Nutrition screening among community-dwelling older adults in Singapore

Yap K B, Niti M, Ng T P

ABSTRACT

Introduction: This study aimed to describe responses to the DETERMINE checklist and the nutritional risk level of community-dwelling older Chinese in Singapore, aged 55 years and older.

Methods: Data was collected from a community health screening project for elderly residents in Singapore. All residents aged 55 years and older in the survey area were identified in door-to-door census surveys and were invited to participate. Participants completed a questionnaire interview conducted by research nurses. The survey also included questions which were potential predictors of nutritional risk: sociodemographic factors (age, gender, education, housing type, marital status, and living arrangement) and health-related factors (self-rated health, number of medical comorbidities, hospitalisations in the past year, functional disabilities and physical health status).

Results: Data for analysis was provided by 2,605 Chinese subjects aged between 55 and 98 years (mean/standard deviation 66.0/7.7). The overall prevalence of nutritional risk (according to a DETERMINE score of 3 or greater) was 30.1 percent. 1,822 (69.9 percent) subjects had no nutritional risk (scores of 2 or lower), 664 (25.5 percent) had moderate nutritional risk and 119 (4.6 percent) had high nutritional risk. The most common contributions to nutritional risks were: changing food intake due to illness (40.3 percent), taking three or more different medications daily (25.0 percent), eating alone (14.5 percent) and consuming insufficient amount of fruits, vegetables or milk products on a daily basis (9.0 percent). Respondents at nutritional risk were more likely to have three or more comorbid medical conditions, were hospitalised in the past year, were functionally dependent on one or more instrumental or basic activities of daily living, were reported to have poor or fair self-rated health, and were in the lowest tertile scores for SF-12 quality of life and depression.

Conclusion: Self-rated general health, lowered quality of life, functional disability and depression have meaningful non-circular associations with the checklist. These support the validity of the DETERMINE checklist in predicting the risk of adverse health conditions and events.

Keywords: community-dwelling older adults, health outcomes, nutrition screening, older adults

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INTRODUCTION

Nutritional well-being is an important component of health, functional independence and quality of life in older persons. However, it is difficult to determine the prevalence of nutritional risk among the elderly due to the differences in assessment methods used. Using assessment instruments based on factors associated with malnutrition, about 35%– 60% of community-dwelling elderly appear to be at risk of becoming malnourished.[1-5] The American Academy of Family Physicians and the National Council of Aging in the United States previously formed the Nutrition Screening Initiative for the development of strategies to detect nutritional risks among older people. One of the strategies included the development of a ten-question checklist, DETERMINE Your Nutritional Health.[6] This checklist, which was designed to be self-administered, could also be administered by a healthcare professional. It includes ten yes/no statements covering dietary, general and social assessments. Each statement has a weighted score, which is then tallied to form a final score for stratification to low, medium and high nutritional risks. A score of 0–2 on the checklist indicates a good nutritional status, 3–5 indicates a moderate nutritional

Department of Geriatric Medicine, Alexandra Hospital, 378 Alexandra Road, Singapore 159964

Yap K B, FRCP, FAMS
Senior Consultant

Department of Psychological Medicine, National University of Singapore, Yong Loo Lin School of Medicine, 5 Lower Kent Ridge Road, Singapore 119074

Niti M, PhD
Research Fellow

Ng TP, MD, FAMS
Associate Professor

Correspondence to:
Dr Yap Keng Bee
Tel: (65) 6379 3443
Fax: (65) 6379 3450
Email: keng_bee_yap@alexhosp.com.sg

risk, and 6 or more indicates a high nutritional risk. The checklist has been used by several researches to identify the prevalence of nutritional risk among community-dwelling elderly due to its simple format, without having to rely on anthropometric or biochemical markers.[5-9]

The purpose of our study was to describe responses to the DETERMINE checklist and the nutritional risk level of community-dwelling older Chinese in Singapore, aged 55 years and older. An additional objective was to examine sociodemographical variations in nutritional risk, and the association between being at nutritional risk and a range of health outcomes, including multiple medical comorbidities, functional disability, self-rated health status, quality of life, hospitalisation, and depression.

METHODS

The data for the study was collected from a community health screening project for elderly residents in the southeast districts of Singapore, a component of an ongoing cohort study (Singapore Longitudinal Aging Study, SLAS). The population of residents, who were aged 55 years and above, from five districts in the southeast region of Singapore, were identified from a door-to-door census, and invited to participate in the study. Participants completed a questionnaire interview conducted at the study centres, which were conveniently situated in the survey area. To maximise subjects' participation, non-responders were re-contacted by telephone or by repeat visits from the research nurse. A total of 2,804 subjects were enrolled at the baseline. The estimated response rate was 78.5%, with predominance by the Chinese (93%). Based on a census done in on year 2000, the ethnic proportions in the total eligible sample (responders and non-responders) were as follows: 6.5% Chinese, 15.6% Malays, and 7.8% Indians. The National University of Singapore Institutional Review Board approved the study protocol and all subjects provided written informed consent.

