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Assessment of nutritional status of older people in homes for the aged in the Somerset West area

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Owing to the paucity of data in South Africa regarding older people (>60 years) living in homes for the aged, the aim of this study was to evaluate their nutritional status in a convenient sample of homes for the aged (*N*=4) in the Somerset West area.

In the descriptive, cross-sectional study, nutritional status was evaluated by using the Mini Nutritional Assessment (MNA) as well as traditional anthropometric measurements independently. Nutrient intake was determined using menu, plate wastage and food acceptability data.

The study population consisted of 53 male and 157 female older people with a mean age of 76.8 years (SD 10.6). The mean body mass index BMI was 25.6 (SD 5.17). According to the MNA, 6% of the older people were malnourished, and 47% were at risk for malnutrition. Had the independent anthropometric measurements been used, fewer older people would have been identified as at risk of malnutrition. After correcting for plate wastage, the average energy consumption was 6 963 kJ. Nutrient values <67% of the recommended intakes for older men and women were observed for vitamin D, folic acid and calcium; and energy, carbohydrates and vitamin C for men specifically. Food items with the most plate wastage (>50%) were the starchy menu items, cooked vegetables and lunch protein dishes.

The MNA is a valuable instrument in identifying older people at risk of malnutrition, thus allowing for early intervention. There was a relationship between malnutrition and lower energy intake, emphasising the need for meticulous menu planning and monitoring of food consumption, and the need for addressing specific micronutrients.

A high prevalence of malnutrition (15 - 60%) in older people who are hospitalised or living in nursing homes, or who are in home care programmes, has been reported worldwide.[1,2] Constant monitoring of the health status of older people is important in order to maintain good nutritional status and prevent development of malnutrition. In long-term planning, efforts should be made to maintain or improve quality of life (QOL) for older people,[3] since regular screening and management ought to improve outcomes[4] such as prolonged independence and disease prevention.[5]

Various factors influence older people's nutritional status and predispose them to infections, malnutrition and chronic disease.[6] Factors such as nutritional intake, socio-economic status, functional status, psychological conditions, oral health and pharmacological treatment are known to decrease appetite, induce malabsorption, and diminish senses of taste and smell.[2,4-9] In addition to the physiological changes that negatively affect nutritional status, simply consuming enough food can become a major challenge to many older people. Common reasons for inadequate food intake in institutionalised older people are reportedly quite simple, e.g. lack of personnel to help feed patients, inappropriate or unnecessary dietary restrictions, and unappetising food.[10,11] Enjoyment of food has also been shown to have an impact on QOL of older people.[11-13]

The World Health Organization (WHO) has reported that traditional measurements of body size may fail to provide adequate estimates of nutritional status or the effects of nutritional intervention in older people.[3] The MNA was designed and validated internationally[14,15] to provide a single, rapid assessment of nutritional status in older people in clinics, hospitals and nursing homes. The aim of the MNA is to evaluate the risk of malnutrition, and to initiate early nutritional intervention when necessary.[1]

In view of the paucity of data regarding this particular population group, this study aimed to assess the nutritional status of older people in homes for the aged. The first objective was to assess nutritional status using the MNA and to compare the results with independent traditional anthropometric measurements. The second objective was to determine nutritional intake by analysing menus and determining food acceptability and plate wastage.

Methods

A descriptive, cross-sectional study design was used. A convenience sample of 4 homes for the aged, serviced by the same private catering company in the Somerset West area, namely Chris Heunis, Robari, Silver Oaks and Zandvliet, were selected. People residing in the frail care units of the old age homes were excluded from the study as the MNA was not validated for this group. Those subjects who were not available on the day of data collection or were <60 years of age were also excluded from the study. If the subjects were unable to respond, their caregivers provided the information. Of the 380 older people living in these 4 homes for the aged, 210 complied with the above criteria and provided written consent to participate in the study. The Committee for Human Research of Stellenbosch University approved the ethical aspects of the study. Final-year BSc Dietetics students were trained to ensure standardisation in completion of questionnaires and performing anthropometric assessments, under the supervision of the investigators.

