CORRELATION BETWEEN SARCOPENIA, RISK OF FALLS AND MORTALITY IN THE ELDERLY - SYSTEMATIC REVIEW AND META-ANALYSIS OF OBSERVATIONAL STUDIES

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ABSTRACT: Introduction: Sarcopenia is a progressive and generalized disorder of the skeletal muscles with multifactorial and complex causes. It involves an accelerated loss of skeletal muscle mass and is associated with increased negative outcomes in older adults, such as functional decline, frailty, falls, and death. Objective: to correlate sarcopenia with the risk of falls and mortality in the elderly. Method: A systematic review of the literature was carried out, considering the publication of observational articles as classified for inclusion. The studies considered eligible were the results of searches in the PubMed, Web of Science, EMBASE and LILACS databases. The descriptors were used for searching. The same descriptors in Portuguese and Spanish provided by DECS (health sciences descriptors) were also included. Results: Of the 922 articles selected, 14 were included in the review. The results were similar in most of the articles identified: there is a positive manifestation between sarcopenia, risk of falls ($p < 0.0001$) and sarcopenia and mortality ($p = 0.009$) in the elderly population. Conclusion: It is concluded that sarcopenia is a risk factor for falls and increased general mortality in the elderly.
KEYWORDS: Elderly; Aged; Sarcopenia; Falls; Mortality.

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CORRELAÇÃO ENTRE SARCOPENIA, RISCO DE QUEDA E MORTALIDADE EM IDOSOS – REVISÃO SISTEMÁTICA E METANÁLISE DE ESTUDO OBSERVACIONAL

RESUMO: Introdução: A sarcopenia é um distúrbio progressivo e generalizado da musculatura esquelética de causas multifatoriais e complexas. Envolve uma perda acelerada de massa muscular esquelética e está associada ao aumento de desfechos negativos em idosos, como declínio funcional, fragilidade, quedas e morte. Objetivo: correlacionar a sarcopenia com o risco de quedas e mortalidade em idosos. Método: Foi realizada uma revisão sistemática da literatura, considerando a publicação de artigos observacionais como critério de inclusão. Os estudos considerados elegíveis foram resultados das buscas nas bases de dados PubMed, Web of Science, EMBASE e LILACS. Os descritores foram utilizados para busca. Também foram incluídos os mesmos descritores em português e espanhol fornecidos pelo DECS (descritores em ciências da saúde). Resultados: Dos 922 artigos selecionados, 14 foram incluídos na revisão. Os resultados foram semelhantes na maioria os artigos identificados: existe correlação positiva entre sarcopenia, risco de quedas ($p < 0,0001$) e sarcopenia e mortalidade ($p = 0,009$) na população idosa. Conclusão: Conclui-se que a sarcopenia é fator de risco para quedas e aumento da mortalidade geral em idosos.
PALAVRAS-CHAVE: Idoso; Sarcopenia; Quedas; Mortalidade.

CORRELACIÓN ENTRE SARCOPENIA, RIESGO DE CAÍDAS Y MORTALIDAD EN ANCIANOS - REVISIÓN SISTEMÁTICA Y METANÁLISIS DE ESTUDIOS OBSERVACIONALES

RESUMEN: Introducción: La sarcopenia es un trastorno progresivo y generalizado de los músculos esqueléticos con causas multifactoriales y complejas. Implica una pérdida acelerada de masa muscular esquelética y se asocia con mayores resultados negativos en los adultos mayores, como deterioro funcional, fragilidad, caídas y muerte. Objetivo: correlacionar la sarcopenia con el riesgo de caídas y mortalidad en ancianos. Método: Se realizó una revisión sistemática de la literatura, considerando como clasificadas para su inclusión la publicación de artículos observacionales. Los estudios considerados elegibles fueron los resultados de búsquedas en las bases de datos PubMed, Web of Science, EMBASE y LILACS. Los descriptores se utilizaron para la búsqueda. También se incluyeron los mismos descriptores en portugués y español proporcionados por los DECS (descriptores de ciencias de la salud). Resultados: De los 922 artículos seleccionados, 14 fueron incluidos en la revisión. Los resultados fueron similares en la mayoría de los artículos identificados: hay manifestación positiva entre sarcopenia, riesgo de caídas ($p < 0,0001$) y sarcopenia y mortalidad ($p = 0,009$) en la población anciana. Conclusión: Se concluye que la sarcopenia es un factor de riesgo de caídas y aumento de la mortalidad general en el adulto mayor.
PALABRAS CLAVE: Anciano; Sarcopenia; Caídas; Mortalidad.

