The prevalence of protein-energy malnutrition (PEM) is very high among the elderly hospital inpatient population and among elderly people living in nursing homes. Some investigators estimate that between 30% and 60% of all such individuals are undernourished [1–3]. The outcome in these elderly people is worse if they have PEM and they also account for the largest number of hospital admissions and the highest morbidity and mortality [4–7]. The proportion of undernourished individuals in the community-based elderly population is lower. However, deficiencies in the intake of specific nutrients, and to a lesser extent of total energy intake, have been found through dietary surveys [8]. This is specially true in the case of frail elderly people.

For this reason, there is strong interest in developing methods of nutritional assessment that will allow rapid but precise screening and diagnosis [9], and which can easily be integrated into the various geriatric assessment programs. Normally, dietetic surveys, anthropometric evaluation, and biochemical assessments have been used for nutritional evaluation [10–12]. Recently, Guigoz et al. [13] developed a tool for nutritional assessment – the Mini Nutritional Assessment (MNA) – which includes 18 items in four different sections: anthropometry, global assessment, dietetic assessment, and subjective evaluation. This tool, validated for the geriatric population, allows people to be analyzed and classified according to their nutritional status into three groups: well-nourished, at risk of malnutrition, or malnourished. The test procedure allows the information to be collected in a systematic and objective way and makes follow-up easy, as well as facilitating comparison of results from other people or groups.

The elderly population is extremely heterogeneous. We find people with different levels of health, different levels of functional autonomy, and different social
The Mini Nutritional Assessment in Clinical Practice

Table 1. General characteristics of the patients under study

<table>
<thead>
<tr>
<th></th>
<th>1 Convalescence</th>
<th>2 Nursing home</th>
<th>3 Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>114</td>
<td>87</td>
<td>199</td>
</tr>
<tr>
<td>Sex, f:m</td>
<td>62:52</td>
<td>69:18</td>
<td>114:85</td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>78.5 (8.4)</td>
<td>83.3 (8.2)</td>
<td>72.75 (5.5)</td>
</tr>
<tr>
<td>m</td>
<td>77.1 (10.8)</td>
<td>78.8 (9.5)</td>
<td>71.41 (5.1)</td>
</tr>
<tr>
<td>ADL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>52 (45.6)</td>
<td>9 (10.3)</td>
<td>0</td>
</tr>
<tr>
<td>2–4</td>
<td>41 (36.0)</td>
<td>23 (26.4)</td>
<td>0</td>
</tr>
<tr>
<td>5–6</td>
<td>21 (18.4)</td>
<td>55 (63.2)</td>
<td>199 (100)</td>
</tr>
</tbody>
</table>

f = Female; m = male.

and family situations. Some live in nursing homes. The use of validated tools such as the MNA can help us to understand and compare these different groups better from a nutritional perspective. In addition, at an individual level and in everyday clinical practice, correct and systematic nutritional evaluation will facilitate the development of preventive and therapeutic programs.

The aim of this chapter is to show some results relating to MNA assessment in three different samples of elderly subjects, living in convalescence geriatric units (CGUs), nursing homes, and in the community. The populations under study were from the city of Mataró (Barcelona, Spain).

The Spanish version of the MNA was obtained by translating the original French version and verifying the translation by the translation-retrotranslation method carried out by a bilingual person [14]. The MNA was administered by previously trained nurses. Any questions which the patient could not answer were answered by their main caregiver.

Other variables included in the study were: the activities of daily living (ADL), evaluated by the Katz scale [15]; cognitive impairment (only in the community-based study), measured by the Pfeiffer’s test [16]; and finally, anthropometric variables, measured as basic indicators of nutritional status: weight, height, and body mass index (BMI), weight loss during the last three months, and serum albumin.

The three groups of elderly people under study were characterized as follows:

1 Convalescent Group

This group included people admitted to the CGU during 1995 (n = 114). There were 62 women and 52 men, mean age 78.5 (SD 8.4) and 77.1 (10.8) years, respectively. These were people in the subacute phase of a disease or in the rehabilitation process. As can be seen from Table 1, only 18.4% were indepen-
dent on the basis of the ADL assessment; in 24.4% the BMI was <21 and in 57.0% it was >23; 47% had a serum albumin of >35 g/l, 33% between 30 and 35 g/l, and 20% <30 g/l.

2 Nursing Home Group
This group included people who were admitted to the nursing home of Saint Joseph in Mataró in 1995 (n = 87). There were 69 women and 18 men, mean age 83.3 (8.2) and 78.8 (9.5) years, respectively. They did not have any acute disease at the time of the evaluation. Of these subjects, 63% were independent in five or six activities in the ADL assessment (Table 1); in 11.5% the BMI was <21 and in 73.6% it was >23; 84% had a serum albumin of >35 g/l, 15% between 30 and 35 g/l, and 1% <30 g/l.

