Original Article

Comparison of Nutritional Status Screening by the Mini Nutritional Assessment (MNA®) and the Nutrition Alert Form (NAF) in Elderly Patients Setting at a Geriatric Clinic, Siriraj Hospital

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Objective: To evaluate the relationship between the Mini Nutritional Assessment (MNA®) and the Nutrition Alert Form (NAF), which is a newly developed nutrition screening tool, in a Geriatric Outpatient Clinic.

Materials and Methods: The present study was a cross-sectional study conducted in 159 elderly patients at a Geriatric Clinic, Siriraj Hospital.

Results: Mean age of the patients was 76.9 ± 6.4 years and 62.3% were female. Their mean body mass index was 24.6 ± 4.3 kg/m^2. The nutritional status which was classified by the MNA® was normal nutritional status 59.7%, at nutritional risk 32.7%, and malnourished 7.5 %. By the NAF cut-off points, the proportion of nutrition status were 74.8 % normal nutrition to mild malnutrition, 18.2 % moderate malnutrition, and 6.9% severe malnutrition, respectively. NAF was completed within 5 minutes in every case. The scores from NAF correlated with that from MNA® with a correlation of 0.192 (p 0.015).

Conclusion: The Nutrition Alert Form (NAF) can be used in Geriatric Outpatient Clinic with reasonable correlation with the MNA®.

Keywords: Nutrition Alert Form, Mini Nutritional Assessment, Nutritional assessment tool, Geriatric outpatient setting

J Med Assoc Thai 2018; 101 (7): 869-74
Website: http://www.jmatonline.com

World's population including Thailand has continually been aging. The proportion of persons aged over 60 years in Thailand now accounts for 15.3 percent of the total population , and it is expected to rise continuously[1]. Malnutrition is prevalent but often unrecognized in the older population leading to adverse functional and clinical outcomes such as: mortality, morbidity, infection, hospitalization and lower quality of life[2-4]. Early detection and intervention should be a key component of the geriatric assessment to prevent the deteriorating process[5]. Several nutrition screening tools were developed for early detection of malnutrition. However, most nutrition screening tools depend on weight and height as criteria for diagnosing malnutrition, are time-consuming or need physical examination and clinical judgment from a nutrition expertise[6-9].

The Nutrition Alert Form (NAF) was developed for screening of malnutrition and was proposed to be easy, concise, not requiring a nutrition expertise and can be used in setting where body weight cannot be measured, by adding the effects of serum albumin and total lymphocyte count[10]. However, it was tested only in hospitalized patients. In clinical practice, the proportion of outpatient service are higher than inpatient service. Nowadays, there is a lack of information on the prevalence of malnutrition in outpatient geriatric patients. Thus, the objective of the present study was to evaluate the relationship between the Mini Nutritional Assessment (MNA®) and the Nutrition Alert Form (NAF) in a Geriatric Outpatient Clinic.

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How to cite this article: Pengsorn N, Muangpaisan W, Assantachai P, Chalermsri C.Comparison of nutritional status screening by the mini nutritional assessment (MNA®) and the nutrition alert form (NAF) in elderly patients setting at a geriatric clinic, Siriraj Hospital. J Med Assoc Thai 2018;101:869-74.

Materials and Methods

The present study was a cross-sectional study. The sample size was calculated using the expected prevalence of 68% and 45 % of at risk or malnourished using the MNA and SGA, respectively. With a 95% confidence interval was used to generate a sample size of 166 individuals[11]. The authors recruited patients visited a Geriatric Clinic, Siriraj Hospital from January to October 2014. Inclusion criteria were adult aged 65 years or over and the Thai Mental State Examination (TMSE) score >23, or TMSE score ≤23 with well-informed caregiver available for accurate information. The patients who had the Thai mental state examination (TMSE) score ≤23 and no accompanying informant or unable to communicate were excluded. The Siriraj Institutional Review Board (IRB) approved the study proposal and informed consents were obtained from all patients or their legal representatives.