1. INTRODUCTION

The World Health Organization (WHO) defines ‘elderly’ as every individual aged 60 years or older in developing countries, and over 65 years of age in developed countries.

As fertility rates decline, the proportion of elderly individuals is expected to increase by three-fold, reaching two billion people by 2050. In most countries, the number of individuals aged over 80 is expected to increase by four-fold to almost 400 million (BVS MS, 2019).

Senescence is a physiological and natural process of aging that has a multifactorial complex, being characterized by gradual changes, increasing the vulnerability of the elderly. Most health problems faced by older people are associated with chronic conditions, mainly non-communicable diseases. (WHO, 2015).

Sarcopenia is a natural phenomenon, with multifactorial and complex causes and is a progressive and generalized disorder of the skeletal muscles. It involves an accelerated loss of skeletal muscle mass, strength and function, which is associated with an increase in negative outcomes in the elderly, such as functional decline, frailty, falls and death, (AQUIMARA et al., 2020), due to the complex interaction of innervation disorders, decrease in hormone levels, increase in inflammatory mediators and changes in protein-calorie intake that occur during aging.

Sarcopenia is considered to be primary or age-related when no other specific cause is evident. It is considered secondary when other causal factors, other than aging, are evident, such as poor nutrition, lack of physical activity, cardiovascular diseases, oncological or neurological diseases, and hospitalization. The diagnosis of sarcopenia has been a challenge for the scientific community, so criteria were created to standardize the diagnosis. The European Working Group on Sarcopenia in Older People (EWGSOP) recommends using the presence of low muscle mass and function (strength or performance) for the diagnosis of sarcopenia (CRUZ-JENTOFT et al., 2010).

The prevalence of sarcopenia varies greatly depending on the age group, gender, clinical setting and definition used. The prevalence in individuals aged between 60 and 70 years ranges from 5% to 13%, while among the elderly aged over 80 years, it can range from 11% to 50% (Morley, et al. 2014).

One of the main mechanisms that associate sarcopenia to mortality is falls, usually caused by low muscle mass and strength and impaired balance. Malnutrition and osteoporosis are frequent findings in the elderly, increasing the risk of fractures that lead to hospitalization, which, throughout a prolonged period, due to being bedridden, can contribute to a decrease in muscle mass and strength, leading to functional decline. This cycle, if perpetuated, can contribute to mortality (BORGES et al., 2023; XU et al., 2022).

It is believed that assessing and correlating the main consequences of sarcopenia in the elderly population can contribute to more effective preventive measures, avoiding negative outcomes in this population. With these results, it is possible to assist in the implementation of multidisciplinary measures for preventing sarcopenia.

Based on the above, the aim of this study was to systematically review the literature and correlate sarcopenia with the risk of falls and mortality in the elderly.

2. METHOD

2.1 Protocol and Registration

The systematic review protocol was registered in the International Prospective Register of Systematic Reviews (PRÓSPERO) under number CRD42023394740 and followed the recommendations proposed by the Preferred Reporting Items for Systematic Review and Meta-analyses: The PRISMA Statement (MOHER et al., 2009).