3 Community Group
This group was a representative sample of people aged between 65 and 85 years, living in the city of Mataró (n = 199). There were 114 women and 85 men, mean age 72.75 (5.5) and 71.41 (5.1) years, respectively. All were independent as judged by the ADL assessment, and made less than three mistakes in the Pfeiffer test (Table 1; these were criteria for inclusion in the study). In only 1.5% was the BMI <21; in 95% it was >23.

The Mini Nutritional Assessment
As expected, the results of the MNA differed according to the group under study: 33.0% of subjects in the CGU, 5.7% in the nursing home, and only 0.5% in the community group fell into the undernourished category; 12.3% of the CGU group, 47.1% of the nursing home group, and 89.9% of the community group fell into the well-nourished category; and 54.4% of the CGU group, 47.1% of the nursing home group, and 9.5% of the community group fell into the at-risk category (Fig. 1).

The results obtained can be explained by the different health status of the groups at the time of evaluation. Patients admitted to convalescence units have had recent acute illnesses or are still in the process of recovery. Most have recent loss of independence which is responsible for their admittance. We have previously described the characteristics of people admitted to our CGU [17]. There is a significant variation in nutritional indices in these patients [4, 17], mainly because of the presence of inflammatory pathology, which results in anorexia (40% of our patients were reported to suffer from anorexia) and a decrease in nutritional intake. The low total score obtained from MNA in this group was mainly the result of the low scores in the anthropometric and dietetic assessments, which probably reflect their loss of appetite, reduced dietary intake, and resulting weight loss. The median value for the MNA in the original validation study [13] was 19.3 for people admitted to a geriatric unit, whereas it was 18.5 for the same population in our study. In other studies carried out in geriatric units, the re-
ported malnutrition rates range from 10% to 15% – lower than in our population or in the original Toulouse study. The percentages of the population at risk always range between 33% and 62% [18, 19].

Those patients who are admitted in a nursing home without any acute diseases have characteristics which favor the appearance of nutritional problems [3]. Other studies are in agreement with respect to proportions of people classified by the MNA as being at risk of malnutrition – around 47–49% [14, 19]. The percentage of people classified as malnourished in the same studies ranged from 6% to 17%. In our group, this result reflected low scores for the global and subjective assessments. This proves the importance of risk factors in nursing homes.

Finally, we studied a population group in the community with a satisfactory health level. All these individuals were self-sufficient in performing ADL and they had good cognitive levels. Our results are similar to those from other studies carried out among outpatients, with the malnourished proportion ranging from 0% [18] to 3% in the Albuquerque study [13]. We only found one person with malnutrition criteria on MNA, but 18 (9.5%) were considered to be at risk (compared with 18% [13], 12% [19], and 3% [18] in other studies). The median MNA score in our population was 27. In the Albuquerque study, which was also community-based, the median was 25. The satisfactory levels of physical and cognitive function (which were criteria for inclusion in our study) show a population in good general health. The percentages of similar people classified as well-nourished in previous studies range from 80% in the Pertoldi study [18] to 97% in the Guigoz study [19].
Table 2. Correlation between total and partial MNA results and nutritional assessment variables

<table>
<thead>
<tr>
<th></th>
<th>Anthropometric area</th>
<th>Global assessment</th>
<th>Dietetic intake</th>
<th>Subjective assessment</th>
<th>Katz index</th>
<th>Albumin</th>
<th>BMI weight loss</th>
<th>no weight loss</th>
<th>Weight loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total MNA NH</td>
<td>0.43</td>
<td>0.79</td>
<td>0.48</td>
<td>0.67</td>
<td>0.38</td>
<td>0.12</td>
<td>0.69</td>
<td>0.06</td>
<td>0.22</td>
</tr>
<tr>
<td>Total MNA CGU</td>
<td>0.70</td>
<td>0.68</td>
<td>0.70</td>
<td>0.59</td>
<td>0.59</td>
<td>0.22</td>
<td>0.43</td>
<td>0.11</td>
<td>0.64</td>
</tr>
<tr>
<td>Total MNA Comm</td>
<td>0.47</td>
<td>0.63</td>
<td>0.44</td>
<td>0.46</td>
<td>–</td>
<td>–</td>
<td>0.23</td>
<td>0.12</td>
<td>0.15</td>
</tr>
</tbody>
</table>

NH = Nursing home; CGU = convalescence geriatric unit; Comm = community group.

