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RELIABILITY OF THE MINI NUTRITIONAL ASSESSMENT (MNA) IN INSTITUTIONALIZED ELDERLY PEOPLE

M.J. BLEDA*, I. BOLIBAR*, R. PARÉS†, A. SALVÀ†#

*Unitat de recerca. Consorci Sanitari del Maresme.Mataró (Spain). † Antic Hospital Sant Jaume. Mataró (Spain). # Programa Vida als Anys, Servei Català de la Salut. Barcelona (Spain). Correspondence: Antoni Salvà, Programa Vida Als Anys. Servei Català de la Salut, Travessera de les Corts 131-159. Edifici Olimpia, 08028 Barcelona (Spain). Phone: +34 93 403 86 09. Fax: +34 93 403 89 23. E-mail: 18581asc@comb.es • This paper has been presented in part at the 51st Annual Scientific Meeting of the Gerontological Society of America.

Abstract: OBJECTIVES: To measure the reliability of the Mini Nutritional Assessment (MNA) in institutionalized elderly people. DESIGN: 12 day interobserver reliability study. PARTICIPANTS AND SETTING: All subjects admitted to two long term geriatric units in Mataró (Barcelona, Spain) over 4 months during 1996 (n=67). MEASUREMENTS: in each center, different trained nurses independently administered the MNA on two separate occasions. RESULTS: Mean (standard deviation) scores for the two assessments of the MNA were 20.8 (5.4) and 21.3 (4.6) respectively. Internal consistency, estimated by the Cronbach's Alpha, were 0.83 and 0.74 for the first and second assessment respectively. Test-restest reliability, according to the intraclass correlation coefficient (ICC), was 0.89 for the total MNA score and higher than 0.89 for its continuous items. According to the Kappa index, test-retest reliability for the stratified total MNA was substantial (0.78); for the 18 ordinal or nominal items of the MNA it was 'almost perfect' or 'substantial' in 12 items, 5 were 'moderate' to 'fair' and in 1 item it was 'slight'. Subjective health evaluation, the number of glasses of liquids per day, and brachial circumference (this former with an ICC=0.91) were the items with the lowest Kappa indices. CONCLUSION: The MNA test has good levels of reliability, according to its internal consistency and its test-retest reproducibility. Some improvements can still be introduced by refining the categorization and content of some items with low reliability.

Key words: Nutrition, Mini Nutritional Assessment, MNA, aging, institutionalized elderly people.

Introduction

Protein-energy malnutrition (PEM) is a common state in elderly institutionalized people. Available data from published studies show different results on its prevalence, but generally accepted values are close to 50% (1-3). Institutionalized elderly with PEM have worse clinical outcomes than well nourished subjects. PEM has also been related to higher mortality (4-7).

Detecting malnutrition in elderly people is difficult and is often excluded from routine geriatric assessment programmes (8). A suitable nutritional evaluation should include the assessment of risk factors for undernutrition, dietary intake and to body composition (9-11). Some authors have used a subjective global assessment (12-13), or instruments like the Prognostic Nutritional Index (14-15) in surgical or those with gastrointestinal diseases. Similarly, the Nutrition Screening Initiative has been developed for the elderly living in the community a method to identify persons at nutritional risk (16).

Guigoz Y et al. (17) have described a tool for nutritional assessment, the Mini Nutritional Assessment (MNA), which includes 18 non-invasive items distributed between four domains: anthropometry, global assessment, dietetic assessment and subjective evaluation. This practical tool has been validated for geriatric populations, and classifies people according to their nutritional status in a systematic, objective and rapid way. It detects the elderly at risk of malnutrition and permits early intervention without requiring a specialized nutritional team. However, little is known about the reliability of the MNA, which seems to have a moderate interobserver agreement (18).

In this paper we measure the interobserver reliability of the MNA in a sample of institutionalized patients. In particular, two common methods of testing reliability are presented, internal consistency and test-retest reproducibility, following the Medical Outcomes Trust recommendations (19).