2.2 Study Design

This study, classified as a systematic review, sought to answer the following question: Is sarcopenia associated with a higher risk of falls and mortality in the elderly? For this purpose, we made a search for complete articles that met the eligibility criteria, available in electronic databases and identified based on descriptors widely accepted in the scientific literature. Thus, full-text articles were selected, available in Portuguese, Spanish and English, including studies that (a) were case-control, cohort or observational studies; (b) had the type of article evidenced in the Method section, (c) associated sarcopenia with risk of falls and/or mortality in the elderly (>60 years). The exclusion criteria comprised articles with other designs and the ones that assessed other risk factors for falls or mortality, other than those mentioned in the inclusion criteria.

2.3 Search Strategy

A systematic review of the literature was carried out, following the recommendations proposed by the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA Statement). The studies considered eligible were identified by combining the results of searches in the PubMed, Web of Science, EBSCO, EMBASE, LILACS and Scielo databases, from April to June/2023. The search for articles considered the following strategy: all articles containing the combination of descriptors

(elderly OR aged) AND (sarcopenia) AND (falls) OR (mortality); these descriptors in Portuguese and Spanish as provided by DECS were also included (descriptors in Health Sciences). The article type filter was used to select only observational studies (case-control, cohort and observational).

2.4 Study Selection and Data Extraction

The titles and abstracts of all articles identified by the search strategy were independently evaluated by two authors of this study. In the second phase of the review, the reviewers independently evaluated the full articles and made their selections, according to the pre-specified eligibility criteria. Disagreements were resolved by consensus, with the help of a third reviewer. The extracted data were: identification of the publication, place (country) where the study was carried out, number of participants ("n" in the sample), study objective, age of the participants, instrument used for diagnosing sarcopenia and outcome.

2.5 Risk of Bias and Methodological Quality Assessment

For the methodological evaluation of the articles, The Newcastle-Ottawa Scale, (THE OTTAWA HOSPITAL RESEARCH INSTITUTE, 2018), was applied, which evaluates the quality of the studies through the selection of study groups, comparability and verification of exposure or the outcome of interest for case-control or cohort studies. Thus, a star system was developed to score when showing eligibility. For the evaluation of cohort and observational studies, the selection part has a maximum score of 4 stars, the comparability part 2 stars, and the outcome part 9 stars, and articles can be classified as good quality, fair quality and poor quality.

Table 1 - The Newcastle-Ottawa Scale

	SELECTION				COMPARABILITY	OUTCOME			Total
Author and year	**Representativeness of the exposed cohort**	**Selection of the unexposed cohort**	**Verification of exposure**	**Demonstration that the outcome of interest was not present at baseline**	**Comparison of cohorts – basis of the project or controlled analysis for confounding factors**	**Result evaluation**	**Follow-up long enough for results to occur**	**Adequacy of cohort monitoring**	
LANDI et al., (2012)	*	*	*	*	**		*	*	**8**
MATSUMOTO et al., (2017)	*	*	*	*	**		*	*	**8**
HERNÁNDEZ-LUÍZ et al., (2017)	*	*	*	*	**	*	*	*	**9**
Henwood et al, (2017)	*	*	*	*	**	*	*		**8**
Tang et al, (2017)	*	*	*	*	**	*	*		**8**
Buckinx et al, 2107	*	*	*	*	**		*	*	**8**
GADELHA et al., (2018)[1]	*	*	*	*	**	*	*	*	**9**
GADELHA et al., (2018)[2]	*	*	*	*	**		*	*	**8**
Reijnierse et al, (2018)		*	*	*	**	*	*	*	**8**
Lam et al, (2020)	*	*	*	*	**	*	*		**8**
Warzecha et al, (2020)		*	*	*	**		*	*	**7**
Bhurchandi et al, (2021)		*	*	*	**	*	*	*	**8**
Weid et al, (2021)		*	*	*	*	*	*		**7**
Liao et al, (2023)		*	*	*	**	*	*	*	**8**

Source: elaborated by the authors (2023).

