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# Nutritional Assessment of the Older Population : Practical Application and Limitation

**Jin-Sook Yoon**†

*Department of Food and Nutrition, Keimyung University, Daegu, Korea*

## ABSTRACT

Evaluation of nutritional status is an essential element in providing appropriate intervention strategies to achieve the highest level of health. Nutritional assessment of the older population is complicated by many factors which do not significantly affect the nutritional status in young adults, therefore, it should be considered in two ways ; community-dwelling elders group and hospitalized or institutionalized elderly group. To sort out the individuals with nutritional problems in a community efficiently, nutrition screening tools must be simple, relatively inexpensive, and applicable to a large number of subjects. Combination of tools and indicators such as 24-hour food recall, body weight and height, and questionnaires on eating practices, and the presence of chronic diseases is practically applicable as basic tools of nutritional screening of older age group. However, the lack of validated screening techniques remains a barrier in improving nutrition. Validation is only limited to energy, BMI, protein intake of the older populations living in western countries. Further refinement of nutritional assessment tools is demanded to figure out whether those are practically applicable to community-living older adults in Asian Society. A careful and systematic evaluation of nutritional assessment tools should be carried out prior to implementation of stepwise nutrition service to the heterogeneous older population. For an in-depth nutritional assessment at the individual level, we need to extend research efforts to clarify the requirements of nutrients due to aging and diseases. More cost-effective methods that will allow rapid analysis of survey results are needed so that information can be readily available to policymakers. (*J Community Nutrition* 2(1) : 36~49, 2000)

**KEY WORDS** : nutrition assessment · screening tools · elderly · MNA · validation · limitation.

## Introduction

The rapid growth of the older population is a worldwide and common phenomenon. By the year 2030, it is projected that one out of every 8 people will be age 65 or older.

Physiological changes are apparent with aging, but these changes are individual and somewhat independent of chronological age. The nutritional status of the elderly is more varied than that of younger adults because of various age-related changes in social, physiological, and pathological status. Thus, evaluation of the nutritional status in the elderly is complicated by many factors that do not significantly affect nutritional status in young adults(Munro & Danford 1989).

As older persons continue to be the largest users of health care services, appropriate intervention strategies to promote the highest level of health are a major issue to health professionals. For older adults in good health, information that promotes continuing physical well-being is a priority. On the other hand, elders in declining health need specialized nutritional services. At present our knowledge of the nutritional needs and factors that influence the nutritional status in older people

†**Corresponding author** : Jin-Sook Yoon, Department of Food and Nutrition, Keimyung University, 1000 Sindang-dong, Dalseo-gu, Daegu 704-701, Korea
Tel : 053) 580-5873, Fax : 053) 580-5885
E-mail : jsook@kmu.ac.kr

is limited(Schlenker 1998).

A complete assessment of nutritional status includes determination of dietary intake, anthropometric measurements, biochemical measurements, and clinical assessment. In interpreting data on the elderly, the advantage and limitations of the methods for dietary intake and anthropometric measurements need to be taken into consideration as well as the limitations of the current biochemical methods.

Assessment of nutritional status is being used in many applied settings ; (1) at the individual level in patient diagnosis, screening, intervention, and monitoring, and (2) at the population level for setting policy, program evaluation, and nutritional surveillance. Nutritional status indicators are used by a diverse group of professionals, including researchers, clinical practitioners, program managers, and policy makers. The onset of diseases and subsequent complications can be lessened by early detection of risk factors or conditions and initiation of nutritional intervention measures (Rush 1997). As a result, older adults may maximize their independence in carrying out activities of daily living and lessen the number of illness-related days of restricted activity. Ultimately, nutrition services can contribute substantial savings in health care costs.

In this paper, practical aspects of nutritional assessment and their limitations will be discussed to improve the nutritional status of the older population in the context of providing better quality of life.

## Nutritional Status of Older Population

A variety of age-related changes affect the nutritional status of the older population. Knowing the causes and prevalence of nutritional problems is essential for planning a sound nutrition service program. A major factor influencing the nutritional status is decreased food consumption. Many factors-socioeconomic, psychological, ethnic, physiological, and pathological factors-play a role in determining dietary intake. Likewise, a disease process may affect nutritional status by affecting food intake and/or by affecting absorption or metabolism of a specific nutrient. Nutrient intake may be an intervening variable that will affect the management of disease(Munro & Danford 1989).

### 1. Age-related changes in nutrient intake

As people grow older, they experience changes in food consumption patterns. First, aging reduces appetite for food. Second, changes in food preferences occur in the population in general over decades. Last, the food supply changes.

