Feature Article

# Associations between socioeconomic status, aging and functionality among older women

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## ARTICLE INFO

## ABSTRACT

To assess if there is an association between socioeconomic status and quality of life, functional status and markers of aging, we studied 86 women aged 73 ± 7 years, who answered the WHO Qol Bref quality of life survey. Mini mental state examination, timed up and go test, 12 minutes' walk, hand grip and quadriceps strength, dual X-ray absorptiometry (DEXA), carotid intima-media thickness and telomere length in peripheral leukocytes were measured. Successful aging was defined as a walking speed, handgrip strength, appendicular lean body mass, timed up and go and minimental values above cutoff points for disability. Participants with successful aging had a higher quality of life score and were more likely to live in rich municipalities. There was a positive correlation between telomere length, right handgrip strength and total fat free mass. Therefore, there is an association between socioeconomic status, successful aging and quality of life.

## Introduction

In 2010, people over 60 years of age constituted 13% of the total population of Chile.[1] It is pertinent to question whether longevity is accompanied by preserved functionality and quality of life. In developing countries like Chile, socially vulnerable groups experience a less successful aging process. Several components may play a role in this phenomenon such as risk behaviors, lifestyle, age or other factors such as poverty, which limits access to adequate nutrition, health services and recreational activities.[2]

In previous studies of older adults in the city of Santiago, no large differences in mortality were observed between different socioeconomic strata, but inequity was demonstrated by the higher prevalence of functional limitations among older people from poor neighborhoods.[3,4] There are profound gender and socioeconomic differences among older adults, thus healthy life years gained are not equal for society as a whole.[5] Moreover, socioeconomic status is an important determinant of educational attainment.[6]

A recent study performed in England showed that chronic psychological distress and low socioeconomic status were associated with higher mortality and that the detrimental effect of psychological distress on mortality is amplified by low socioeconomic status.[7] Many studies have suggested a relationship between chronic stress and poor health indices, including cardiovascular risk factors,[8] poor immune function[9] and eventually a faster aging rate.[10] Socioeconomic status is an important predictor of health and disease. The less affluent deal with a significant number of social and environmental conditions that contribute to chronic stress.[11] However the mechanism by which stress causes these consequences has not been unraveled. The proposed hypothesis is that stress impacts health through the modulation of cellular aging rate.[12]

Telomere length measured in peripheral blood mononuclear cells is used as a marker of aging.[13] Shortened telomeres correlate with age and age-associated diseases such as cardiovascular disease, diabetes and osteoporosis.[14] Also, among women, there is an association between perceived stress and shorter telomeres in peripheral blood mononuclear cells.[11]

We conducted a survey in elderly non-disabled adults residing in the city of Santiago de Chile, between 2009 and 2010, showing that quality of life is closely linked with socioeconomic status and education level of the participants.[15] We hypothesized that low socioeconomic status would be associated with less successful aging. To test this hypothesis, we performed a secondary analysis of data from the above mentioned quality of life survey. Using internationally accepted cutoff points for functional measures, body composition[16] and minimental examination,[17] we constructed a model of successful aging, defined as those participants who had all their functional parameters and minimental score over the cutoff points to define disability and a body composition not indicating the presence of sarcopenia. We measured telomere length as a marker of overall aging and carotid intima-media thickness (CIMT) as a marker of vascular aging.[18]

Thus, the aim of this study was to evaluate if socioeconomic status was associated with successful aging and markers of aging such as telomere length and CIMT, among healthy elderly Chilean women.

## Methods

### Participants

We invited a group of elderly women living independently in metropolitan Santiago and ascribed to community centers for older people, to participate in this study. All participants were contacted at their community centers, where they meet regularly. All had answered the quality of life survey, the WHOQOL bref,[19] between October 2009 and May 2010. The survey included questions about socioeconomic status, environment, functional and health-related issues. We excluded participants with physical disabilities, which would preclude the performance of functional tests, and those with chronic, life-threatening diseases such as cancer, heart failure, kidney or liver failure or a minimental state score below 21. This study was approved by the ethics committee of Institute of Nutrition and Food Technology (INTA) and all participants signed a written informed consent.