Methods

We examined all patients that were admitted to two long term geriatric units in Mataró (Barcelona, Spain) between June and September of 1996: 42 from the Sant Josep Residence and 25 from the Antic Hospital Sant Jaume. Of the 67 patients studied, 19.4% were males, with a mean (standard deviation) age of 79 (9) years, and 80.6% females with a mean age of 84 (8) years.

Two nurses with more than one year's experience with the MNA carried out the test at each center. One nurse did the first test and the other nurse the second test, independently of the first. The median time between both MNA measurements was

12 days and ranged from 10 to 55 days. The Spanish version of the MNA was obtained by translating the French original version and verifying it by the translation-retrotranslation method, which was carried out by a bilingual person (20). Those items which the patient could not answer were answered by their main carer. All anthropometric examinations involved in the MNA were performed at the time of the study according to Jelliffe's methodology (21). For patients with important chiphosis or unable to stand we used Chumlea's formula to calculate the height from the knee height (22).

The MNA score was calculated as the sum of the points assigned to the responses of the 18 items. According to the obtained score, patients were classified into three categories: well-nourished (MNA 30-24), at risk of malnutrition (MNA 17-23.5) and malnourished (MNA <17). MNA mean differences between administrations were tested with Students t-test.

Two measures of reliability were analyzed (19). First, internal consistency, which examines the variation within the MNA by a function of the number of items and their covariation. This was estimated by Cronbach's alpha (ac), which provides an indication of the degree of convergence between the different (standardized) items hypothesized to represent the same construct (23-24). If the items making up the score were all identical and therefore perfectly correlated, ac would be 1, but if the items were all independent then ac would be 0. We used the ac 95% one-sided confidence interval according to Kristof and Feldt (25).

Second, test-retest reproducibility was analyzed, which examines the variation between the two administrations of the MNA, and measures the capacity of scores to remain stable over time. For continuous items, ie. the MNA score and the anthropometric measurements, the test-retest reproducibility was estimated by the intraclass correlation coefficient (ICC). The ICC was calculated according to a mixed effects model, after confirming the assumption of no differences between observers by two-way ANOVA (25-26). In general, ICC values below 0.4 may be taken to represent poor reliability, values between 0.4 and 0.75 may be taken to represent fair to good reliability and values above 0.75 may be taken to represent excellent reliability (27).

For nominal or ordinal MNA items the test-retest reliability was estimated by the Kappa index (K) and the weighted Kappa index (Kw) respectively, as proposed by Cohen (28). For Kw, we used the weightings suggested by Cicchetti and Allison (1971). According to Landis & Koch the Kappa index is classified as 'almost perfect' (0.81-1), 'substantial' (0.61-0.80), 'moderate' (0.41-0.60), 'fair' (0.21-0.40), 'slight' (0.00-0.20) or 'poor' (<0.00) (29).

Results

Mean (standard deviation) of the total MNA score was 20.84 (5.40) for the first assessment, and 21.30 (4.58) for the second. The MNA scores for each area were, according to the first and second assessment respectively, 6.52 (1.78) - 6.43 (1.54) for anthropometric indices, 5.06 (1.99) - 4.97 (1.98) for global evaluation, 6.75 (1.99) - 7.43 (1.63) for dietary parameters, and 2.51 (1.12) - 2.46 (1.17) for subjective assessment. None of these differences between assessments were statistically significant, except for the area of dietary assessment (P=0.03). Out of the 16 patients initially classified assessment as malnourished 2 (12.5%) were considered at risk of malnutrition at the second ; out of the 25 patients initially classified at risk, 5 (20.0%) were reevaluated as well-nourished; and out of the 26 patients initially classified as well-nourished 5 (19.2%) were subsequently considered as at risk of malnutrition.

At the first assessment, Cronbach's Alpha for the total MNA score was 0.83 with a one-sided 95% confidence interval of 0.78. At the second administration it was 0.74, with a one-sided 95% confidence interval of 0.66.

