JAMDA xxx (2016) 1.e1–1.e9

JAMDA

journal homepage: www.jamda.com

Original Study

Association Between Sarcopenia and Cognitive Impairment: A Systematic Review and Meta-Analysis

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Keywords:
Sarcopenia
cognition
dementia
muscle
aging

A B S T R A C T

Background: Sarcopenia, a gradual loss of muscle mass and function, has been associated with poor health outcomes. Its correlation with another age-related degenerative process, impaired cognition, remains uncertain. This meta-analysis aimed to determine whether there is an association between sarcopenia and cognitive impairment.

Methods: PubMed and Scopus were searched for observational studies that investigated the association between sarcopenia and cognitive dysfunction. Participants' demographics and measurements, definition of sarcopenia, and tools for evaluating cognitive function were retrieved. The correlations between sarcopenia and cognitive impairment were expressed as crude and adjusted odds ratios with 95% confidence intervals (CIs).

Results: Seven cross-sectional studies comprising 5994 participants were included. The crude and adjusted odds ratios were 2.926 (95% CI, 2.297–3.728) and 2.246 (95% CI, 1.210–4.168), respectively. The subgroup analysis showed that different target populations and sex specificity did not significantly modify the association, whereas the tools for evaluating cognitive function and modalities for measuring body composition did.

Conclusions: Sarcopenia was independently associated with cognitive impairment. Future cohort studies are warranted to clarify the causal correlation. The inclusion of relevant biomarkers and functional measurements is also recommended to elucidate the underlying biological mechanism.

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Sarcopenia was originally known as age-related loss of muscle mass, leading to impaired strength, reduced aerobic activity, and decreased physical performance.[1] Its prevalence varies from 0.9% to 85.4% in the geriatric population based on different measuring tools and cut-off values for muscle mass and function.[2,3] Other than aging, possible causes of sarcopenia include inadequate nutrition, disuse atrophy, hormone depletion, and chronic inflammation.[4,5] It has been associated with several worse health outcomes, including increased mortality, longer hospitalization, and greater need for rehabilitation care after hospital discharge.[6] Sarcopenia has also been recognized as a systemic condition that is related to comorbidities such as diabetes mellitus, depression, and cardiovascular events.[6] Cognitive impairment, a prognostic factor for disability and dependence in elderly individuals, is also comorbid with chronic diseases such as hypertension, diabetes mellitus, thyroid disease, and heart failure, but its association with sarcopenia remains uncertain.[7]

Declines in cognitive function occur as a neurodegenerative process of aging and can transition to the most severe form, dementia. The most common subtype of dementia is Alzheimer disease, followed by vascular dementia, dementia with Lewy bodies, and frontotemporal dementia.[8] The reported prevalence of dementia is 7.1%–16.3% among people >65 years of age, and it causes a significant health care expenditure burden.[9] The risk factors for cognitive impairment include malnutrition, sedentary lifestyle, lack of anabolic hormones, and persistent inflammatory reactions, all of which are potential causes of sarcopenia.[10] Until now, although sarcopenia and cognitive dysfunction

The study was funded by the research funding of the Community and Geriatric Research Center, National Taiwan University Hospital, Bei-Hu Branch.

The authors declare no conflicts of interest.

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http://dx.doi.org/10.1016/j.jamda.2016.09.013
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are prevalent features of advanced aging, whether both are independently associated appears inconclusive based on the available literature. Therefore, the present meta-analysis aimed to explore the association between sarcopenia and impaired cognition, as well as examine whether the association is modified by other relevant factors.

Methods

Search Strategy and Inclusion Criteria

PubMed and Scopus were searched for observational studies that investigated the association between sarcopenia and cognitive impairment published between the earliest record and May 2016. Sarcopenia was defined as an age-related loss of muscle mass with reduced muscle strength and/or impaired physical performance.[2] Adults who were able to communicate and participate in the sarcopenia screening program were included in this study. Those who were institutionalized or unable to walk independently were excluded. The assessment of cognitive function by a validated scale was required in each enrolled study. The search keywords consisted of sarcopenia, dementia, cognition, and cognitive impairment. Related systematic reviews and reference lists of the retrieved articles were manually scrutinized for other potentially eligible studies. We also discarded non-English literature and abstracts that lacked available full texts.