### Procedures

Participants were assessed at the Institute of Nutrition and Food Technology of the University of Chile (INTA) during 2012 by a health professional, who performed a minimental state examination (MMSE) and a functional assessment, including timed up and go (TUG)[20] and 12 min walk.[21] Body weight and height, waist and hip circumference, blood pressure, handgrip strength using a hand grip dynamometer (Hand Dynamometer T-18, Country Technology, Inc.) and quadriceps strength using a quadriceps table,[22] were also measured. The best of three measurements of the last two parameters was recorded. A neck ultrasound was performed for the measurement of carotid intima-media thickness (CIMT) using a General Electric LogiQ e device, equipped with border recognition software. This examination was conducted by a trained professional according to previously published guidelines.[23] The mean and maximal value of at least 100 measurements per side was reported. A dual X-ray absorptiometry (DEXA) was performed to measure body composition using Lunar iDEXA equipment, since fat free mass is a strong predictor of functional capacity.[24] A fasting blood sample was obtained for routine biochemistry and isolation of peripheral blood mononuclear cells for the measurement of telomere length using the quantitative polymerase chain reaction described by Cawthon et al,[25] whose results were expressed as a ratio to a housekeeping gene.

### Measures

Each question in the WHOQOL bref quality of life survey has five possible answers, representing a score fluctuating from 1 to 5 (best quality of life). The overall quality of life score of each participant was expressed as a percentage of the maximal obtainable score (100%) of the survey, summing all questions effectively answered. Socioeconomic status of participants was determined according to the classification of the municipality of residence, based on a survey conducted by the Chilean Ministry of Planning (MIDEPLAN) and by interviewers' assessment.

Using internationally accepted cutoff points, we defined participants with successful aging as those who complied with all of the following criteria: a walking speed of 1 m/s or more, a hand grip strength of 16 kg or more, an appendicular lean body mass per body mass index ($ALM_{BMI}$) of 0.512 or more,[16] a timed up and go of 8.1 s or less,[26,27] and a minimental state score over 24.[17] We did not include quadriceps strength in this classification due to the lack of internationally accepted cutoff points for this parameter.

### Statistical analysis

All statistical analyzes were done using Stata 10.0 (StataCorp, 4905 Lakeway Drave, College Station, Texas 77845, USA). Normality of variable distribution was assessed using the Shapiro—Wilk test. Normally distributed variables were expressed as mean ± standard deviation, otherwise as median and interquartile range. Concordance was determined using kappa analysis between educational, socioeconomic levels assessed by interviewers and by municipality of residence in Santiago. Educational levels were grouped into 3 categories: illiterate/elementary education, secondary education and technical school/higher education. Women with successful aging were compared with their counterparts using ANOVA and Bonferroni tests when variables had a normal distribution or Kruskal Wallis otherwise. A logistic regression model was performed including successful aging as the dependent variable and age, quality of life score, educational level socioeconomic status, telomere length and CIMT as independent variables. Univariate associations between variables were quantified using Spearman's correlation. A $p$-value of $<0.05$ was considered statistically significant.

## Results

We contacted 110 women and 86, aged 73 ± 7 years agreed to participate. The studied population consisted of 15 participants with illiterate level/primary education, 38 with high school/secondary education and 33 with technical school/higher education. Twenty four resided in poor, 24 in intermediate and 40 in rich municipalities. The educational level of the participants had a concordance of 70 and 68% with the socioeconomic level assessed by interviewers and with the municipality of residence in Santiago, respectively (Weighted kappa $<0.01$). Thus, the educational level of the participants was used as another indicator of socioeconomic status. Demographic characteristics, cognitive status and quality of life scores of the studied population are shown in Table 1. Quality of life scores were significantly higher among participants in technical school/higher education category ($p < 0.05$), as reported previously.[15] The illiterate/primary education group had a significantly