Nutritional status assessment

The MNA was used to assess nutritional status of the study population. The MNA consists of simple, brief questions that can be completed in less than 10 minutes; anthropometric measurements (weight, height, mid-arm circumference and calf circumference); a global assessment (6 questions relating to lifestyle, medication and mobility); a dietary questionnaire (8 questions relating to number of meals, food and fluid intake, and autonomy of feeding); and a subjective assessment (self-perception of health and nutrition). A score of >24 indicates an adequate nutritional status. A score between 17 and 23.5 indicates possible risk of malnutrition. A score <17 indicates under-nutrition.[1] BMI, calf circumference (CC) and mid-arm circumference (MAC) were measured as part of the MNA measurements, but were also used independently as a means of assessing nutritional status.

Definition of nutritional status was achieved by using cut-off values for the anthropometric measurements and indices according to the MNA (Table I).[1] Standardised procedures were followed to determine weight, MAC, CC and standing height.[3] Where measurement of standing height was not possible (as in the case of kyphosis and spinal curvature, which would have invalidated the measurement of standing height), knee height was measured.[3] The following formula was used to estimate height:[16]

Male stature (cm)=(2.02 × knee height [cm]) – (0.04 × age [yr]) + 64.19

Female stature (cm)=(1.83 × knee height [cm]) – (0.24 × age [yr]) + 84.88

Dietary intake

Menu data

A private catering company provided the cycle menu, portion sizes and recipes for each old age home for the dietary analysis. The first 21 consecutive days of the 5-week menu cycle for each old age home were evaluated according to the Dietary Reference Intakes (DRIs)[3,17] and the prudent dietary guidelines. The mean age, weight and height values of the study population were entered into the Foodfinder 1 (MRC, 1991) computer analysis program to determine average daily nutritional intake.

Food acceptability

Food acceptability was measured by using the menu planning guidelines, the residents' own opinions, and a food wastage study. Using a standardised questionnaire, the residents evaluated menus in terms of the adequacy of each meal (3-point Likert scale) and acceptability (5 questions regarding menu items with a 3-point Likert scale), while open-ended questions provided any recommendations for menu improvements.

Food wastage was evaluated for 6 randomly selected meals at each old age home (2 breakfasts, 2 lunches, and 2 suppers) by using the validated visual plate wastage method.[16] Reference portion sizes were determined using the menu specifications and the average weight of 3 plates of food. Food wastage was visually measured against these reference portions and recorded as 0%, 25%, 50%, 75% or 100% wastage. A standardised form was used to keep record of the wastage per menu item per person. The mean percentage of food wastage per menu item was calculated. This was used to adjust the average intake per person as calculated from the menu analysis and compared with the nutritional value of the menu.

Analysis of data

Descriptive statistics were used to evaluate the risk of malnutrition according to the MNA, the menu composition and average food intake (subtracting food wastage from menus), using Microsoft Excel (2000). Menus and average food intake were nutritionally analysed using the Foodfinder 1 program. The menus' macronutrient composition was compared with the prudent dietary guidelines, and the micronutrients with the RDA values of the DRIs.[17]

Table I. **Comparison of the mean nutrient intake to the recommendations (2003), expressed as a percentage of the recommendations**[15]

Nutrients	Actual mean intake (adjusted for wastage)	Men: Recommendations	Men: Actual intake expressed as %	Women: Recommendations	Women: Actual intake expressed as %
Macronutrients					
Energy kJ	6 963	1 0487*	66.4%	8 417*	82.7%
Protein	66	56*	118.0%	46*	143.6%
CHO	219	381*	57.5%	306*	71.7%
Fat	58	83*	70.1%	67*	87.3%
Cholesterol (mg)	234	300*	78.1%	300*	78.1%
Fibre (g)	21	30*	68.7%	21*	98.2%
Micronutrients – macrominerals					
Calcium (mg)	620	1 200†	51.7%	1 200†	51.7%
Phosphorus (mg)	979	580‡	168.7%	580‡	168.7%
Magnesium (mg)	260	350‡	74.2%	265‡	98.0%
Micronutrients – trace elements					
Iron (mg)	8	6‡	136.1%	5‡	163.3%
Zinc (mg)	9	9.4‡	93.5%	6.8‡	129.3%
Fat soluble vitamins					
Vit A (RE)	957	625‡	153.2%	500‡	191.5%
Vit D (mg)	3	15†	22.2%	15†	22.2%
Vit E (mg)	9	12‡	74.7%	12‡	74.7%
Water soluble vitamins					
Thiamin (mg)	1	1.0‡	87.8%	0.9‡	97.5%
Riboflavin (mg)	1	1.1‡	90.0%	0.9‡	110.0%
Niacin (mg)	12	12‡	98.0%	11‡	107.0%
Vit B_6 (mg)	1	1.4‡	81.2%	1.3‡	87.5%
Folic acid (mg)	192	320‡	60.0%	320‡	60.0%
Vit B_{12} (mg)	4	2‡	196.2%	2‡	196.2%
Panto acid (mg)	3	5†	62.4%	5†	62.4%
Biotin (mg)	18	30†	59.6%	30†	59.6%
Vit C (mg)	49	75‡	65.6%	60‡	82.0%

*Prudent dietary guidelines.
†Adequate intakes.
‡EAR.