Study Selection and Data Extraction

Two authors independently scrutinized the retrieved articles and extracted the data using a standardized form that included study design, participant demographics, and definition and measurement of sarcopenia and cognitive impairment. The Newcastle-Ottawa Scale was used to assess the included studies and evaluate their quality in terms of study group selection, group comparability, and exposure or outcome of interest.[11–14] The overall maximum score was 9 points for the case-control and cohort studies but 6 points for the cross-sectional studies.[11–14] Differences in opinions between reviewers were resolved through discussion or judgment by the corresponding author.

Outcome Measurement and Statistical Analysis

The crude and adjusted associations between sarcopenia and cognitive impairment are expressed as odds ratios (ORs) and 95% confidence intervals (CIs). The adjusted confounders might have differed among studies but generally included sex, age, education, depression, and physical performance. The DerSimonian and Laird random effect model was used to pool effect sizes across selected studies.[15] The χ^2-based Cochran Q statistic test and I^2 statistic were used to quantify heterogeneity for each summary estimate, with values of $I^2 > 0.5$ indicating moderate heterogeneity.[16,17] To identify

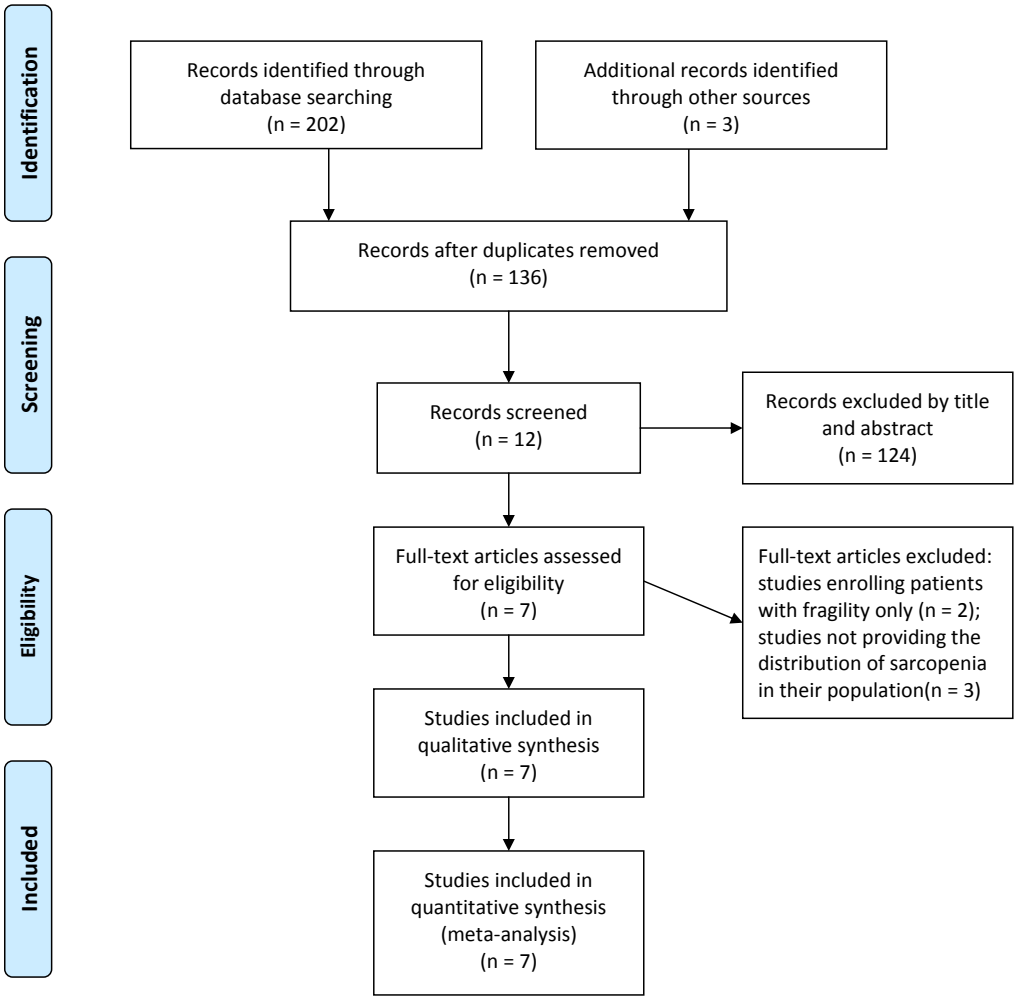

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for the study selection process.

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