In the case of thiamin, the need for this vitamin is linked to energy intake, so that the reduction with aging is compensated by diminishing energy consumption. However, this is not the case for iron intake, which also declines with age. The reduction in caloric and nutrient intake accelerates between age 70 and 80 years. With the diminishing food intake resulting from less demand for energy, it becomes increasingly difficult to meet the RDAs for calcium, iron, zinc, folic acid, vitamin $B_6$, and vitamin E. Exercise plays an important role in maintaining an adequate food intake by the elderly. However, adults become less inclined to exercise as age advances (Munro & Danford 1989).

### 2. Other factors affecting nutritional status of the elderly

To understand the nutritional problem of the elderly, it is important to consider the underlying causes that deteriorate the nutritional status of older population.

First, there are adverse social and environmental factors as primary causes of malnutrition. These include ignorance of the basic facts of nutrition, poverty, physical disability, social isolation, depressive mental illness and confusional states, all of which are incompatible with well-balanced nutrition and occur more frequently among old people.

Secondly, elderly people have malnutrition secondary to pathological conditions. This group includes malabsorption because of previous gastrectomy and gastrointestinal dysfunctions ; major nutrients affected are fat-soluble vitamins, folic acid, and vitamin $B_{12}$. Inefficient mastication from ill-fitting dentures can restrict food choices. Alcoholism and drugs can affect nutrition in various ways. Disease processes can increase requirements for nutrients while also impairing appetite, either from the disease process itself or from medications. The effect of chronic disease on nutritional status may also account for the varied number of elderly people with unacceptably low blood values for certain vitamins, depending on whether they lived at home or in a nursing home(Schlenker 1998).

Finally, there is some evidence suggesting that the elderly can more easily become nutrient deficient in response to stressful illnesses. This combination of age-related deterioration with impaired nutritional status is also seen in the lack of capacity of the elderly to increase albumin synthesis when protein intake is raised from a suboptimal to a high level(Munro & Danford 1989).

In conclusion, the study of nutritional status and requirements of the elderly is complicated by many factors that do not significantly affect nutritional studies in young adults. These should be recognized if the nutrition of the elderly is to receive adequate evaluation.

## Nutrition Assessment Tools Commonly Used for Elders

Nutritional assessment is an evaluation of the nutritional status of individuals or populations through measurements of food and nutrient intake and evaluation of nutrient-related health indicators.

Nutritional assessment consists of anthropometric, biochemical, clinical, and dietary data to determine the nutritional and health status of individuals and population groups as indicated in Table 1.

### 1. Anthropometric assessment

Anthropometry, which is the measurement of body size, weight, and proportion, is of increasing importance in nutritional assessment for older population.

#### 1) Body weight

Excess weight is extremely common among older Americans, but it seems to be less of a problem in Koreans. In several large studies,

**Table 1.** Components of nutritional assessment for older adults(Schlenker 1998)

| Components of Nutritional Assessment for Older Adults | |
|---|---|
| • **Anthropometric** | • **Clinical** |
| Weight | Signs and Symptoms |
| Stature | Functional Status |
| Knee Height | Congnitive Status |
| Total Arm Length | Oral Health |
| Arm Span | Use of Drugs |
| Circumferences | |
| Skinfolds | |
| Bioelectrical Impedance | |
| • **Biochemical** | • **Dietary** |
| Cholesterol Levels | Food and Beverage Intake |
| Folate Status | Food Preferences |
| Iron Status | Food Security/Insecurity |
| Protein Status | Use of Supplements |

both excess body weight and central body fat distribution patterns were predictive of coronary artery disease risk.

A loss of weight, which is an indicator of poor nutritional status, is more widely used for older patients.

**2) Body height**

Height measurements for the older population is complicated. Knee height, total arm span, or total arm length can be used to predict stature. Equations were developed to estimate the stature from knee height(Cokram & Baumgartner 1990). However, Han(1996) reported that these equations are less fit for the Korean population.

**3) BMI(Body Mass Index)**

High and low values of BMI are associated with increased risks of disease, and the relation of BMI with all cause mortality is reported U-shaped. Mortality associated with low BMI consists of tuberculosis, obstructive lung disease, and lung and stomach cancer. The mortality associated with high BMI is cerebrovascular and cardiovascular disease, diabetes, and colon cancer. However, the cut-off points for centiles as markers for obesity or undernutrition are not clearly established at any age. High and low levels of BMI have been reported to be associated with poor health among the elderly. If BMI is to be used as a marker in the elderly, it should be noted that it is influenced by declining bone mass and changes in hydration of the fat-free body with age : as such, this may limit its value.

