JAMDA 15 (2014) 342–348

JAMDA

journal homepage: www.jamda.com

Original Study

Obesity Can Benefit Survival—A 9-Year Prospective Study in 1614 Chinese Nursing Home Residents

Jenny S.W. Lee MSc, FRCP [a,b,*], Tung-Wai Auyeung MPH, FRCP [a,*], Patsy P.H. Chau PhD [c], Elsie Hui MSc, FRCP [d], Felix Chan FHKAM, FRCP [e], Iris Chi DSW [f], Jean Woo MD [a,b]

[a] *The S. H. Ho Center for Gerontology and Geriatrics, The Chinese University of Hong Kong, Hong Kong SAR, China*
[b] *Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong SAR, China*
[c] *School of Nursing, The University of Hong Kong, Hong Kong SAR, China*
[d] *Department of Medicine and Geriatrics, Shatin Hospital, Hong Kong SAR, China*
[e] *Department of Medicine, Fung Yiu King Hospital, Hong Kong SAR, China*
[f] *School of Social Work, University of Southern California, Los Angeles, CA*

Keywords:
Mortality
nursing home
body mass index
weight
obesity
underweight
elderly
nutrition

A B S T R A C T

Objective: Weight loss has been considered predictive of early mortality in nursing home residents. Lower body mass index, irrespective of weight loss, has also been considered detrimental for survival in community-dwelling older persons. We examined which of the 2 is more important for survival in nursing home residents and at what body mass index (BMI) cut-offs survival benefits are gained or lost.
Design: Prospective study.
Setting: Nursing homes.
Participants: One thousand six-hundred fourteen nursing home residents.
Measurement: Minimum Data Set at baseline and mortality status assessed at 6 months, 1, 2, 4, and 9 years later. Relationship between mortality and significant weight loss ($\geq$5% over 30 days or $\geq$10% over 180 days), and BMI, was studied by Cox regression with both variables in the same model, adjusted for age, sex, medical conditions (cancer, renal failure, heart disease, dementia, hip fracture, diabetes mellitus), tube-feeding, 25% food left uneaten, swallowing problem, and the activities of daily living hierarchy scale.
Results: One thousand six-hundred fourteen residents (69.5% female) with mean age 83.7 $\pm$ 8.4 years and mean BMI 21.7 $\pm$ 4.8 were studied. Mortality rates were 6.3% (6-month), 14.3% (1-year), 27.1% (2-year), 47.3% (4-year), and 78.1% (9-year). Significant weight loss was not associated with higher mortality at all follow-up durations, whereas higher BMI was significantly protective: mortality reduction per 1 unit increase in BMI were 9% at 6 months, 10% at 1 year, 9% at 2 years, 7% at 4 years, and 5% at 9 years, all at $P < .001$. Having $\geq$25% of food left uneaten (51.2% of participants) had no relationship to survival at all follow-up durations. At 9 years, compared with those with BMI $< 18.5 kg/m^2$, the normal weight (BMI 18.5–22.9 kg/m^2, Asia Pacific cut-off), overweight (BMI 23–25 kg/m^2, Asia Pacific cut-off) and obese (BMI $> 25 kg/m^2$, Asia Pacific cut-off) had significantly lower mortality (hazard ratio 0.65, 0.62, and 0.47, respectively, all $P < .001$).
Conclusions: Significant weight loss as defined by the Minimum Data Set was not associated with short- or long-term survival in Chinese nursing home residents. BMI, however, is predictive of short- and long-term survival irrespective of weight loss in this population. Low BMI, detectable at a single point of time, may be another readily available alternative trigger point for possible interventions in reducing mortality risk. Obese residents had the lowest mortality compared with those with normal weight.

Weight loss has been considered predictive of early mortality in nursing home residents. Studies in nursing home residents have demonstrated that significant weight loss, defined as >5% over 1–6 months,[1–3] was highly predictive of mortality, in particular short-term mortality over 6–12 months.[4,5] Because regular body weight measurement is a common routine in many long-term care facilities across the world, this change could be readily captured for the necessary medical attention if unexpected, or advance care

The survey was funded by the SK Yee Memorial Fund. The authors declare no conflicts of interest.
* Address correspondence to Jenny S.W. Lee, MSc, FRCP, Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong SAR, China or Tung-Wai Auyeung, MPH, FRCP, Department of Medicine and Geriatrics, Pok Oi Hospital, Yuen Long, Hong Kong SAR, China.
E-mail addresses: jennylee@cuhk.edu.hk (J.S.W. Lee), auyeungtw@cuhk.edu.hk (T.-W. Auyeung).

1525-8610/$ - see front matter
http://dx.doi.org/10.1016/j.jamda.2013.12.081

planning if the resident is deemed to be approaching the end of life.

On the other hand, lower body mass index (BMI), irrespective of weight loss, has also been considered detrimental for survival in both nursing home residents and community-living older adults.[5,6] Weight change is sometimes difficult to monitor because it requires multiple weightings at regular intervals, hence, both time and manpower consuming. In some long-term care facilities, a single BMI may be the only readily available index of nutritional status. Recently, authors have reported that the BMI may be used to predict 5-year mortality in nursing home residents.[7,8] In view of this, a single BMI measurement might be as good as weight changes as a predictor of mortality for nursing home residents.