Results

Nutritional status assessment

The study population consisted of 53 males and 157 females with a mean age of 76.8 (SD 10.6) years, a mean height of 1.57 m (SD 0.09) and a mean weight of 63.3 kg (SD 13.98). The mean BMI was 25.6 (SD 5.17). According to the MNA, 6% of the older people were malnourished, 47% were at risk of malnutrition, and 47% were well nourished. When classifying nutritional status according to the WHO categories[18] using BMI independently, findings differed, indicating that 7% of the older people were malnourished, 27% were at risk of malnutrition, and 66% were well nourished. In contrast, the results of the independent MAC measurements indicated that only 2% could be classified as malnourished, with 6% at risk of malnutrition and 92% being well nourished. According to the independent CC measurements, 17% were classified as malnourished and 83% as well nourished (Fig. 1).

Although it is known that the MNA is a composite measure of anthropometric, global, dietary and subjective assessments, it is important to identify possible reasons for the lower scores (and therefore nutritional status) to be able to recommend areas for intervention. Points of concern that should be addressed for those malnourished, or at risk of malnutrition, included taking more than 3 drugs daily (75%, 48% respectively), feeling stressed (50%, 31% respectively), and eating only one protein dish per day

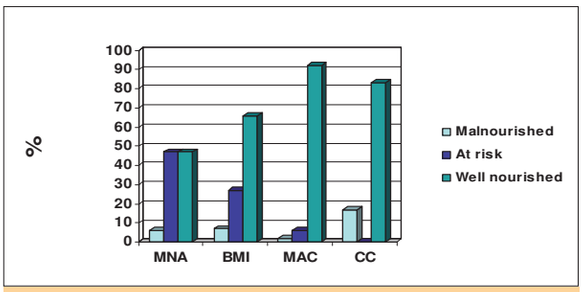

*Fig. 1. Comparison of independent anthropometry and MNA in the classification of nutritional status of older people (*N*=210).*

(25%, 21% respectively). In the group of subjects who were classified as malnourished, a greater percentage of subjects were bedridden (42%), had severe dementia (42%) and pressure sores (33%), ate only 1 meal a day (17%), had severe loss of appetite (33%) and difficulty eating on their own (58%), reported a major or moderate health problem(s) (34%), and indicated that they were not as well off as others their age (83%) (Fig. 2).

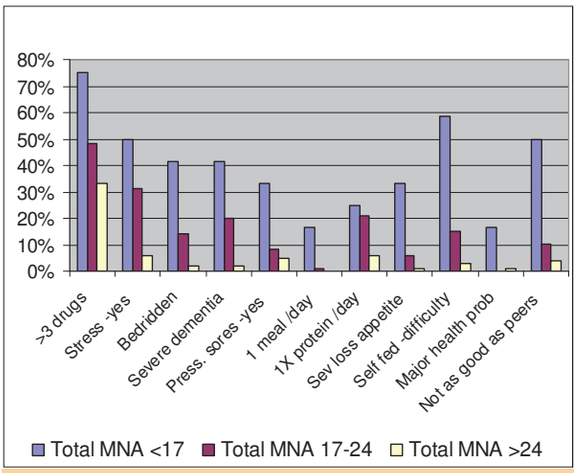

Fig. 2. Contributory factors affecting nutritional status of older people according to the MNA (N=210).

Nutrient intake

The mean daily energy content of the menus at the 4 old age homes ranged from 6 207 kJ to 7 918 kJ. There was a positive relationship between the percentage of malnourished older people and the decrease in energy content of the menu from the different homes for the aged (Fig. 3).