All patients' demographic data including age, gender and socioeconomic status were collected by an interview and medical record review. Basic activities of daily living (BADLs) were assessed by using Barthel index which has a total score of 100, a lower score indicating worse functional ability[12]. Cognitive status was assessed using the Thai Mental State Examination (TMSE) of which score ranges from 0-30, a lower score being suggested of worse cognitive function[13]. All patients underwent physical examination including body weight and height measurement. Complete blood count and serum albumin were obtained for evaluating the nutritional status. All patients received hand strength measurement by a hand grip dynamometer[14].

The patients' nutritional status was assessed by two nutritional screening tools in the same visit by two independent raters. The first one is the Mini-Nutritional Assessment (MNA®), the 30-scored validated questionnaire consisting of 18 questions including anthropometric assessment, general assessment, dietary assessment and subjective assessment. The MNA® was evaluated by the patient interview and physical examination. If the patients could not give reliable information, the questionnaire was confirmed by their caregivers. A score below 17, 17-23.5 and 24 or higher referred to malnutrition, at risk of malnutrition and well nourish status, respectively[15]. The second screening tool is the Nutrition Alert Form (NAF), which contains eight sections: height, weight and body mass index, body build, weight change, dietary intake change, gastrointestinal symptoms, functional capacity and patient's disease[10]. For patient whose weight could not be taken, the NAF score could be obtained by adding two routine standard laboratory tests: serum albumin and total lymphocyte count instead of the BMI. All patients' nutritional status was evaluated by the MNA® and NAF which was calculated by a score from the BMI, serum albumin or total lymphocyte count, (NAF - BMI, NAF - albumin and NAF - TLC, respectively). A score of 0-5, 6-10 and 11 or higher referred to NAF = A (normal to mild malnutrition), NAF = B (moderate malnutrition) and NAF = C (severe malnutrition), respectively.

Descriptive statistics were used to show percentage, means, standard deviations (SD), median and inter-quartile range (IQR). Comparison between different groups were tested with Chi-square test for categorical variables. Spearman's Rank Order Correlation was used to test correlation between the MNA® and each NAF sets (NAF - BMI, NAF - albumin and NAF - TLC). Kappa index was used to analyze the agreement between MNA and each subgroup of NAF in dichotomous variables. Statistical analyses were performed with Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL) version 15.0

Table 1. Demographic data of the study population (n = 159)

Demographic variables	Total (n = 159)
Age (years) (Mean, SD)	76.9 (6.4)
Female (%)	62.3
Walk independently (%)	77.4
BADL dependence* (%)	30.2
Income (baht/month) (median, IQR)	20,000.0 (10,000, 40,000)
Education ≤ 4 years (%)	45.9
Co-morbid diseases	
Hypertension (%)	113 (71.1)
Diabetes (%)	60 (37.7)
Cerebrovascular disease (%)	36 (22.6)
Dementia (%)	78 (49.1)
Chronic Kidney Disease (%)	68 (42.8)
Depression (%)	35 (22.0)
Malignancy (%)	10 (0.6)
Medication used > 4 items (%)	74.2
TMSE** (Median, IQR)	26.0 (21.0, 28.0)
Body mass index (kg/m^2) (Mean, SD)	24.6(4.3)
Serum albumin (g/dl) (Median, IQR)	4.2 (3.9, 4.3)
Lymphocyte count (cells/cm^3) (Median, IQR)	1955.0 (1.494.0, 2.383.7)

*BADL = Basic Activity of Daily Living

** TMSE = Thai Mental State Examination

for Windows. The *p*-value of < 0.05 was considered statistically significant.

Results

There were 159 patients enrolled in the present study. Mean (SD) age was 76.9 (6.4) years and 62.3 % were female. The baseline characteristic including underling diseases, functional capacity, socioeconomic status, cognitive status or number of current medication use were shown in Table 1. According to the MNA® classification, 7.5% were malnourished and 32.7% were at risk for malnutrition and 59.7 % were well nourished. Female had poorer nutritional status than male (*p*-value = 0.04). By the NAF - BMI, the prevalence of normal nutritional status to mild malnutrition, moderate malnutrition and severe malnutrition were 74.8%, 18.2% and 6.9%, respectively. The prevalence of malnutrition defined by the NAF - albumin and NAF - TLC were slightly different from NAF - BMI (Table 2). According to all three sets of the NAF, there were no difference of nutritional status between genders (Table 2).

