Nutrition risk, functional dependence, and co-morbidities affect depressive symptoms in Taiwanese aged 53 years and over: A population-based longitudinal study

Hsin-Jen Tsai *

Department of Health Management, I-Shou University, Kaohsiung, Taiwan

ARTICLE INFO

ABSTRACT

Objective: This study examined cross-sectional and longitudinal associations of nutritional risk, functional dependence and co-morbidities with depressive symptoms in people aged 53 years and over in Taiwan.
Methods: Study data were obtained from a population-based longitudinal study, the Taiwan Longitudinal Study of Aging (TLSA), with a nationally representative sample of nearly-old and old Taiwanese.
Results: The prevalence of having depressive symptoms and being at risk of malnutrition/malnourishment in 1999 was 23% and 21%. Mini-Nutritional Assessment (MNA) score, being at risk of malnutrition/malnourishment, number of self-reported co-morbidities, and Activities of Daily Living (ADL) score were all cross-sectionally correlated with depressive symptoms (all $p < .05$). Being at risk of malnutrition/malnourishment and number of co-morbidities were also longitudinally associated with increased risk of subsequent depressive symptoms over four and eight years (all $p < .05$). The relationship between nutritional risk and subsequent depressive symptoms was stronger than the relationship between co-morbidities and ADL score and subsequent depressive symptoms.
Conclusions: These results suggested that nutritional risk, co-morbidities and functional dependence are all associated with increased risks of depressive symptoms in people aged 53 years and above. Nutritional risk contributes significantly to subsequent depressive symptoms and is a strong and consistent predictor of subsequent depressive symptoms in nearly-old and old Taiwanese.

© 2013 Elsevier Inc. All rights reserved.

Introduction

Populations in many countries are aging. Depressive symptoms are one of the most common health problems for the elderly. In total, 13% to 26% of community-dwelling elderly Taiwanese and 65% of institutionalized elderly had depressive symptoms [1–3]. The incidence rate of elderly depression over four years was around 20% [4]. The etiology of depressive symptoms is multifactorial. Previous studies often demonstrated that self-reported functional difficulties and co-morbidities were associated with elderly depressive symptoms [5–7].

Malnutrition is also a common problem among the elderly. Around 2% of elderly people in Taiwan were malnourished and an additional 13% were at risk of malnutrition [8]. Malnutrition can decrease functional status and increase morbidity and mortality. Previous studies have shown that a relationship exists between depressive symptoms and malnutrition [9–12]. Most studies indicated that depression results in poor nutrition, which leads to malnutrition. Malnutrition was prevalent in individuals with depressive symptoms for old people living at home in a prospective Swedish study [9]. A Japanese study of community-dwelling healthy elderly showed that depression increased risk of malnutrition [10].

However, few studies have investigated the longitudinal effects of malnutrition on depressive symptoms in old people. Whether malnutrition also has an effect on depressive symptoms in this population remains unclear, as does the impacts of malnutrition on depression. This study examined cross-sectional and longitudinal associations between nutritional risk, functional dependence, and co-morbidities and depressive symptoms in the people aged 53 years and over using national representative data from a population-based longitudinal study, the Taiwan Longitudinal Study of Aging (TLSA).

Methods

Subjects and design

Data were obtained from the TLSA, which was launched in 1989 with a nationally representative sample. TLSA was conducted to assess the health status and wellbeing of nearly-old and old people in Taiwan. Study design and survey methods of TLSA were described by Hermalin et al. [13]. Briefly, a stratified multi-staged equal probability sampling design with township as the primary sampling units was performed in the survey. First, the TLSA recruited 4049 persons aged ≥60 years in 1989, including those institutionalized. Considering aging with time, another 2462 and 1599 subjects aged 50–66 years were recruited in 1996 and 2003, respectively, in order to replenish the younger part of the age distribution of study participants. Method and procedure of

* Department of Health Management, I-Shou University, Kaohsiung 82445, Taiwan.
Tel.: +886 7 6151100x7416; fax: +886 7 6155150.
E-mail address: hsinjen@gmail.com.

sampling for people aged 50–66 in 1996 and 2003 were the same as in 1989. Therefore, sample of TLSA was representative of the entire Taiwan population aged 50 years or over living in the community or in an institution. All subjects in this cohort study were followed up every three to four years [14,15]. Six waves of interview (1989, 1993, 1996, 1999, 2003, and 2007) were conducted between 1989 and 2007. Procedures of each wave were the same. Each wave had a main component and an additional component for a particular purpose. The 1999 survey had a special component for evaluating the nutritional risk of nearly old and old Taiwanese and was chosen as a baseline dataset by this current study. The 2007 survey was the latest dataset available and chosen as the end-point of this current study. This current study is the secondary data analysis of TLSA. TLSA excluded Taiwanese aboriginals.

An in-home in-person questionnaire was conducted to obtain socio-demographic, lifestyle, health, social function, and healthcare data. The 1999 survey obtained completed data for 4440 participants in the cohort; the youngest subjects were 53 years old. Of the 4440 participants, 3778 and 3132 participants were successfully traced and interviewed in the 2003 survey and the 2007 survey, respectively. Fig. 1 shows the flow of study participants from 1999 to 2007. The TLSA was approved by government-appointed representatives in Taiwan. All study participants signed an informed consent and subjects' anonymity was preserved at all times.