After correcting for plate wastage, the average energy consumption was 6 963 kJ (Table I), with a macronutrient distribution of 16% protein, 53% carbohydrates and 31% fat. The average daily intake of fibre was 20 g. Nutrient values below 67% of the recommended intakes according to relevant RDA/EAR (recommended dietary allowance/estimated average requirement) for older men and women[15] were observed for vitamin D, folic acid, and calcium. Additionally, the

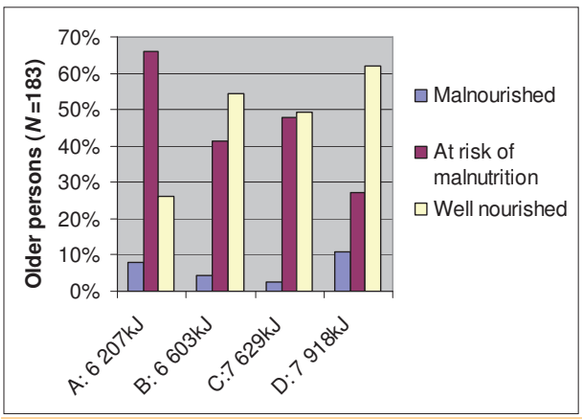

Fig. 3. The percentage of malnourished older people in relation to the energy content of the menus from the different homes for the aged (A, B, C and D).

intake for men was suboptimal (<67% RDA/EAR) for energy, carbohydrates and vitamin C.

Only 183 older persons completed the food acceptability questionnaire; the majority (63.8%) found the food acceptable, regardless of whether they were malnourished, at risk of being malnourished, or well nourished (Fig. 4). Specific foods, e.g. rice (13%), pasta (11%), potatoes (10%), cooked vegetables (11%) and soup (21%), which were rated by the older people themselves as being unacceptable, were found to lead to an increase in wastage (Fig. 5). Food items with the most plate wastage (>50%) were the starchy menu items, cooked vegetables and lunch protein dishes. The great majority of respondents thought that the food was enough (breakfast 96%, lunch 93%, supper 80%) but 14% indicated that the amount of food served at supper was insufficient.

Discussion

The prevalence of malnutrition in this sample was found to be 6%, with 47% identified as being at risk for malnutrition. This finding is consistent with figures reported by Charlton *et al.* in an older black sample in Cape Town, where 5% were classified as malnourished and 50.4% were in the 'at risk' classification of nutritional status.[19] These results are also in line with global research which shows a low (3 - 6%) prevalence of malnutrition in the free-living elderly population, whereas those in institutions and on admission to hospital are more at risk of malnutrition.[20] By identifying those at risk of malnutrition, it may be possible to provide adequate and immediate nutritional support to prevent further deterioration. In this study, the use of the BMI only to identify malnutrition would have underestimated the percentage of subjects at risk for malnutrition by 20%, in comparison with the percentages indicated by the MNA. This underscores the importance of including other factors in the assessment of nutritional status and early identification

of malnutrition, especially to identify the often overlooked at-risk group. The results of the MAC and CC also illustrate the limitations of using anthropometry as the only tool in assessing nutritional status, as both these methods failed to identify a large number (39% and 30%, respectively) of older people at risk of malnutrition in comparison with the results obtained from the MNA in this and other studies.[1]

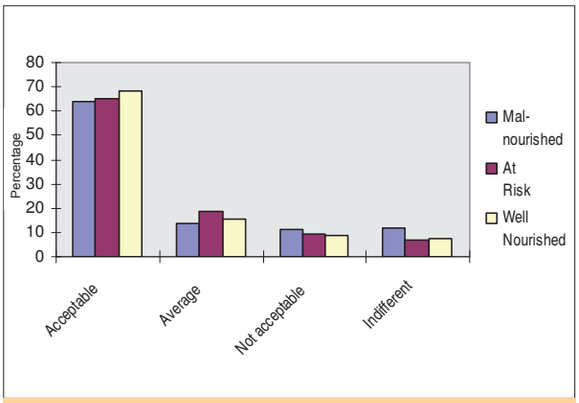

*Fig. 4. Food acceptability among older persons classified in the different nutritional status groups (*N=*210).*

Corrective and individualised nutritional intervention has been shown to improve the nutritional state of older people by lowering mortality, improving QOL, and reducing health care costs.[21,22] Possible points for intervention identified in this study include: taking more than 3 drugs, psychological stress, too few protein dishes and, specifically for those malnourished, being bedridden, having dementia and pressure sores, loss of appetite or eating only 1 meal a day, not being able to eat without assistance, and poor health status.