Tayback et al.(1990) reviewed BMI data from the National Health and Nutrition Examination Survey for 9-year survival follow-up, and they found that the accepted definition for overweight, used for young adults was inappropriate for older adults. For adults older than 65 years of age, the lowest mortality rate was associated with a BMI between 23 and 30 for men. In an analyses of the same population, Galanos et al.(1994) also found that a BMI between 22 and 30 was associated with improved functional ability.

**4) Circumferences and skinfolds**

While measurement of circumferences require minimal equipment, it reflects fat distribution. Skinfold measurements have limitations when used for older adults. Cut-off points of arm circumference, tricep skinfold for nutritional risk group were not adequately tested for the Korean population.

**5) BIA(Bioelectrical impedance analysis)**

BIA(Bioelectrical impedance analysis) has been recommended as a practical nutritional assessment tool. Chertow et al.(1995) validated this method in patients with renal disease. PER is common among this group and contributes substantially to morbidity and mortality. The usual methods of nutritional assessment, such as anthropometry, can be misleading because of altered tissue hydration.

A limitation of the BIA is the assumption that subjects are normally hydrated. Errors in estimation of fat mass can result from the variability in hydration levels. Serial BIA measures of body water in older adults would seem to be beneficial to assess risk for dehydration. The risk for diabetes and osteoporosis increases with advancing age, thus increasing the risk for limb amputations and hip fractures. BIA may not be a valid measure of body composition in amputees or in people with metal pins in prosthetic replacements.

**2. Dietary assessment**

Weighed food records are useful primarily as validation for less intrusive methods. A complete food history recorded by interview is expensive and time consuming. A 24-hour dietary recall obtained by a trained dietitian

can provide accurate, quantitative information on recent intake but does not represent usual intake. Food frequency questionnaires provide better estimates of usual diet but less quantitative and subject to problems of recall and seasonality(Lee & Nieman 1996).

Keller et al.(1997) assessed the association of 24 risk factors with dietary intake in 5,073 community-living seniors. Diet score, Mean Adequacy Ratio and energy were derived from a self-administered food frequency questionnaire. Factors such as chewing status, dentition, hearing, level of happiness and body mass index were consistently and negatively associated with diet outcomes.

The uses of dietary assessment are many and are increasing as are the demands for the dietary data of better quality. Although the state of assessment methodology has improved, continued efforts are needed worldwide to further enhance expertise in dietary assessment at local levels. Strategies to improve dietary assessment include increasing awareness among policymakers and academics of the existence of high-quality information about what people eat and how this information may or may not be used, improving communication and dissemination of available nutrition information, and continuing to improve the quality of the information collected and the speed with which it is put to use(Helsing 1994).

#### 1) Assessment of adequacy of nutrient intakes of populations

In evaluating the nutritional status of the elderly in a population, it is important to know their average daily intakes of individual nutrients and compare these with the estimated requirements for persons of the same age and sex.

In all these approaches to accuratly assess the food intakes of individuals in groups or populations, it is desirable to have some guarantee of the precision of the individual estimates.

Finally, the use of levels of vitamins in the blood is a good confirmation of the frequency of inadequate intakes measured from dietary histories. Good correlations of levels of vitamin C in the blood(0.59), vitamin $B_2$(0.55), vitamin $B_{12}$(0.45), folate(0.50), α-tocopherol(0.64) and dietary intakes in elderly population were reported(Payette & Gray-Donald 1991).

A further restriction on the methodology of dietary intake assessment is the limitation of the food composition database that is applied to a person's consumption of foodstuffs in order to obtain intakes of individual nutrients. Food composition has been inadequately extended to the full range of foods for folic acid, zinc, and trace metals, largely because of limitations in analytical methodology. This may result in underestimation of intakes of these nutrients. Another factor lies in differences in the nutrient composition of foodstuffs encoded in different databases.

### 3. Biochemical assessment

Biochemical methods are more sensitive than other assessment methods and reflect alterations in nutritional status before other methods can detect these changes(de Jong et al. 1999).

Among older adults, protein-energy malnutrition, hyperlipidemia, and iron and folate deficiency anemias are common nutritional problems.

#### 1) Protein status

Serum albumin, transferrin, hemoglobin, total lymphocyte count are commonly used diagnostic indicators of PEM. Serum albumin and transferrin are good markers for evaluating visceral protein status. However, various factors can influence serum albumin levels.

Serum albumin is a good marker for evaluating visceral protein status. However, various factors can influence serum albumin levels. Hypoalbuminemia may result from certain gastrointestinal and renal diseases, liver disease, hypothyroidsm, congestive heart failure, infection, or zinc deficiency.

Serum transferrin serves as an iron transport protein and has a half-life of 8 to 10 days and a smaller body pool. Therefore, it responds more rapidly to changes in protein status over short periods. However, like serum albumin, it is affected by other factors, such as pernicious anemia, iron overload, gastrointestinal, renal, and liver diseases, congestive heart failure, and inflammation.