Nutritional risk

Nutritional risk in the 1999 survey of TLSA was assessed using the Mini-Nutritional Assessment (MNA) (0–30 points). MNA is composed of simple anthropometric measurements, global and dietary assessments,

Fig. 1. A flow chart of study participants from 1999 to 2007. [a]Questionnaire was not completed due to rejection, unavailable participants and participants with unknown survival status.

and subjective self-evaluation [16–18]. The cutoff points of anthropometric parameters – body mass index (BMI), mid-arm circumference (MAC), and calf circumference (CC) – were modified and validated for the Taiwanese elderly by Tsai et al. [19,20]. In MNA Taiwan version-II, BMI was omitted and its score was re-assigned to the MAC and CC. This study adopted the modified cutoff points and scores for BMI, MAC, and CC from the study by Tsai et al. [19,20]. MNA score was calculated to evaluate nutritional risk based on criteria of MNA Taiwan version-II.

Participants were classified as at risk of malnutrition/malnourishment, or as having normal nutrition. For MNA score, subjects with scores <24 were classified as at risk of malnutrition/malnourished and scores ≥24 had normal nutrition status in this study.

Functional dependence

The six-item basic Activities of Daily Living (ADL) measured functional dependence based on the need for help while bathing, dressing/undressing, eating, getting out of bed/standing up/sitting in chair, moving around the house, and toileting [21]. Responses to each item were on a scale of 0–3, ranging from zero for "no difficulty to do it" to three for "unable to do it".

Co-morbidities

The number of co-morbidities was assessed by summing the number of medical problems reported by a respondent from a list. Medical problems were asked "Have you ever had the following diseases and been diagnosed by doctors, including hypertension, diabetes, heart diseases, stroke, cancer, lung diseases, arthritis/rheumatism, gastric ulcer/gastric diseases, liver/gallbladder diseases, hip fracture, cataract, kidney diseases, gout and bone spurs?" Time period for evaluation of medical problems was in the past 12 months and current status. The uses of self-reported chronic diseases are generally accepted in population-based studies and the validity of self-reported chronic diseases is reported [22,23].

Depressive symptoms

Depressive symptoms were assessed using the ten-item Center for Epidemiologic Studies Depression (CES-D). The validity of CES-D in Mandarin was demonstrated by Chou et al. [24] and Lee et al. [25]. The scale has a total score of 30. A score of ≥10 was considered to indicate having depressive symptoms. The cutoff point had good sensitivity (0.85) and specificity (0.80) for Chinese elderly by Boey [26].

Other variables

The covariates were sociodemographic variables, including sex, age and education level. Education level was derived from the following survey questions. "How many years did you receive formal education?"

Data analysis

Descriptive data were weight-adjusted for the sampling design. Multivariate logistic regression analyses were performed to evaluate the cross-sectional and longitudinal association between nutritional risk, functional dependence, and co-morbidities and depressive symptoms. The outcome of this study was depressive symptoms. Since MNA score, ADL score, and co-morbidities were strongly inter-correlated (Pearson's correlation coefficient $(r) = -0.50$ for MNA and ADL scores; $r = -0.34$ for MNA score and co-morbidities; $r = 0.17$ for ADL score and co-morbidities) (all $p < .0001$), MNA score, ADL score, and co-morbidities were introduced into logistic regression models individually to avoid collinearity. A full model, including all major variables (nutritional risk, ADL score, and no. of co-morbidities), was also perfo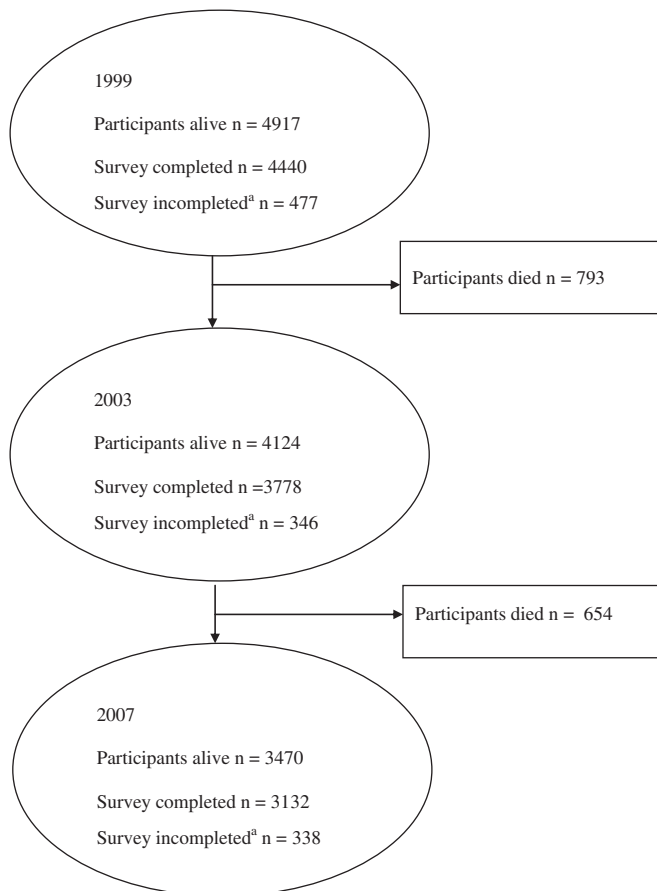rmed. There were 22.76% of study