Table 2 shows the correlation between the total scores in the MNA with each of its sections and the nutritional indicators for each of the three groups under study. In each of the groups, all the sections of the MNA were highly correlated with the total scores (regression coefficients from 0.43 to 0.79); in general, the coefficient of correlation was more significant in the convalescence group (especially in the anthropometric and dietetic indices) than in the nursing home group (where the subjective and global assessments are highlighted), and it was less significant in the community-based group (where the global assessment was the most important).

A moderate correlation was found with ADL, measured by the Katz index. Other studies have also shown a relation between level of physical functioning and nutritional status [20, 21].

No correlation was observed between total MNA scores and serum albumin in the nursing home population, but a correlation was found in the convalescence group, although this was weak. The low correlation with the serum albumin can be explained on a clinical basis of the greater complexity of the MNA as a nutritional evaluation tool, since it also includes risk factors and dietetic assessment among its evaluation criteria. Serum albumin decreases late in chronic undernutrition owing to reduced protein intake, and it decreases very rapidly when there is an inflammatory process [22]. It is for this reason that the highest correlation was found in the CGU patients.

The relation between the MNA score and recent weight loss was significant in all three groups, and particularly in the convalescence group. The association of MNA with BMI was also significant and it was more important in the convalescent patients. This correlation was confined to the subgroup with weight loss (Table 2).
The Mini Nutritional Assessment in Clinical Practice

The MNA includes sections on anthropometry, evaluation of risk situations (global assessment), dietetic survey, and self-perception of health. Owing to the fact that there are several sections, the MNA has a different profile according to the population under study. The multidimensional nature of this tool makes it useful for assessing different subclasses of elderly subjects and helps the clinician to understand some of the mechanisms determining nutritional status. For this reason, it may facilitate decision taking in therapeutic programs.

Acknowledgement

We thank Núria Casas Casanovas, who was responsible for translation of the manuscript.

References


Discussion

Dr. Guesry: My question regards the agreement between the same variables measured by two different observers. Of course I can easily understand why you have differences with subjective variables, depending on how you ask the question. I was pleased to see that what we discussed yesterday proved to be true in your experience. But I have difficulty in understanding why you found such a discrepancy between two observers when measuring brachial circumference. Do you have any explanation for that?

Dr. Salvà: We were surprised at these results as well. In a recent publication on the reliability of MNA, we saw similar results with respect to brachial circumference [1]. I don’t know why this should be. Maybe our technique was at fault, but the nurses were trained in anthropometric techniques by the same person. Maybe someone else can offer an explanation?

Dr. Guesry: I think this is quite important, because it raises questions about the reliability of such measurements, especially for the arm. My last question to Dr. Salvà is about your measurements of MNA in 1995 and 1996 in your group of malnourished patients. You saw no improvement, though there were apparently improvements in BMI and brachial circumference. Do you have a program of nutritional support?

Dr. Salvà: First, the malnourished group is only five people. It is difficult to compare the changes in this group. Secondly, in this nursing home, the management of the patients was that normally provided by the home. We went there only to administer the MNA, and after a year and a half we returned to do the MNA again. The professionals in this nursing home had the MNA results and could institute a different nutritional regimen, but we were not responsible for that. As I said before, we have the data but we haven’t analyzed them yet.

Dr. Chumlea: In relation to what Dr. Guesry was saying about the anthropometric tests: a kappa test is a nonparametric test and is probably not the most appropriate measure of reliability for the body measurements. That would be a repeated measures test.

Dr. Morley: I have a question about the length of stay. Your average of 15 days would be a very long time indeed in the USA. Even 6 days is now almost unacceptable! Was this just a subgroup that you were looking at, or is that a normal length of stay in French hospitals?

Dr. Salvà: For elderly patients, this is a normal length of stay.

Dr. Rubenstein: In one of your slides you showed a comparison of before and after for the different at-risk categories. In one of them, about 15% of people who were at risk at time 1 had their status improved by time 2. It seems quite dramatic to me that you were able to improve 15% of the group. Is a 15% improvement in the at-risk category about what you would expect? Also I’m curious about the intervention. What did you do to these people who
you found to be at risk? Did you involve them in an intervention or was this just natural history?

**Dr. Salva**: Of course we need to know what happened to these groups during those 18 months. We need to know who were the patients who improved and who were the ones whose nutritional status became worse? We also need to know whether the doctor in this nursing home tried to apply a treatment or nutrition plan. As I said before, we have these data, but we have not analyzed them yet.

**Dr. Vellas**: We need to remember that this study by Dr. Salva was not an interventional study, only a descriptive one. I am not even sure that the physician in the nursing home knew about the MNA during the first year.

**Dr. Salva**: Yes, he knew the MNA results. He had the MNA results in the clinical history. I’m not sure whether he looked at them, but he had them!

**Reference**