Research report

Appetite predicts mortality in free-living older adults in association with dietary diversity. A NAHSIT cohort study ☆

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ARTICLE INFO

ABSTRACT

This study aimed to assess the predictive ability of appetite for mortality among representative free-living Taiwanese older adults. A total of 1856 participants aged 65 years or over from the Elderly Nutrition and Health Survey during 1999–2000 completed an appetite question in a larger questionnaire. Personal information was obtained by face-to-face interview at baseline, together with a 24-hour dietary recall and simplified food frequency questionnaire which provided a dietary diversity score and food intake frequency. Survivorship was ascertained from the Death Registry until December 31, 2008. Participants with a poor appetite had lower dietary diversity scores (DDS) and intake frequencies of meat, fish and sea food, egg, vegetable and fruit intake, along with lower energy, protein, vitamin B-1, niacin, iron and phosphate intakes. Those who had fair and poor appetites had a higher risk of all-cause mortality compared to those with good appetite, with hazard ratios (HR) (95% confidence interval, CI) of 1.28 (1.03–1.58) and 2.27 (1.71–3.02), respectively. After adjustment for confounders, the HRs (95% CI) were 1.05 (0.83–1.33) and 1.50 (1.03–2.18), respectively. With further adjustment for DDS or general health these HRs became non-significant. The joint HR (95% CI) for "DDS ≤ 4 and poor appetite" was 1.77 (1.04–3.00) compared to "DDS > 4 and good appetite" as referent. Poor appetite is associated with lower food and nutrient intakes and an independent risk for mortality in older Taiwanese. In conclusion, appetite is separate, mediated by general health and modulated by dietary quality in its predictive capacity for mortality.

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Introduction

Appetite is generally regarded as one of the most important indices of health (Kalantar-Zadeh, Block, McAllister, Humphreys, & Kopple, 2004; Malafarina, Uriz-Otano, Gil-Guerrero, & Iniesta, 2013)

and is a routine question in clinical practice. It is also a fundamental part of the daily discourse among people of Chinese heritage. Its study in Chinese populations in regard to health outcomes is of considerable merit on account of possible cross-culture differences in appetite perception and in its operation on health. However, there is little scientific information about what is a strongly held cultural belief that satisfaction of appetite is an indicator of well-being.

Appetite loss and decreased food intake is prevalent among the older adult and it may be affected by various familial, environmental, and behavioural factors. It is a phenomenon referred to as the "anorexia of ageing" (Morley, 1997). It is influenced by physical factors (such as sensory-specific satiety changes, chewing difficulties, the side effects of medications and deterioration in general health) (Hetherington, 1998; MacIntosh, Morley, & Chapman, 2000; Morley, 1997) as well as psychological factors (such as loneliness, depression and the sense of stress) (Donini, Savina, & Cannella, 2003; Hickson, 2006). Factors of this kind lead to poor appetite and health with their potential consequences for mortality.

Dietary patterns with low nutrient and high energy densities which contribute to energy regulation (Lee, Chen, Chang, Huang, & Wahlqvist, 2012; Wahlqvist et al., 2010) among the older adults

are presumptively tied to appetite regulation (Hetherington, 1998) whose disorder would be a contributor to wellbeing, health and survival. Moreover, high-intensity exercise may suppress appetite and delay eating (King, Burley, & Blundell, 1994) and increases in physical activity are correlated with a lower mortality risk (Wen et al., 2011).

Dietary quality, for which variety is a measure, is a modifiable factor for healthy ageing in older adult populations (Lee, Huang, Su, Lee, & Wahlqvist, 2011; Trichopoulou et al., 1995) but one likely to be affected by appetite (Donini et al., 2013). Poor appetite can be expected to contribute to problematic energy dysregulation with age with sequelae which are body compositional, metabolic, organ and system-compromising (Hickson, 2006). For these various reasons, poor appetite may be a valuable and early indicator of incipient nutritionally-related disorder and disease and of premature mortality.

Anorexia is indeed an independent predictor of health deterioration and mortality in intermediate and home care patients (Cornali, Franzoni, Frisoni, & Trabucchi, 2005; Landi et al., 2012; Shahar et al., 2009). More needs to be known, however, about free-living and representative older adult populations with long-term follow-up to assess the relationships between appetite, dietary intake and mortality. In particular, the role of dietary quality in such associations needs attention as it may provide achievable means to mitigate appetite-related health outcomes. The work reported here sets out to assess the predictive potential of appetite for mortality among representative free-living Taiwanese older adults and to consider whether dietary pattern may modulate such an outcome via a dynamic path analysis (Gamborg, Jensen, Sorensen, & Andersen, 2011). Further, it has been suggested that poor appetite affects inflammation (Kalantar-Zadeh et al., 2004) and long-term nutritional status (Donini et al., 2013) which are addressed in our study. Our hypothesis was that dietary diversity could modulate favourably the risk of poor appetite for survival in an ageing population with dominantly Chinese food habits, while taking into account indices of socioeconomic and educational status as well as covariates for food and nutrient intakes and biomarkers of nutritional status. If so, then as with other interventions like physical activity (Blundell, Stubbs, Hughes, Whybrow, & King, 2003) and nutrition education including cooking skill (Chung & Chung, 2014), improvements in dietary quality might favourably alter appetite-linked mortality.