2.6 Meta-Analysis

The Review Manager 5.4® program was used for the meta-analysis. The measures of association between risk of falls and mortality were analyzed by calculating the odds ratio (OR) with a 95% confidence interval and a significance level of 5%. Measures of association of individual studies were combined in a forest plot meta-analysis with Mantel-Haenszel statistical model to combine different ORs. The effect analysis model was determined according to the heterogeneity of the results evaluated by the I^2 statistics. The presence of statistical heterogeneity was investigated by inspecting the presentation of the meta-analysis graphs and the funnel plot.

3. RESULTS

After an initial search in the databases, 992 articles were found, with the exclusion of 491 articles due to duplicates. Of the 501 remaining articles, 430 were excluded after reading the titles and abstracts, leaving 71 articles for full-text reading. Articles were excluded for not meeting the inclusion criteria, as shown in Figure 1, thus leaving 14 studies, of which 13 had sufficient data to generate a meta-analysis. Of these 13 articles, 5 had data for both outcomes (mortality and falls).

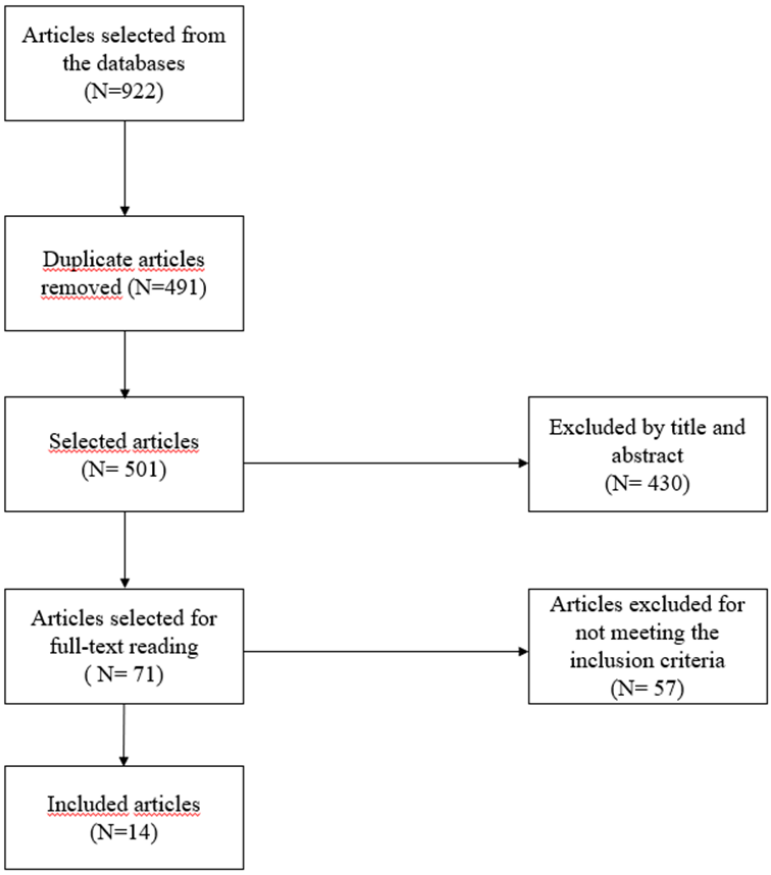
This systematic review included 14 articles that were selected according to the eligibility criteria. The main findings are described in Table 1.

Three main tools for defining sarcopenia were identified, with the most common being the European Working Group on Sarcopenia in Older People (EWGSOP) present in six studies (BHURCHANDI et al., 2021; BUCKINX et al., 2017; GADELHA et al., 2018; HENWOOD et al., 2017; LANDI et al., 2012; WARZECHA et al., 2020), followed by the Asian Working Group for Sarcopenia (AWGS) definition, (LAM et al., 2020; MATSUMOTO et al., 2017) present in two studies and the definition of the Foundation for the National Institutes of Health (FNIH) used by one study (TANG et al., 2018).