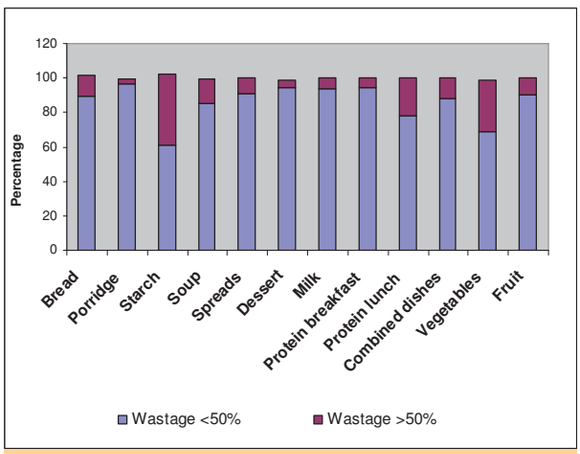

*Fig. 5. Food wastage of older people (*N=*183).*

Griep *et al*. observed similar findings, and established a significant negative correlation (r=–0.34, p=0.001) between the number of drugs taken and the MNA score, showing that older people at risk of malnutrition took more medication than those not at risk.[7] It follows that drug-induced inadequate nutrient intake would predispose these older people to greater risk of disease by reducing their appetite and thus absorption of nutrients.[4]

Similarly to other studies, the great majority of all respondents regarded the amount of food served at all meals as being enough, which makes an important contribution to their QOL[12] – although 14% of the subjects thought that the amount of food served at supper was insufficient. Portion size and problems with eating/swallowing, or insufficient time to eat, should always be borne in mind, especially as it was found that more of the malnourished older people reported severe loss of appetite and difficulty in eating without assistance.

The macronutrient distribution found in this study is close to the ideal of the prudent dietary guidelines.[23] Whereas fibre intake was at the lower level of the suggested range recommended for older people (21 - 30 g/day),[17] it was acceptable for the amount of energy consumed.[23] The mean energy intake was similar to the mean energy intake found in another study on 200 non-institutionalised older people in Cape Town (men 7 984 kJ, women 6 979 kJ).[24] Of concern, however, is that the menus provided on average only 6 963 kJ, which is less than 67% of the EAR/RDA[17] for energy recommended for older men.[17] A study in India among the elderly also found the diets to be energy deficient.[25] It has been noted that diets falling below 7 600 kJ tend to be inadequate in a greater number of nutrients,[23] and the menu needs to be planned with great care so as to increase nutrient density as well as additional energy sources, especially carbohydrates. The SENECA study in Europe found inadequate intake of one or more nutrients in 23.9% of men (N=486) and 46.8% of women (N=519), and that the prevalence of inadequate intakes decreased gradually with higher energy intakes, although 6 300 kJ was still inadequate.[26]

It was encouraging to find that the average protein intake was adequate for men and women. Although not yet reflected in the current editions of the DRIs, some investigators consider that older people may require protein in greater amounts than young adults.[27] Combined with the fact that older people are more likely to be affected by stressful stimuli which tend to increase protein needs, the low energy intakes often found in older persons may reduce the efficiency of dietary protein utilisation, thus further increasing protein requirements.[8] Some studies found lower rates of illness and hospital admission in subjects who had protein intakes >1 g/kg/day, compared with those with lower intakes.[28,29] The malnourished and those at risk of malnutrition reported being more stressed than the well-nourished group, which highlights the importance of protein intake among these vulnerable population groups.

Some of the nutrients found to be <67% of recommended intake in this study, are classified as high priority to older people, cf. the low intake of antioxidants (especially vitamin C in this study), folate and vitamin D in combination with calcium.[30] The inadequate calcium and vitamin D intakes correspond with results from other studies among the elderly (in India[25] and non-institutionalised older persons in a South African study), showing inadequate intakes of calcium for men, and calcium and vitamin D for women.[31] According to the MNA, 10% of the older people in this study were reportedly bedridden (the greatest majority of whom were in the malnourished group), and 25% seldom went outside (the greatest majority were in the at-risk-of-malnutrition group); therefore, care should be taken to ensure that they have regular exposure to the sun.