Total lymphocyte count(TLC) declines and lymphocyte response to antigens is impaired in malnutrition. Unfortunately, the specificity (the ability of the index to identify and classify those people who are genuinely well-nourished) and sensitivity(the extent to which the index reflects nutritional status or predicts changes in nutriture) is low for TLC, because it is affected by factors such as stress, sepsis, neoplasia, and the administration of steroids.

**2) Serum cholesterol**

Low total serum cholesterol levels are predictive of excess mortality, independent of cancer incidence. In addition, low total cholesterol levels in elderly people are associated with an increased risk of hemorrhagic stroke. A total serum cholesterol value less than 160mg/dl is also a marker for PEM. This is used in nutrition screening instruments such as the Level Ⅱ Screen of NSI.

In older adults, lipoprotein cholesterol levels appear to be more predictive of coronary events than total serum cholesterol. HDL-cholesterol levels below 35mg/dl were significantly associated with a 2.5-fold increase in coronary heart disease(CHD) compared to HDL-cholesterol levels of 60mg/dl or higher. The ratio of total cholesterol to HDL cholesterol was also strongly associated with CHD mortality(Goichot et al. 1995).

Low cholesterol concentration has been reported in various pathologic conditions in institutionalized elderly patients, and seems to be associated with poor outcome. Low cholesterol concentration is a nonspecific feature of poor health status that is independent of nutrient or energy intake. The role of nutrient factors as a determinant of cholesterol concentration appears to be marginal in free-living elderly subjects.

**3) Iron status**

Iron deficiency in the older population is generally associated with increased blood loss, excessive intake of aspirin or anti-inflammatory drugs to relieve arthritic pain, or achlorhydria.

Several factors can affect an index of Fe status. Chronic diseases-infection, inflammation, and certain neoplastic diseases-lead to anemia. A decline of hemoglobin may occur as a result of physiologic aging, although nutrient deficiencies and chronic disease may also be involved. Hemoglobin level is the most widely used screening test for Fe deficiency anemia because it is inexpensive. However, smoking is associated with higher levels of hemo-globin. Meanwhile, chronic infections, inflammation, hemorrhages, PEM, Vit B-12 or folate deficiency, and overhydration can result in low hemoglobin concentrations. Elevated concentrations of serum ferritin can occur with liver disease, leukemia, or Hodgkin's disease, whereas serum ferritin may display normal or slightly above-normal levels in vit B-12 or folate deficiency which cause increase transferrin saturation(Schlenker 1998).

At present, no single biochemical indicator has proven to be diagnostic of iron deficiency.

Frisoni et al.(1994) assessed anthropometric

and biochemical indicators in 104 nursing home elderly residents. Mortality data were collected over an 18-month follow-up period. They reported a nonlinear U-shaped relationship of cholesterol levels with mortality. A prognostic index, based on cholesterol, lymphocyte count, mid-arm circumference, hemoglobin, age, and gender, was associated with progressively higher risks at 12 months and 18 months. Sensitivity and specificity calculated on 18-month mortality were 80% and 78.4%, respectively.

**4. Clinical assessment**

Clinical assessment includes physical examination to determine physical signs and symptoms of nutritional disease, assessment of functional status and oral examination.

Many elderly may not report symptoms or changes in functional status because they accept their condition as an aging phenomenon. Some elderly may be mentally confused and unable to clearly describe signs and symptoms.

Clinical signs and symptoms are generally nonspecific and develop in the advanced stages of a nutritional deficiency. The big limitation of this assessment is that clinical signs indicative of nutritional disease, commonly found in elderly population can have non-nutritional etiologic causes. Changes of functional status represent an important symptom of nutritional status that need to be monitored (Schlenker 1998). Two measures of independence/dependence commonly used to assess functional status are the Activities of Daily Living(ADLs) and the Instrumental Activities of Daily Living(IADLs).

## How to Select Nutritional Assessment Indicator for Elders?

Nutritional assessment is important for older adults. Undetected condition or disease can be diagnosed by routine laboratory tests. The most commonly undetected nutritionrelated conditions for which assessment methods are available include : anemia, hyperlipidemia, diabetes, and electrolyte disturbances caused by diuretics and nonsteroidal anti-inflammatory agents. The onset of diseases and subsequent complications can be lessened by early detection of risk factors or conditions and the initiation of nutritional intervention measures.