The ICC for the total MNA score for first and second administrations was 0.89, indicating an "excellent" reliability. At the Antic Hospital Sant Jaume it was 0.78 (25 patients), and at Sant Josep Residence it was 0.93 (42 patients). The ICC for continuous values of body mass index was 0.90; for mid arm circumference it was 0.91, and for calf circumference it was 0.95.

Test-retest reliability for the stratified total MNA score and for all ordinal and nominal items of the MNA are presented in Table 1.

Table 1
Kappa index of agreement for the stratified total Mini Nutritional Assessment (MNA) and each of its items.

AREA	ITEM	Kappa
I. Anthropometric assessment	1. Body mass index*	0.890
	2. Mid arm or brachial circumference*	0.385
	3. Calf circumference*	0.868
	4. Weight loss*	0.630
II. Global evaluation	5. Independence at home	1.000
	6. More than 3 medicines per day	0.868
	7. Psychological stress	0.653
	8. Mobility*	0.841
	9. Neuropsychological problems*	0.751
	10. Pressure scores or skin ulcers	0.939
III. Dietetic assessment	11. Number of meals per day*	0.731
	12. Proteinic score*	0.676
	13. Fruits or vegetables	0.482
	14. Declined food intake*	0.725
	15. Daily consumption of beverages*	0.370
	16. Mode of feeding*	0.528
IV. Subjective assessment	17. Subjective nutritional evaluation*	0.530
	18. Subjective health evaluation*	0.204
Total	Total MNA*	0.782

* Weighted Kappa.

The stratification of the total MNA score in three categories of nutritional status obtained a Kappa index of 0.78. Of the 18 MNA items, 12 items had 'almost perfect' or 'substantial' Kappa indices (66.7%), 5 items had 'moderate' or 'fair' Kappa indices (27.8%), and only 1 item (5.6%) had a 'slight' or 'poor' Kappa index. The highest Kappa index was observed for the item "independence at home" because all patients were living at geriatric units. It was followed by the items "bed sores", "body mass index" and "taking more than 3 medicines". The items with the lowest Kappa index were "subjective health evaluation", "number of glasses of liquid per day" and "mid-arm circumference".

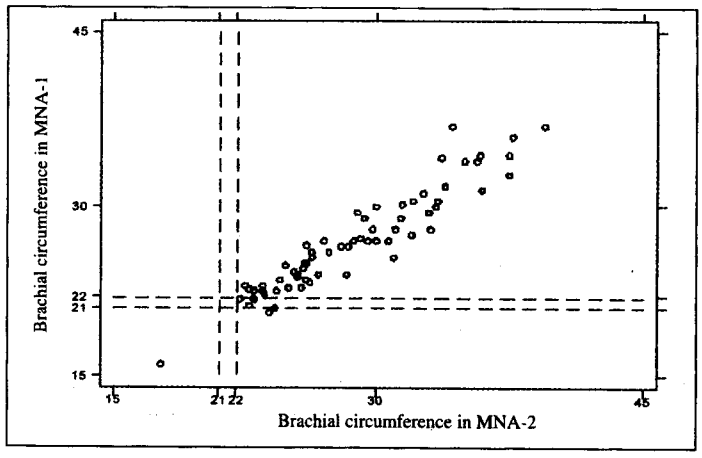
Discussion

We observed a high interobserver reliability of the MNA in 67 elderly people institutionalized at two long term geriatric units. In terms of internal consistency, the items of the MNA conform to a homogeneous scale with a Cronbach's Alpha of 0.74 or higher. Test-restest reliability for the total MNA score obtained an excellent intraclass correlation coefficient, and for the stratified MNA score it had a substantial Kappa index.