The subjects were interviewed by a trained research nurse. Besides completing the DETERMINE checklist, the survey also included questions which were potential predictors of nutritional risk: sociodemographical factors (age, gender, education, housing type, marital status, living arrangement), health-related factors (self-rated health, number of medical comorbidities, hospitalisation in the past year, functional disabilities, physical health status based on the SF12-PCS score),[10] and psychological factors (mental health status based on the SF12-MCS score,[10] depressive symptoms based on Geriatric Depression Scale,[11] cognitive functioning by the Chinese version of the Mini-Mental State Examination[12]). Information on household income or employment status was not collected as most of our subjects were retired elderly with no regular source of income. Housing type was used as a proxy for socioeconomic status of our subjects. Housing type and corresponding size have been shown consistently in numerous studies to be a reliable surrogate indicator of socioeconomic status, with persons living in lower-end, small-sized (1–2 rooms) public housing apartments having lower average income and education than those living in higher-end, bigger housing types.

Frequency distributions were generated for item responses to the DETERMINE checklist for the whole population as well as the three age strata (55–64, 65–74 and ≥ 75 years). In the univariate analyses, the association of nutritional risk (defined by the DETERMINE total scores of 3 or greater) and potential correlates were individually tested using Chi-square and simple logistic regression. Multivariate analyses were further conducted using backward-stepwise logistic regression with nutritional risk as a dependent variable and covariate adjustment for potential independent correlates, which were found to be significant in the univariate analyses. Crude and adjusted odds ratios for the moderate-to-severe nutritional risk were computed, yielding point estimates with their corresponding 95% confidence limits. All statistical analyses were performed using statistical software Statistical Package for Social Sciences version 14.0 (SPSS Inc, Chicago, IL, USA) and the statistical significance was set at $p < 0.001$.

RESULTS

Among those eligible older adults identified by door-to-door census, 78.5% agreed to participate in the survey (n = 2,804). And of these, 2,611 were Chinese (93.1%). However, as we were unable to gather information on the nutritional screening from six subjects, the total sample for the analysis was therefore based on 2,605 subjects. The number of non-Chinese elderly in our SLAS cohort was very much under-represented (n = 193, 6.9%). Given the circumstances, interpretation of the findings based on a more homogeneous sample (i.e. Chinese population) was deemed more definitive. The respondents differed from the non-responders in being younger (mean [SD] age 66.0 [7.7] years versus 68.1 [9.2], $p < 0.01$), having a higher proportion of women (63.2% versus 47.8%), a lower proportion of residents living in 1–2 room Housing and Development Board (HDB) flats or nursing homes (7.7% versus 51.4%), a higher proportions of residents in higher-end five-room HDB flats, private apartments and landed properties (29.7% versus 9.0%), ($p < 0.01$), and a lower proportion of non-Chinese (6.6% versus 10.2%, $p = 0.04$).

Data for the analysis was provided by 2,605 Chinese subjects aged between 55 and 98 years (mean [SD] = 66.0 [7.7]). The overall prevalence of nutritional risk (according to a DETERMINE score of 3 or greater) in

Table I. Evaluation for known causes of neuropathy.

Screening questions	Overall (%) (n = 2,605)	55–64 years (%) (n = 1,292)	65–74 years (%) (n = 973)	75+ years (%) (n = 340)	p-value
Having an illness that changed the kind and/or amount of food consumed	40.3	35.1	45.8	42.8	< 0.001
Eating fewer than two meals per day	2.3	2.9	1.7	2.4	0.18
Eating few fruits/vegetables/milk products (less than once a day)	9.0	8.7	8.9	10.0	0.76
Having three or more drinks of beer/liquor/ wine almost every day	3.1	3.0	3.2	3.4	0.94
Having tooth or mouth problems that cause difficulty in eating	5.2	3.6	5.2	10.5	< 0.001
Not always having enough money to buy the food needed	2.1	1.7	1.9	4.2	0.0011
Eating alone most of the time	14.5	11.9	16.4	18.1	0.001
Taking three or more different prescribed or over-the-counter drugs a day	25.0	18.5	28.0	37.5	< 0.004
Without wanting to, having lost or gained 4 kg in the last six months	3.5	3.2	3.5	4.5	0.51
Not always physically able to shop, cook and/or feed by self	2.6	1.6	2.4	6.8	< 0.001

community-dwelling older persons was 30.1% (95% CI 28.6–31.6). Responses to the specific areas on the DETERMINE checklist are shown in Table I. The most common contributions to nutritional risks were: changing food intake due to illness (40.3%), taking three or more different medications daily (25.0%), eating alone (14.5%) and consuming insufficient amounts of fruits, vegetables or milk products on a daily basis (9.0%). Differences in responses due to age were not statistically significant, except for items like having an illness that changes the kind and/or amount of food consumed ($p < 0.001$), having tooth or mouth problems that make it hard to eat ($p < 0.001$), not always having enough money to buy the food needed ($p = 0.011$), eating alone most of the time ($p = 0.001$), taking three or more different prescribed or over-the-counter drugs a day ($p < 0.001$), not always physically able to shop, cook and/or feed by self ($p < 0.001$) (Table I).