The selection of nutritional indicators to assess nutritional status depends on several factors. These include : the objective of the assessment, the amount of time available for the assessment, and the level of personnel and money available to support the evaluation. Biochemical assessment generally involves invasive techniques and can be time-consuming and expensive because of the cost related to the personnel required to draw blood samples and perform the assays. In comparison, anthropometric measurements can be easily obtained by trained personnel with relatively inexpensive tools. In addition, scales, calipers, height boards, and measuring tapes are transportable. If the objective is to obtain baseline data and then monitor the nutritional status of older adults in a day-care facility on a limited budget, the choice of indicators could be a 24-hour food recall, body weight and height measurements, and questionnaires dealing with eating practices, food preferences, presence of chronic diseases, and use of prescription drugs(Schlenker 1998).

A nutritional assessment can take one of three forms : surveys, surveillance, or screening. Nutritional screening is the process of identifying characteristics or risk factors known to be associated with nutritional problems and then identifying individuals who have the condition or are potentially at high risk for the condition. If nutritional screening identifies a person at nutritional risk, a more

thorough evaluation of the individual's nutritional status can be performed. Surveys and surveillance represent nutritional assessment approach that are used at the community level for population groups, whereas screening applies to individual in clinical settings and to more narrowly defined population subgroups (Rush 1997).

## Practical Aspects of Nutritional Assessment for Community Dwelling Elders

Two approaches are possible to reduce risk factors in the target population(Rush 1997).

The first, the public health or population-based approach, is aimed at the general population, and the high-risk or individual-based approach, is aimed at individuals with defined risk profiles. However, it is usually not possible to make recommendations for individuals. On the other hand because the majority of the general population are suffering from chronic disease, the greatest benefit is likely to be achieved by a public-health prevention strategy. Therefore, issues of nutritional assessment and health can be addressed in two ways ; community-dwelling elderly and hospitalized or institutionalized elderly.

While there are many published papers describing nutritional assessment tools which are used in hospitals, there are few which describe tools which have been developed for community use(Edington 1999).

Screening tools for the community dwelling elderly must be short and relatively inexpensive. Fixed equipment can be used for clinic or office-based periodic health examination. It is possible, for example, that noninvasive measurements of body composition such as ultra-sound, infrared interactance and bioelectric impedence could be developed for mass use. The use of biochemical screening tools is also far easier in the clinic setting than in the field.

In fact, nutrition screening and intervention cannot depend on referring all high-risk individuals to specialists or physicians. There are too few specialists to cope with all the nutritional problems that need to be dealt with, and most specialists are clustered in urban areas.

Self-screening is also utilized in many situations. For example, any individual can judge whether he/she is smoking or not exercising. White et al.(1992) suggested the following scheme in Fig. 1 as a practical approach of nutrition screening.

### 1. Validation of screening nutrition screening tools

Nutrition screening is a first step before assessment, which identifies characteristics known to be associated with dietary or nutritional problems. Its purpose is to differentiate individuals who are at high nutritional risk or have poor nutritional status. Patients suffering from these factors need to be identified so that screening becomes a routine part of their medical treatment. At-risk groups include the elderly, the chronically ill, those with cancer and neurological disorders, post-surgical patients(Lee 1998 ; Schlenker 1998).

Rush(1997) describes the following as the justification for screening.

1) Acceptable levels of sensitivity in the screening instrument which means the ability to identify those with presymptomatic disease or risk factors for disease, specificity(the ability to classify correctly those without disease or risk factors), and relatively high predictive validity(the proportion of those screened positive who are truly positive).

2) The availability of proven interventions.

3) Screening shown to be preferable to other strategies, such as universal application of an intervention.