Some areas of the MNA scale showed higher levels of reliability than others. The area of global evaluation stands out with almost perfect Kappa indices in most items. The anthropometric area also had high Kappa indices, except for the brachial circumference. The area of dietetic assessment had substantial Kappa indices for half of its items, two with moderate Kappa indices (consumption of fruits and vegetables, and mode of feeding), and one with a fair Kappa index (consumption of beverages). Finally the area of subjective assessment had only moderate to fair Kappa indices. These results suggest that improvements can be introduced into some items of the MNA in order to reach better levels of reliability.

Mid arm circumference had some inconsistent results (Figure 1). The Kappa index for its categorized value was 0.385, indicating a fair reliability, but the ICC for its continuous value was 0.91, implying an outstanding test-retest reliability. Hence, inconsistency might lie in its categorization, as other authors have pointed out (18). The lower cut-off point (21 cm) was defined as the 10th percentile of the mid arm circumference for the study population of over 80 years on which Guigoz Y. et al validated the MNA (17). One consideration is that this may not apply to our elderly population. Population studies on mid arm circumference showed a 10th percentile of 23 cm and 21.5 cm for Spanish males and females older than 64 years respectively (30). Thus, our 10th percentile is above that used for the MNA. A second consideration is that the middle category of mid arm circumference (21-22 cm) may be too narrow. The 25th percentile from the Spanish population studies is 24.5 cm and 23.5 cm for elderly males and females respectively (30). Thus, a category of 22 to 24 cm may improve the reliability of mid arm circumference.

Figure 1
Continuous values of mid arm circumference at the first administration (MNA-1) and at the second administration (MNA-2) of the Mini Nutritional Assessment according to the cut-off points used for its scoring.



The item on subjective health evaluation had the lowest Kappa index of the MNA scale. This item requires the patient to compare his/her health status with other people's of the same age. This question has been widely used in population health surveys, so it is difficult to explain why it has little reliability in our study. Comparing self-perceived health status with the perceived health of others may be a difficult process for the elderly. Alternatively, this comparison may be variable over time, even when the period of time is brief (ie. influenced by the mood of the patient).

Reliability of the number of cups/glasses of beverages consumed per day was also fair, with a Kappa index of 0.37. The MNA scoring of this item also uses narrow categories of consumption: 0 points for less than 3 glasses, 0.5 points for 3 to 5 glasses, and 1 point for more than 5 glasses. For such a common daily activity, test-retest reliability is expected to be low because elderly people may not remember the number of glasses drunk with a precision of fine than ±2 glasses.

Comparing our results with those of Gazzotti et al., which come from a sample of 39 patients in 1997 (29), in general we got better Kappa indices (Table 2). However, our items with low Kappa index are consistent with those of Gazzotti. Differences of Kappa indices could easily be explained by the patient characteristics (hospitalized with acute diseases) and their cognitive function. In fact, our patients at the Hospital Sant Jaume had poorer health status and lower reliability than our patients at Sant Josep Residence.

Table 2
Comparision of our results on the Mini Nutritional Assessment (MNA) with those of Gazzotti's et al (18).

Classification of index Kappa by Landis & Koch, 1977	Present Study		Gazzotti Study	
	# of items	% of items	# of items	% of items
Almost perfect (0.81-1.00)	6	33,3%	2	11,1%
Substantial (0.61-0.80)	6	33,3%	5	27,7%
Moderate (0.41-0.60)	3	16,6%	5	27,7%
Fair (0.21-0.40)	2	11,1%	4	22,2%
Slight (0.00-0.20)	1	5,5%	1	5,5%
Poor (< 0.00)	0	0,0%	1	5,5%
Total	18	100%	18	100%

Finally, there is a third kind of reliability that we have not measured, the intra-observed reliability. This is the agreement of two or more measurements by the same observer separated by time. This evaluation was not possible within our study design.

In conclusion, the MNA test in our study acheived secure levels of reliability both in terms of internal consistency and in terms of interobserver test-retest reliability. Our results gave good levels of reliability for the total score, the categorized score and for most of its items. These findings, together with their good characteristics in terms of validation, effectivity and efficiency, give support to the usefulness of the MNA.

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