risk of malnutrition and 21.7 were definitely malnourished. According to some authors, nutritional deficiencies are worsened during hospitalization (23, 26, 27). Our patients had an average MNA score of 20.5, which put them at a risk of malnutrition. This may be explained by including patients being weakened by their acute illness as reflected by the mean number of pathologies at admission (2.3 ± 1.1) or simply by the fact that poor nutritional status is commonly observed in the elderly (1-3).

We found that MNA scores were neither influenced by age or gender, as opposed to another study in which women were

more likely to suffer from malnutrition (23). By contrast, we observed that weight and BMI were significantly associated with the nutritional status. This observation was also confirmed in another work (28).

By comparing Katz scores, we found that patients were less dependent at the end of hospitalization. This improvement can be partially attributed to the quality of nursing care as well as to patients being educated on how to be more independent. Nonetheless, improvement resulting from initial illness recovery has also to be accounted for. Our study showed a significant inverse relationship between MNA and Katz scores, especially for items concerning "eating" and "cognitive function". Patients receiving complete feeding assistance reflected a poor MNA score and therefore a poor nutritional status. Thomas (29) also demonstrated that the degree of feeding assistance needed in a population of nursing home residents was directly related to the presence of malnutrition.

A high percentage of medical complications occurring during hospitalization is directly related to poor Katz scores as well as low albuminemia, i.e. poor nutritional status (30, 31). Malnutrition is therefore a problem of major concern for hospitalized geriatric patients even more so since feeding assistance cannot assure nutritional recovery. Larson studied the use of nutritional supplements in treating undernutrition (32). He found supplements inefficient when administered to undernourished patients, whereas they preserved nutritional status in well nourished patients. Other methods of feeding, either enteral or parental, must be developed to insure a stable nutritional status during hospitalization.

The number of drugs consumed appeared to significantly influence the patient's nutritional status, i.e. the more drugs consumed the lower the MNA score. The data collected however did not permit to discern whether it was the number of drugs or the acute pathology necessitating these drugs that caused lower scores. The mean number of drugs prescribed before admission increased with the mean number of diseases (2 drugs per disease), a finding recently confirmed by Taziaux et al. in a large survey on drug prescription to the elderly in Wallonia, Belgium (33). Sullivan (31) also showed that, after the Katz index, the number of prescription medications was associated with the risk of developing at least one complication in a population of geriatric rehabilitation patients. We found lowered MNA scores for patients taking laxatives, steroids, and sedatives. Other drug categories did not seem to influence MNA scores (NSAID, antibiotics, digitalis, thyroid hormones, calcium). Other studies did not find differences between well nourished and undernourished patients consuming the following categories of drugs: antibiotics, digitalis, antihistamines, neuroleptics, sedatives, and tricyclic antidepressors (29). Finally, as Mowé (34), we found that women consumed more drugs than men.

Our study showed a significant relationship between MNA scores and patient's origin, with lower scores for nursing home patients. This difference is probably explained by a lower

degree of autonomy reflected by the Katz score. In our study the Katz value at admission was significantly correlated with the origin (19.7 ± 6.8 at home versus 23.9 ± 4.3 in nursing home; $P < .001$). Attention should be paid to this observation since the «organized environment» of nursing homes should prevent and correct malnutrition. Indeed, Keller (35) showed that factors significantly associated with malnutrition in institutionalized elderly that may be amenable to intervention included dependency for feeding. We observed that 7-8 out of 10 incoming patients (77.8%) were living in private homes, whereas after hospitalization, only half (48%) returned home even though dependency scores were improved. This can be attributed to transfers to other clinical units, deaths during hospitalization, and parameters other than dependency (eg. lack of family). There was no significant difference for MNA scores upon admission between patients returning to private homes and those going to nursing homes.

The death rate of 6.3% was comparable to that found in other geriatric units (31). When comparing survivors with nonsurvivors, a low BMI was a significant risk factor. Moreover, the MNA scores were found to be significantly lower in deceased patients (14.1) as compared to patients alive (20.9). Like other authors (5-7), we conclude that malnutrition represents an elevated mortality risk. Deceased patients had also a higher degree of dependency as confirmed by significantly higher Katz scores. Thus, the mortality rate increases with the loss of autonomy (36). We found no association between patient's origin and mortality. By contrast, consumption of laxatives and steroids was considerably higher for deceased patients, whereas sedatives were equally consumed by both groups.

In conclusion, malnutrition is a frequent condition in acute geriatric practice. It is associated with higher morbidity and mortality rates as well as a poorer quality of life (37). We have shown that the MNA is not only a reliable but also an easy to use and inexpensive diagnostic tool. MNA has become part of our routine geriatric admission «check-up» and patients can easily be classified into one of three categories: (i) well nourished, (ii) at risk of malnutrition, and (iii) malnourished. MNA was negatively correlated to Katz scores and with the number and kind (laxatives, sedatives and steroids) of drugs recorded upon admission. Patients living at home had significantly better nutritional scores than those coming from nursing homes. Poor MNA scores were significantly related to high mortality risk. Further research work is needed to evaluate the relationship between MNA and variables measured inside and outside healthcare institutions.

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