The distribution of the DETERMINE checklist scores is shown in Fig. 1. 1,822 (69.9%) subjects had no nutritional risk (scores of 2 or lower); 664 (25.5%) had moderate nutritional risk and 119 (4.6%) had high nutritional risk. Sociodemographical factors are summarised in Table II, and health outcomes in Table III. Respondents were more likely to be at nutritional risk when they were older, male, less educated, living in lower-end housing, single, divorced or widowed, or living alone. In multivariate analysis, the sociodemographical factors independently associated with nutritional risks were male gender (OR 1.29; 95% CI 1.05–1.57); lower-end housing in 1–2 room HDB apartments (OR 1.41; 95% CI 0.97–2.05) and three-room apartments (OR 1.33; 95% CI 1.07–1.65); being single, divorced or widowed (OR 1.46; 95% CI 1.15–1.84); and living alone (OR 2.06; 95% CI 1.43–2.94).

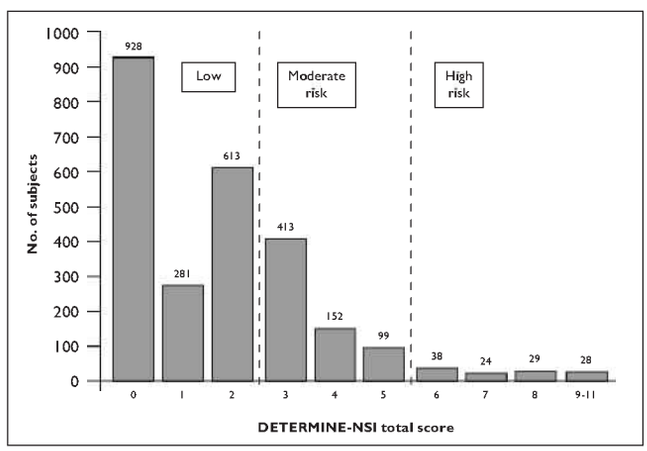

Fig. 1 Distribution of DETERMINE checklist scores and nutritional risk levels.

Table II. Association of nutritional risk (score ≥ 3) with sociodemographical variables (n = 2,605).

Sociodemographical variables	Sample proportion (%)	Prevalence of nutritional risk (score ≥ 3) (%)	Crude OR (95% CI)	p-value	Adjusted¶ OR (95% CI)	p-value
Age group						
55–64 years	49.6	24.1	1.00	< 0.001		ns
65–74 years	37.3	33.1	1.56 (1.29–1.88)			
75+ years	13.1	40.9	2.18 (1.71–2.78)			
Gender						
Female	63.1	28.9	1.00	0.095	1.00	0.015
Male	36.9	32.0	1.16 (0.98–1.38)		1.29 (1.05–1.57)	
Education						
Primary and below	52.1	33.6	1.00	< 0.001		ns
Secondary and above	47.9	26.2	1.42 (1.20–1.68)			
Housing type						
1–2 rooms/nursing homes	6.5	47.1	2.42 (1.76–3.33)	< 0.001	1.41 (0.97–2.05)	0.009
3 rooms	23.7	34.8	1.45 (1.20–1.77)		1.33 (1.07–1.65)	
4–5 rooms/private	69.8	26.9	1.00		1.00	
Marital status						
Married	74.6	26.5	1.00	< 0.001	1.00	0.002
Single/divorced/widowed	25.4	40.2	1.86 (1.54–2.23)		1.46 (1.15–1.84)	
Living arrangement						
Living alone	7.0	50.0	2.51 (1.85–3.40)	< 0.001	2.05 (1.43–2.94)	< 0.001
Living with others	93.0	28.5	1.00		1.00	

Dependent variable: Nutritional risk (Score on DETERMINE-NSI checklist ≥ 3)

Reference categories: age < 65 years, female gender, secondary level education, 4–5 rooms or higher-end housing type, married, living with others.

¶Method: Backward Stepwise (LR)

Table III. Association of nutritional risk (score ≥ 3) with health-related outcomes (n = 2,605).