According to the MNA, 17% of respondents consumed less than 2 fruits and vegetables per day, a frequency that was higher in the group at risk of malnutrition and the malnourished group. The intake of vegetables was sub-optimal according to the moderate rating of acceptability, which was substantiated by a high percentage of food wastage. Low intake of vegetables among the elderly is a common finding also reported in other studies.[30,32,33] Older people who find it difficult to consume adequate amounts of fruit and vegetables are known to have low blood levels of vitamin C. Indeed, this appears to be the case even in the presence of an apparently adequate intake of vitamin C.[34] Vitamin C deficiency can leave older persons more susceptible to infection and delayed wound healing, and lead to bleeding gums, irritability and muscle wasting.[23]

Charlton *et al*. found a high prevalence of folate deficiency,[24] which corresponds with the relatively low intake of folate in this study. It is recommended that folate status of the elderly should be monitored and improved,[24,35] as folate deficiency is a known risk factor for dementia and impaired cognitive function,[33,36-43] as found in 13% of this group of older people.

An inadequate diet consumed on a long-term basis increases the risk of malnutrition.[23] The results of this study indicate that the percentage of older people who are malnourished or at risk of malnutrition was much higher in homes for the aged which did not meet the required energy allowances according to the RDA/DRI. One must bear in mind that the DRI's energy allowances are the estimated energy requirements of healthy, active individuals, and may therefore be an overestimation of the energy needs of older people living in homes for the aged.[17] Therefore, the energy content of meals could be increased to combat under-nutrition, without increasing the financial burden on homes for the aged. Apart from the nutritional content of foods, socio-psychological aspects of food are also important,[12,44] therefore more attention could be given to older people's preferences. It has been suggested that the introduction of choice menus could increase acceptability and nutrient intake.[27,45] Meals also serve a symbolic function. How meals are selected, where and when they are eaten, and attractiveness of presentation, could encourage those who have eating difficulties and those who have limited mobility, to enjoy their meals.[27]

A possible limitation of the study was that the study population comprised 75% women, which is higher than the area statistics (60% women >60 years in the City of Cape Town municipal area; 2001 census data), but reflects the higher number of women than men in this age group.

Conclusions

The MNA is a valuable instrument for assessing nutritional status of older people in homes for the aged, as demonstrated in this study. It helped to identify older people at risk of malnutrition, thus allowing for early intervention.

Although the macronutrient distribution in the old age homes studied was within prudent dietary guidelines, and the majority of the micronutrients were within the required amounts, specific micronutrients need to be addressed, especially vitamin D, folate and calcium, and particularly vitamin C in men. Food acceptability was not related to nutritional status or plate wastage, although starchy foods, cooked vegetables and lunch protein dishes were wasted by half of the older people. There was a relationship between malnutrition and lower energy intake, emphasising the need for meticulous menu planning and monitoring of food consumption.

Suggestions for implementation at old age homes to improve the nutritional status of older people appear in the boxed text.

The authors thank the residents and staff of Chris Heunis, Robari, Silver Oaks and Zandvliet homes for the aged in the Somerset West area of the Western Cape, for taking part in the study. They also thank Geratech, the Department of Human Nutrition and the final year BSc Dietetics students (Stellenbosch University) and Ancois Basson, without whose help this study would not have been possible to complete.

Recommendations for implementation at old age homes to improve the nutritional status of older people:

- The nutritional care of older people should be an integrated part of the continuous health care of older people, of which nutritional screening is the first step, and it is recommended that the revised version of the MNA* be used for this screening.
- As greater dietary variety is associated with higher nutrient intakes in older people, more attention should be given to the planning of menus in homes for the aged, especially the acceptability of protein, starchy and vegetable dishes, inclusion of menu items with a high nutrient density, and the nutrient content and satiety value of the dinner menu. Portioning of food in the presence of the older person simulates a home-like atmosphere, thereby encouraging increased food consumption. Older people can be encouraged to add seasonings to their food to increase flavour. Modification in consistency of food should be considered to increase the food intake of older persons with mastication or swallowing problems
- To address the low intake of calcium, folate and vitamin C, daily consumption of menu items containing fresh fruit and vegetables (especially green leafy vegetables), whole grains, milk and milk products, should be emphasised. Older people should be encouraged to spend time outdoors regularly and to increase their physical activities.

*The original MNA was very well accepted and utilised; however, its length might have impeded its use as a screening tool. Consequently, in 2006, a short version was developed to enhance its usefulness. The redesigned MNA still contains the same 18 items but is now administered in 2 stages: Stage 1 (6 screening questions) and stage 2 (12 assessment questions). The screening stage of the MNA can be viewed as a preliminary nutritional assessment, reserving the full MNA to confirm the diagnosis and, above all, to guide tailored nutritional intervention.[46]

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