Participants and methods

The representative Elderly Nutrition and Health Survey in Taiwan (NAHSIT) among free-living older adults conducted during 1999–2000 provided the participants in this study. A detailed description and the design of the survey can be found elsewhere (Pan et al., 2005). The data were collected by household interview and physical examination. Participants gave informed consent before interview; where illiteracy or handicap precluded signature, the responsible caregiver provided assistance. A total of 1937 subjects, 65 years or older (mean ± SE: 74.3 ± 0.27 years; range: 65.3~97.4 years) completed the household interview. There were 1901 subjects who had valid identities and who could be linked to National Death Registration files. We excluded three participants who had equivocal death status and 42 participants with missing appetite information. Finally, 1856 subjects were eligible for analysis. They were followed for a median of 8.76 years until December 31, 2008. The study was approved by the ethics committees of the National Health Research Institutes and Academic Sinica, Taiwan.

Baseline and appetite information

All information was collected by face-to-face household interviews by trained-interviewers and by mobile health examinations.

Information collected included household and socio-demographic variables, dietary information, eating habits, and medical history. Socio-demographic information included age, gender, education, ethnicity, economic status and whether living alone. Shopping frequency, eating alone and chewing ability were assessed at baseline as well. Appetite status was based on the following question: "How is your current appetite"? The responses offered were 'good', 'fair' or 'poor'. The validity of the question has support from related studies. An available Short Nutritional Assessment Questionnaire (SNAQ) which includes four items derived from an eight item Council of Nutrition appetite questionnaire, and which self-rates appetite status (i.e., my appetite is; when I eat; food tastes; normally I eat). This questionnaire has validity for the prediction of weight loss in community-dwelling adults and nursing home residents (Wilson et al., 2005). Our appetite question was similar to the first question in the SNAQ (i.e., my appetite is: very poor, poor, average, good, very good). Another related question was "Has your appetite changed in the past 2–3 months"? The responses provided were 'had become better', 'unchanged' or 'had become poorer'. This question provides the information about the trajectory and change in appetite.

Food intake information

The dietary information was collected using a simplified food frequency questionnaire (SFFQ) and a 24-hour dietary recall. The SFFQ had 28 food items (18 food groups, one sugar/honey/syrup item, one dessert item, three drinks and five processed foods). Participants were asked to indicate how many times each food was consumed per month/week/day during the past month. This SFFQ was validated by multiple 24-hour dietary recalls and biomarkers, as published elsewhere (Huang, Lee, Pan, & Wahlqvist, 2011).

The 24-hour dietary information was used to calculate nutrient intakes and estimate serving characteristics for each food group, with computational methodology as described for NAHSIT 1993–1996 (Pan et al., 1999). The dietary diversity score (DDS) comprised of six food groups (dairy, eggs/legumes/fish/meat, grain, fruit, vegetable and oil/fat). Half a serving per day for one of the six food groups was required for a DDS score of 1 (Lee et al., 2011).

Ambulation variables

Types and duration of sport and leisure time activities per week were obtained by questionnaire. Physical activity was estimated as the number of metabolic equivalents (METs), counted from activity duration, frequency and intensity as well as on number of stairs climbed. We assigned an intensity level based on the rate of energy expenditure for all activities as METs (Ainsworth et al., 1993). Based on the recommendations from the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM), we classified MET intensity and duration of physical activity into three groups, namely, <1.5 METs (moderate physical activity <30 min/day), 1.5–3 METs (moderate physical activity ≥30 ~ <60 min/day or vigorous physical activity <30 min/day), >3 METs (moderate physical activity ≥60 min/day or vigorous physical activity ≥30 min/day) (Pate et al., 1995).

Activities of daily living (ADL) were basic tasks of older adults' everyday life which could reflect physical health and independent living (Wiener, Hanley, Clark, & Van Nostrand, 1990). A total of nine questions about self-care task difficulty were asked, which included eating, transfer between bed/chair, walking indoors/outdoors, dressing, bathing, toileting and urinary/bowel continence. Participants were considered as having no or any (≥1) difficulty.