Health-related outcomes	Sample proportion (%)	Crude OR (95% CI)	p-value	Adjusted¶ OR (95% CI)	p-value
≥ 1 medical comorbid condition	91.0	3.31 (2.23–4.89)	< 0.001	3.14 (2.11–4.69)	< 0.001
≥ 1x hospitalisation in past year	4.0	2.28 (1.54–3.38)	< 0.001	2.24 (1.49–3.36)	< 0.001
Functional disability (≥ 1 IADL/ BADL task)	24.8	2.00 (1.66–2.41)	< 0.001	1.72 (1.41–2.11)	< 0.001
Poor or fair self-rated health	32.7	2.32 (1.94–2.76)	< 0.001	2.29 (1.91–2.74)	< 0.001
Lowest tertile SF-12 PCS quality of life	33.2	2.15 (1.81–2.56)	< 0.001	2.01 (1.67–2.42)	< 0.001
Depression (GDS ≥ 5)	13.3	2.00 (1.59–2.52)	< 0.001	1.81 (1.42–2.31)	< 0.001

Dependent variable: health-related outcome

Reference category: those without nutritional risk (score on DETERMINE-NSI checklist < 3)

¶Adjusted for sociodemographic variables (age, gender, education, housing type, marital status, living arrangement ('forced' method)

Respondents at nutritional risk were more likely to have three or more comorbid medical conditions (multivariate OR 3.14; 95% CI 2.11–4.69), to be hospitalised (OR 2.24; 95% CI 1.49–3.36), to be functionally dependent for one or more instrumental or basic activities of daily living of daily living (OR 1.72; 95% CI 1.41–2.11), to report poor or fair self-rated health (OR 2.29; 95% CI 1.91–2.74), to be in the lowest tertile scores for SF-12 quality of life (OR 2.01; 95% CI 1.67–2.42), and depression (OR 1.81; 95% CI 1.42–2.31).

DISCUSSION

The results of this study indicate that 30% of community-dwelling persons aged 55 years and older were at risk for poor nutrition. Other studies in urban populations have yielded a higher proportion, varying from 37% to 62%, of senior citizens at nutritional risk.[1-3] However, it is difficult to make inter-study comparisons, because different population segments were studied and it was uncertain whether the DETERMINE checklist is wholly applicable to an Asian population. It is interesting to note, however, that the distribution of reported individual nutritional risk factors in this sample was similar to previously-reported findings in that the same four items were identified as the most frequent problems.[2,13-15]

Despite the current availability of several nutrition screening instruments, the ideal test, one that has high sensitivity and specificity, has not yet been developed. The ideal screening tool should also be able to identify specific conditions that can be prevented or treated before it leads to serious malnutrition. The DETERMINE checklist has previously been criticised for its poor specificity and sensitivity.[16] Phillips also found no significant correlation between risks identified by the checklist and the risks as detected by dietary inadequacy measured by the 131-question food frequency questionnaire.[17] However, in a more recent study on elderly European subjects,[5] de Groot et al found a similar specificity for high nutritional risk when the DETERMINE checklist was compared with the Mini Nutritional Assessment scale. These comparisons were made using serum albumin, lymphocyte count, body mass index and weight loss as criterion variables.

Every instrument has its own unique scoring systems. Their "total" score may represent the magnitude of a specific intangible construct like nutritional risk, quality of life, and depression. The use of several different instruments in the same survey is justifiable and not uncommon. Their derived scores can be analysed at the same time in a multivariate model after fulfilling certain assumptions. In this study, logistic regression has shown that a checklist score of 3 or more is independently associated with sociodemographical factors and appear to predict pertinent health conditions and events. The associations with marital status, living alone and housing type are expected, because they correspond to similar questions asked in the DETERMINE checklist ("eating alone", "not enough money to buy food"). The association with multiple medical conditions is also expected from its auto-correlation with the DETERMINE checklist question on "have an illness that make me change my food intake" and another on "take three or more drugs a day". However, self-rated general health, lowered quality of life, functional disability and depression have meaningful non-circular associations with the checklist. These suggest the validity of the DETERMINE checklist in predicting the risk of adverse health status and events. Depression was also found to be independently associated with nutritional risk in a study on the DETERMINE screening tool by MacLellan and Van Til.[3] This suggests that additional questions on self-rated general health and mental health (i.e. depression) could increase the performance of the DETERMINE screening tool.

The DETERMINE checklist was originally introduced as a screening and educational tool. The research literature suggests that it has limited sensitivity as a nutritional screening tool. Given the complexity inherent in the assessment of nutritional statuses, it is likely that the ideal tool will never be developed. However, nutritional screening should continue as it increases the awareness of nutrition-related problems in the community. Screening tools are not designed to diagnose malnutrition; they only identify people at risk for poor nutrition. These high risk individuals should be further evaluated through the use of more extensive nutritional assessment tools.

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