Both BMI and weight loss are documented in the Minimum Data Set (MDS). We, therefore, attempt to compare these parameters as mortality predictors in nursing home residents and to examine whether their relative importance may change over a wide range of observation periods. It had been noted that compared with Caucasians, Asians have higher metabolic risks at the same BMI, having higher body fat and central fat, higher fasting blood sugar, and lower high density lipoprotein levels.[9–11] Owing to these differences, BMI among Asians was categorized according to the World Health Organization (WHO) Asia Pacific cut-offs in 2000: <18.5 kg/m^2 (underweight), 18.5–23 kg/m^2 (normal weight), 23.1–25 kg/m^2 (overweight), and >25 kg/m^2 (obese).[12] In this study, we also examined whether the Asia-Pacific BMI cut-offs might be associated with mortality outcomes in Chinese nursing home residents.

Methods

Ten private and 4 subsidized homes with at least 100 residents were randomly selected from among the 533 private nursing homes and 130 subsidized nursing homes in Hong Kong in 2001. The ratio of private and subsidized homes was chosen to reflect the excess of private homes. Of the 1914 residents in these residential care facilities, 1820 of them were successfully assessed between December 2001 and August 2002, using the Chinese version of the Minimum Data Set—Residential Assessment Instrument (MDS-RAI) version 2.0,[13–15] with a response rate of 95%. Reasons for unsuccessful assessments of the remaining 94 residents included hospitalization, moved to other facilities, and home leave during the period of study. Of the 1914 residents, the data of 1614 were included in this analysis: 4 were excluded due to invalid Hong Kong identity numbers and, therefore, untraceable mortality status; 202 were excluded due to missing or erroneous data on their body weight or height. Among those included in this analysis, 546 (33.8%) resided in subsidized homes, whereas 1068 (66.2%) were from private homes.

The MDS-RAI

The MDS-RAI captures detailed information on each resident including demographic information, medical diagnoses and medications, physical and cognitive functional status, and their dietary, nutrition, and behavioral patterns. Data were collected by 2 trained research assistants. Medical and social information was collected from the residents or from a proxy if the former were too frail to be interviewed. Proxies included personal care workers, other front-line nursing staff, family members, or close friends. The participant's file at the facilities was also consulted for background social and medical history. Participants' daily routines were confirmed with care home staff to ensure reliability and validity of the information gathered.

Weight Loss and BMI

Weight loss of $>5\%$ over 30 days or $\geq 10\%$ over 180 days was extracted from the original MDS variable with the exact description. BMI was calculated from the body height and weight variables in the dataset.

Mortality

Residents were assessed by the MDS at baseline and mortality status was ascertained as at December 31, 2010, giving a follow-up of 9 years from baseline assessment. The exact date of death was ascertained by the death registry kept by the Hong Kong Special Administrative Region government, and death was identified using the Hong Kong Identity Card number, which is unique to every Hong Kong resident.

Covariates

Covariates were chosen because of their probable relationship to mortality in nursing home residents.[3,5] Age, sex, tube-feeding, presence of swallowing problems, having 25% food left uneaten, and medical conditions were obtained directly from variables available in the MDS. The medical conditions included in the analyses were dementia (Alzheimer's disease or dementia other than Alzheimer's), cancer, renal failure, heart disease (atherosclerotic heart disease or congestive heart failure), diabetes mellitus, and a history of hip fracture. Functional level in activities of daily living (ADLs) was categorized by the MDS ADL Self-Performance Hierarchy (MDS ADL) scale, which described the actual performance level of each resident across a spectrum of activities of daily living.

Multiple MDS items concerning ADL and dependency levels in performing those activities were used to formulate a score that ranged from 0 (independent) to 6 (total dependence) according to the methods described by Morris et al.[16] The functional level in ADLs has been found to be a significant predictor in nursing home residents in previous studies.[17]

Statistical Analysis

Relationship between mortality and significant weight loss ($\geq 5\%$ over 30 days or $\geq 10\%$ over 180 days), and BMI, was studied by Cox regression with both variables in the same model, adjusted for age, sex, medical conditions (cancer, renal failure, heart disease, dementia, hip fracture, diabetes mellitus), tube-feeding, 25% food left uneaten, swallowing problem, and the level of functional impairment as represented by the category on the ADL hierarchy scale. In model 1, BMI was used as a continuous variable, whereas in model 2, BMI was used as an ordinal variable according to the Asia Pacific cut-off values described above,[12] with the underweight group as reference. To study whether the association between BMI and weight loss would vary according to the duration of survival, in each model, separate Cox regressions were performed with the dependent variable being the survival time censored at different time points: 182 days (6 months), 1, 2, 4, and 9 years after the date of the MDS assessment. Statistical analysis was conducted using the SPSS software version 16.0 (SPSS Inc, Chicago, IL). A P value of $<.05$ was taken as statistically significant.

Results

Of the 1614 residents, 69.5% were female. The mean age was 83.7 ± 8.4 years. Approximately one-half (49.4%) of the residents were mildly impaired in ADLs as defined by the MDS-ADL scale, whereas 36.1% were severely impaired. The mean BMI was 21.7 ± 4.8; one-quarter of the residents were underweight (BMI < 18.5 kg/m^2) and another one-quarter approximately were obese (BMI > 25 kg/m^2). Overall, 36.7% of