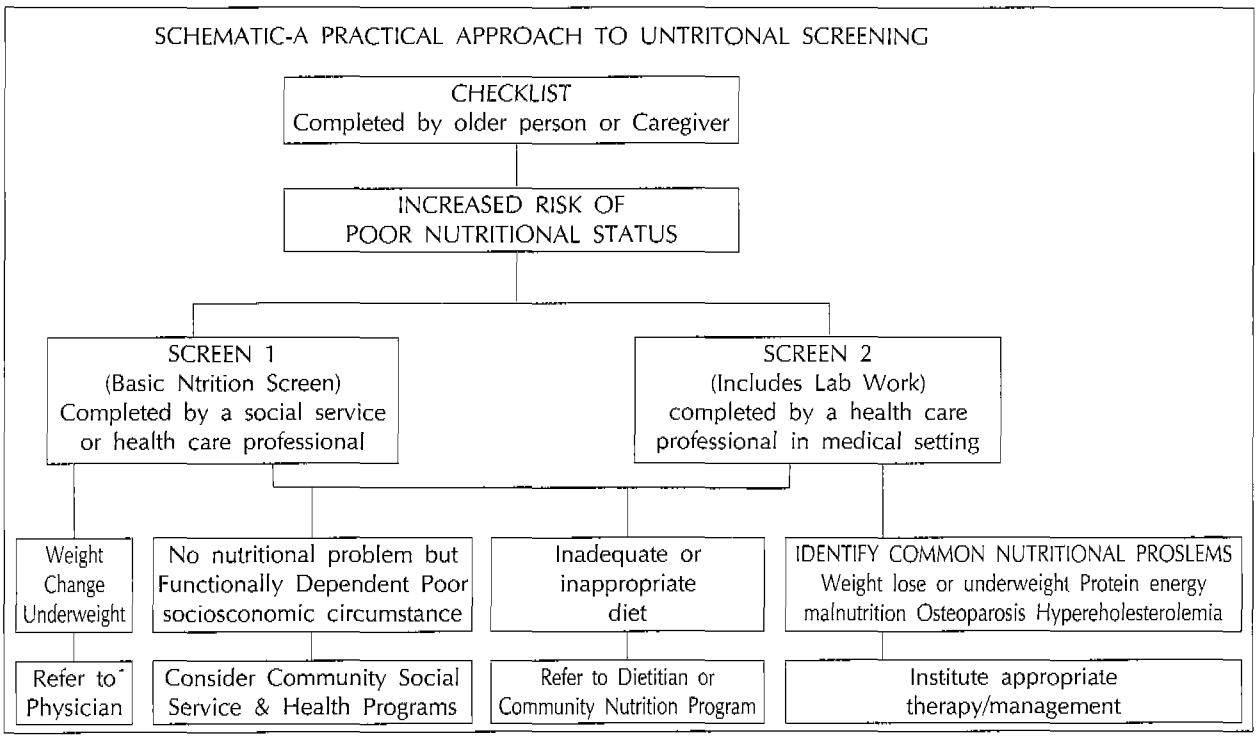


**Fig. 1.** A practical approach to nutrition screening(White et al. 1992)

### 2. Mini nutritional assessment(MNA)

MNA is originally developed in France. It is an 18-item tool used to assess nutritional risk. As shown in Fig. 2, it includes anthropometric measurements(BMI, mid-arm and calf arm circumferences, and weight loss), a dietary questionnaire(number of meals consumed, food and fluid intakes, and feeding autonomy), global assessment(life style, medication and mobility), and self-assessment(self-perception of health and nutrition). The time required to administer the MNA is approximately 10 min. This tool classifies subjects to well-nourished, at-risk, and malnourished categories. Validation studies were conducted for populations in community-dwelling, apparently healthy persons, as well as frail or sick persons in acute, subacute, or chronic care facilities. Functional indexes such as immune status, odor perception, dehydration, and disability was adversely affected by aging (Verllas et al. 1997).

The MNA is an accepted screening method for classifying the nutritional status or the risk of malnutrition of elderly individuals. However, the MNA does not clearly discriminate differences among all individuals in terms of levels of fat-free mass(FFM) or body fatness. To clarify these levels in relation to under-or overnutrition, additional studies are needed to increase the sensitivity and specificity of the MNA in relation to measured values of body storeage of fat and protein.

#### 1) Limitations of MNA

The current version of the MNA may have some limitations in its sensitivity and specificity in relation to measured values for body composition, owing to this apparent categorization of some healthy individuals as at risk for malnutrition. The third question of MNA is related to servings of fruits and vegetables. The answer to this question can be seasonably affected, but most probably reflects possible dieting or lifelong food habits or preferences. There could be some confusion as to

**Screening**

A Has food intake declined over the post over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0=severe loss of appetite
1=moderate loss of appetite
2=no loss of appetite ☐

B Weight loss during last months
0=weight loss greater than 3kg(6.6lbs)
1=does not know
2=weight loss between 1 and 3kg(2.2 and 6.6lbs)
3=no weight loss ☐

C Mobility
0=bed or chair bound
1=able to get out of bed/ chair but does not go out
2=goes out ☐

D Has suffered psychological stress or acute desease in the past 3months
0=yes 2=no ☐

E Neuropsychological problems
0=severe dementia or depression
1=mild dementia
2=no psychological problems ☐

F Body Mass Index(BMI)(weight in kg)/(height in m)$^2$
0=BMI less than 19
1=BMI 19 to less than 21
2=BMI 21 to less than 23
3=BMI 23 or greater ☐