By a correlation analysis, there were statistically significant correlations between MNA® score and NAF - BMI, NAF - albumin and NAF - TLC with Spearman correlation 0.192 (*p*-value 0.015), 0.173 (*p*-value 0.029) and 0.186 (*p*-value 0.020), respectively, (Table 3). All 3 sets of NAF (NAF-BMI, NAF-albumin and NAF-TLC) were highly correlated with each other (0.930–0.964, $p<0.001$). There was a significant correlation between the NAF and number of current medication used (r 0.288, <0.001), but no correlation between the NAF and BADL or TMSE was found in the present study.

Discussion

The present study was the cross-sectional study focusing on a comparison of the performance of the two different nutritional screening tools in elderly patients at an outpatient services. Based on the MNA®, the prevalence of elderly hospital patients being malnourished were 7.5%, lower than the findings from other studies. Saka et al[16] which included both outpatient elderly patients showed the prevalence of

Table 2. Nutritional status of the study population (n= 159)

Nutritional status by a screening tool	Total (n = 159)	Female (n = 99)	Male (n = 60)	*p*-value
MNA® classification				0.04
Normal nutritional status	95 (59.7%)	52 (52.5 %)	43 (71.7 %)	
At risk of malnutrition	52 (32.7%)	37 (37.4 %)	15 (25.0%)	
Malnourished	12 (7.5%)	10 (10.1%)	2 (3.3 %)	
NAF-BMI classification				0.91
Normal nutrition to mild malnutrition	119 (74.8 %)	73 (73.7%)	46 (76.7%)	
Moderate malnutrition	29 (18.2 %)	19 (19.2%)	10 (16.7%)	
Severe malnutrition	11 (6.9%)	7 (7.1%)	4 (6.7%)	
NAF-albumin classification				0.90
Normal nutrition to mild malnutrition	122 (76.7%)	76 (76.8%)	46 (76.7%)	
Moderate malnutrition	28 (17.6%)	18 (18.2%)	10 (16.7%)	
Severe malnutrition	9 (5.7%)	5 (5.1%)	4 (6.7%)	
NAF-TLC classification				0.91
Normal nutrition to mild malnutrition	119 (71.6%)	74 (75.5%)	45 (75.0%)	
Moderate malnutrition	30 (21.1%)	19 (19.4%)	11 (18.3%)	
Severe malnutrition	9 (7.3%)	5 (5.1%)	4 (6.7%)	

Table 3. Correlation and Kappa index between total MNA® score and 3 different NAF subgroups

	Correlation (r)	*p*-value	Kappa index	*p*-value
NAF-BMI score	-0.192	0.015	0.217	0.001
NAF-albumin score	-0.173	0.029	0.217	0.001
NAF-lymphocyte score	0.186	0.020	0.173	0.006

malnutrition was 13%. Normally, malnutrition rate in hospitalized or institutionalized patient is likely to be higher than general outpatient or community-dwelling setting. Schueren et al[17] demonstrated elderly outpatient being malnourished was 17%, this might be from older age of the patients than the present study. The subjects in Schueren's study were living independently without care giver support and having higher prevalence of cognitive impairment and depression than the present study.

According to ESPEN Guidelines for Nutrition Screening[18], the MNA® has been recommended for nutritional assessment in geriatric population. Thus, it is used as the gold standard of the nutritional assessment in the present study to demonstrate the performance of the NAF. From each NAF set calculated by using the BMI, serum albumin or total lymphocyte count, the prevalence of severe malnutrition was similar to that classified by the MNA®. However, there were slightly differences in proportion of normal and at risk of malnutrition from the result classified by the MNA®. A higher proportion of patients was classified into normal nutrition to mild malnutrition by the NAF compared to the patients categorized into normal nutritional status by the MNA®. This is likely from the different categorization. The best nutritional status category of the NAF included both normal nutrition and mild malnutrition, but the MNA® classified only absolute normal nutritional status.