Screening score(subtotal max. 14 points) ☐☐

12 points or greater Normal-not at risk-no need to complete assessment

11 points or below Possible malnutrition-continue assessment

**Assessment**

G Lives independently(not in a nursing home or hospital)
0=no 1=yes ☐

H Takes more than 3 prescription drugs per day
0=yes 1=no ☐

I Pressure sores or skin ulcers
0=yes 1=no ☐

J How many full meal does the patient eat daily?
0=1meal 1=2meals 2=3meals ☐

K Selected consumption markers for protein intake
• At least one serving of dairy products (milk, cheese, yogurt)per day? yes ☐ no ☐
• Two or more serving of legumes or eggs per week? yes ☐ no ☐
• Meat, fish or poultry every day yes ☐ no ☐
0.0=if 0 or 1 yes
0.5=if 2 yes
1.0=if 3 yes

L Consumes two or more servings of fruits or vegetables per day?
0=no 1=yes ☐

M How much fluid(water, juice, coffee, tea, milk … ) is consumed per day?
0.0=less than 3 cups
0.5=3 to 5 cups
1.0=more than 5 cups ☐.☐

N Mode of feeding
0=nuable to eat without assistance
1=self-fed with some difficulty
2=self-fed without any problem ☐

O Self view of nutritional status
0=view self as being malnoureshed
1=is uncertain of nutritional state
2=views self as having no nutritional problem ☐

P In comparison with other people of the same age, how do they consider their health status?
0.0=not as good
0.5=does not know
1.0=as good
2.0=better ☐.☐

Q Mid-arm circumference(MAC) in cm
0.0=MAC less than 21
0.5=MAC 21 or 22
2.0=MAC 22 or greater ☐.☐

R Calf circumference(CC) in cm
0=CC less than 31
1=CC 31 or greater ☐

**Fig. 2.** Details of mini nutritional assessment(MNA).

Total Assessment(max. 30 points) ☐☐.☐
Malnutrition Indicator Score
17 to 23.5 points at risk of malnrtrition ☐
Less than 17 points malnoureshed ☐

what is a fruit or a vegetable. Potatoes are a vegetable, but are servings of French Fries important? Instead, do we want to know about the servings of green leafy vegetables?

MNA is currently used in numerous different cultures, however, this tool has not yet been validated for the Asian population.

### 3. Screening tools of NSI(Nutrition Screening Initiative)

The Nutritional Screening Initiative(NSI) is a voluntary collaborative effort of major health and social service professional organizations in the USA to improve the nutritional status among older Americans. As indicated in Fig. 2, this screening tool consists of 3 parts-"DETERMINE Your Nutritional Health" checklist, Level I Screen and Level II Screen(White et al. 1991 ; White et al. 1992). Details of the checklist are shown in Table 2.

Table 3 provides a description of those characteristics or risk factors. Many of these

**Table 2.** DETERMIME Your nutritional health checklists

| | YES |
|---|---|
| I have an illness or condition that made me change the kind and/or amount of food I eat. | 2 |
| I eat fewer than 2 meals per day. | 3 |
| I eat few fruits or vegetables, or milk products. | 2 |
| I have 3 or more drinks of beer, liquor or wine almost every day. | 2 |
| I have tooth or mouth problems that make it hard for me to eat. | 2 |
| I don't always have enough money to buy the food I need. | 4 |
| I eat alone most of the time. | 1 |
| I take 3 or more different prescribed or over-the-counter drugs a day. | 1 |
| Without wanting to, I have lost or gained 10 pounds in the last 6 months. | 2 |
| I am not always physically able to shop, cook and/or feed myself. | 2 |
| TOTAL | |

Total Your Nutritional Score. If it's –
0-2 : Good!
3-5 : You are at moderate nutritional risk.
6 or more : You are at high nutritional risk.

**Table 3.** DETERMINE checklist of risks of malnutrition in older Americans(Dwyer 1996)

| | Social/ Psychological/ Economic | Medical/ Patho-physiological |
|---|---|---|
| Disease | x | xxx |
| Eating poorly | x | xxx |
| Tooth loss and mouth pain | | xxx |
| Economic hardship | xxx | |
| Reduced social contacts | xxx | |
| Multiple medications | | xxx |
| Involuntary weight loss or gain | x | xxx |
| Need assistance with self care | xxx | |
| Elder at very advanced age | x | xxx |

Causes of Nutritional Status Problems
Key : x=minor factor, occasionally involved
xxx=major factor, frequently involved

change in prevalence with chronological age. Taken together, they are relatively good predictors of mortality in elderly persons, but they are non-specific and are rather insensitive-that is, they tend to identify a large number of false positives. For this reason the presence of any one particular risk factor cannot be taken as indicative of malnutrition. However, the presence of several of them increases suspicion that nutritional status is affected.

Published reports(de Groot et al. 1998 ; Garofalo & Hynak-Hankinson 1995 ; Zylstra et al. 1995) indicate the usefulness of "DETERMINE Your Nutritional Health" checklist in identifying older adults at greater risk for malnutrition, including those who take more than three drugs a day, eat alone, and have illnesses that result in changes in eating patterns. This tool can be utilized as a starting point for a general discussion about nutrition and health. However, it is not intended to replace standard clinical or biochemical indicators ; nor is it to replace accepted diagnostic approaches. It identifies the individuals who need more detailed and extensive nutritional assessment measurements as well as nutritional intervention. A score above 6 on the checklist indicates the need for more in-depth assessment, specifically the administration of the Level I or Level II Screening Tool.

Several studies attempted to test the validity of this tool(Coulston et al. 1996 ; de Groot et al. 1998 ; Garofalo & Hynak-Hankinson 1995). Coulston et al.(1996) assessed the nutritional status of elderly in California to identify older adults with poor nutritional status among the independent-living elderly applying for meals-on-wheels, and to compare how a self-assessment tool and more traditional criteria identify nutritional risk.

de Groot et al.(1998) evaluated MNA and the NSI as tools for assessing the nutritional

status with 1,161 elderly people(most of them who live at home). According to MNA, 55% of the subjects which were classified as well-nourished, 44% as at risk of malnutrition, and 1% as undernourished.The NSI categorized the elderly people differently : 11% as well-nourished, 42% as at moderate nutritional risk, 48% as at high nutritional risk. Incidental differences emerged for biochemical indices(serum albumin, hemoglobin, lymphocyte count, serum lipids, serum vitamins), intakes of energy and protein, and anthropometric characteristics between MNA categories and between NSI categories. Using serum albumin values(<30g/l) and lymphocyte counts(<1500/ml) as standards, the specificity and sensitivity of both instruments for identifying at-risk groups were below 0.6%. Only with weight loss(>10%) as a criterion were higher sensitivities(0.96(MNA), 0.75 (NSI) and specificities found(0.60(MNA), 0.54 (NSI). They concluded that usefulness of both instrument tools for a healthy elderly population needs further evaluation.

Published reports(Coulston et al. 1996 ; de Groot et al. 1998 ; Garofalo & Hynak-Hankinson 1995) indicate the usefulness of nutrition screenings based on the NSI model in identifying older adults at greater risk for malnutrition. Individuals receiving higher scores on the checklist are more likely to have low nutrient intakes compared to RDAs.

We tested the adequacy of this check list targeted for Korean older women by examining the relationship of this NSI score and nutrients intake in 59 free-living older women(Yoon & Lee 2000).

As indicated in Table 4, our results indicated that nutritional risk is highly prevalent among Korean older women as measured by "DETERMINE" Your Health Checklist. Nutrients Intake(Energy, protein, zinc) of "good" health group was significantly higher compared to other groups. The lower the nutritional health score, the better dietary intake of energy, protein, zinc, and the less body fat in the elderly was observed. The DETERMINE check list seems to be a useful tool to screen the nutritional risk of older adults in Korea.

**Table 4.** Distribution of check list score in Korean elderly(Yoon & Lee, 2000)

| Variable | Percentage(%) |
|---|---|
| Good | 25.4 |
| Morderate nutritional risk | 50.9 |
| High nutritional risk | 23.7 |

### 1) Limitations of NSI DETERMINE checklist

The weight of the "DETERMINE" scores is arbitrary, as the cut-off points prompt further attention. Data on sensitivity and specificity of this instrument in relationship to any specific indices of health and nutritional status are currently lacking. There is no information on the internal consistency of the items. The interventions suggested are nonspecific, and there is no evidence for their efficacy. This tool is not intended to replace standard clinical or biochemical indicators ; nor is it to replace accepted diagnostic approaches.

However, it deserves more attention from nutritionists, since this tool differentiates the individuals who need more detailed, extensive nutritional assessment and nutritional intervention.

## Conclusions

As discussed in this paper, nutritional assessment for the older population needs to be more focused on identifying individuals at nutritionally risk in order to reach the goal of

disease prevention in the 21st century. Dietary assessment is an important component of identifying groups that are nutritionally at risk and developing programs and policies to improve well-being. However, more cost-effective methods are needed that will allow rapid analysis of survey results so that information can be readily available to policymakers at all levels. It is likely that nutritional screening is one of most efficient strategies for improving the nutritional health status of older population, however, lack of validated screening techniques remains a barrier to improving nutrition. Currently validation of Nutritional Screening tools is limited to energy, BMI, protein intake of older populations in western countries. Further refinement of nutritional assessment tools is demanded to figure out whether those are practically applicable to community-living older adults in Asian Societies. A careful and systematic evaluation of nutritional assessment tools should be done prior to implementation of stepwise nutrition service to heterogenous older population. For a in-depth nutritional assessments at an individual level, we need to extend research efforts to clarify the requirements of nutrients with aging and diseases.

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