The study result showed the trivial correlation between MNA and NAF, it may reflex NAF has less sensitivity to detect malnutrition in outpatient setting. However, this finding may come from many reasons. Firstly, MNA is created to detect malnutrition in all geriatric setting included outpatients, inpatients and rehabilitation setting, thus, the questions are incorporating dietary intake, acute or chronic illness, and functional aspect which are important in nutrition in older people. While NAF is created to detect nutrition in hospitalized patients, included medicine, surgery, and orthopedic ward which the questions focus on gastrointestinal symptoms and subject's diseases. Secondly, there are differences in the duration of each question between two tools. The questions in MNA ask the risk factors within a 3-month period, whereas NAF focused on the shorter duration (2-4 weeks). Lastly, there are the different categorization between the two tools as mentioned earlier. With respect to correlation between NAF and MNA, the present study is lower than the previous study, which conducted in combined the elder hospitalized and outpatient setting. The difference in clinical setting might alter the correlation because NAF mainly use in IPD patients[19].

Recent studies showed that serum albumin was insensitive to predict nutritional status due to many confounding factors such as acute illness or infection[20,21]. However, serum albumin level is used as one of the nutritional status predictors in general practice especially in primary care service because it is not costly, easy to assess, and useful to identifying a patient at high risk for malnutrition[22-25]. Complete blood count is one of the basic laboratory investigations because it is less invasive and low cost. Although lymphocyte count is affected by several possible causes such as infection or inflammation, the reducing number of lymphocyte especially less than 1,500 cells /mm^3 may be associated with malnutrition and adverse health outcomes[23,24]. Generally, patients in an outpatient clinic tend to have more stable health status than hospitalized or critically ill patient setting. Thus, the authors supposed that the usage of serum albumin in outpatient setting may yield more accurate result than other clinical setting. From the present correlation analysis, there are statistically significant correlations between the MNA® score and all 3 sets of NAF calculated by using the BMI, serum albumin and total lymphocyte count (correlation ranging between 0.930–0.964, p-value < 0.001). Therefore, in patients unable to be measured body weight or height, we may use NAF for nutritional status evaluation by substituting serum albumin or complete blood count instead of BMI.

Although malnutrition is one of the geriatric syndromes and early recognition is essential for initiating the intervention, there is no "gold standard" screening tool[7,9]. Most of the screening tools depend on weight and height whereas some tools need skilled nutritional expertise or time - consuming. The recent developed nutritional screening tool, Nutrition Alert Form (NAF), is easy, concise, convenient and not requiring skill personnel and no weight and height need for identifying the nutritional status. The NAF contained 8 sections of questionnaires as previous description. Patients' co-morbid diseases are the major component of total score (60 of the total score 85) as the NAF is developed for inpatient setting purpose. Items of co-morbid diseases are common illnesses in a hospital such as septicemia, severe pneumonia, severe head injury, second degree burn or critically ill. The present study found these disease items were rarely present in outpatient setting and it may affect the prevalence of malnutrition in the present study and

one of the factors of disproportionate prevalence of malnutrition classified by the MNA® and NAF. From this reason, the NAF is less suitable for follow up visit after the first screening session because of their unchanged co-morbidity which could lead to relative unchanged of the score despite the improvement of nutritional status. Furthermore, no study shows health impacts of nutritional screening by the NAF. Hence, the ability of the NAF to predict clinical outcomes is the challenge requiring future research.

Conclusion

The Nutrition Alert Form (NAF), a newly developed nutrition screening tool can be used in Geriatric Outpatient Clinic with reasonable correlation with the MNA®. Using BMI, serum albumin and total lymphocyte count in NAF formula yield similar prevalence of malnutrition. Therefore, anthropometric measurements and basic laboratory data can be used interchangeably in the setting where the BMI cannot be obtained.

Acknowledgement

The authors would like to thank Mrs. Angkana Jongsawadipatana and all healthcare personnel of the Geriatric clinic, Siriraj Hospital for assistance with data collection. We are also grateful to all elderly patients who kindly participated in the present research.

Potential conflicts of interest

The authors declare no conflict of interest.

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