Two instruments used to assess muscle mass were evident in the studies. Bioelectrical Impedance, which was implemented by four studies (BUCKINX et al., [s.d.]; HENWOOD et al., [s.d.]; MATSUMOTO et al., 2017; REIJNIERSE et al., 2019) and DXA (Whole body dual energy x-ray absorptiometry), used by four other studies (GADELHA et al., 2018; LAM et al., 2020; TANG et al., 2018; WARZECHA et al., 2020). To assess muscle strength, 11 studies used handgrip strength (HGS) with a dynamometer (BHURCHANDI et al., 2021; BUCKINX et al., 2017; HENWOOD et al.,

2017; HERNÁNDEZ-LUIS et al., 2018; LAM et al., 2020; LANDI et al., 2012; LIAO et al., 2023; MATSUMOTO et al., 2017; REIJNIERSE et al., 2019; TANG et al., 2018; WARZECHA et al., 2020).

Figure 1 – article selection flowchart



Source: elaborated by the authors (2023).

Regarding the analyzed outcomes, eight studies showed an increased risk of falls in individuals with sarcopenia (BUCKINX et al., 2017; GADELHA et al., 2018a, 2018b; LANDI et al., 2012; MATSUMOTO et al., 2017; REIJNIERSE et al., 2019; WARZECHA et al., 2020; WIEDL et al., 2021) and six studies correlated sarcopenia with increased mortality (BHURCHANDI et al., 2021; BUCKINX et al., 2017; LIAO et al., 2023; REIJNIERSE et al., 2019; TANG et al., 2018; WIEDL et al., 2021). On the other hand, one study showed that the correlation between sarcopenia and the risk of falls and mortality was not significant and that age was considered a better predictor of mortality than sarcopenia (HENWOOD et al., 2017).

Table 2- summary of the included studies

	Author/Year	Place/ Type of Study	Study Objectives	Age	Sample (n)	Instrument Used	Justification of instrument	Outcome/ p-value or 95%CI
1	**LANDI et al., (2012)**	Italy/ Cohort	To evaluate the relationship between sarcopenia and the risk of falls in the elderly population	80 years or +	260	1- EWGSOP 2- MAMC 3- 4 Meter Walk Test 4- HGS- Dynamometer	1- Definition of Sarcopenia by EWGSOP 2- Evaluate Muscle Mass 3- Assess gait speed (muscle performance) 4- Evaluate Muscle Strength	Sarcopenia is a factor for falls P<0.001
2	**MATSUMOTO et al., (2017)**	Japan/ Cohort	To investigate the relationship between sarcopenia and falls in the elderly population	60 years or +	223	1- AWGS 2- Bioeletric Impedance 3- HGS- Dynamometer 4- Gait teste and 5-m walk teste	1- Definition of sarcopenia by AWGS 2- Assess muscle mass 3- Assess muscle Strength 4- Asess gait Speed (muscle performance)	Sarcopenia is a risk for falls in the elderly. P= 0.049
3	**HERNÁNCEZ-LUIZ et al., (2017)**	Spain/ Cohort	To determine the mortality prognostic value of physical function tests, loss of muscle mass, disability and frailty in the elderly	60 years or +	298	1- MAMA 2- HGS- Dynomometer	1- To assess the muscle mass index 2- To assess muscle strength/function	Sarcopenia is directly associated to decreasd muscle function, which increases the risk of mortality in the elerdely. CI= 1.55 (1.04-2.33)
4	**Henwood et al, (2017)**	Australia /Cohort	To report on the implications of sarcopenia in nursing home at 18 months of follow-up.	60 years or +	102	1- EWGSOP 2- Bioelectric Impedance 3- HGS- Dynamometer 4- SPPB	1- Definition of sarcopenia by EWGSOP. 2- To assess muscle mass.	Age was considered a better predictor of mortality than sarcopenia. There was no significant correlation between sarcopenia and the risk of falls and mortality. P= 0.906

							3- To assess muscle strength 4- To assess gait speed (muscle performance)	
5	**Tang et al, (2017)**	China/ Cohort	To estimate the association between sarcopenia, adverse events and mortality	65 rears or +	728	1- FNIH 2- DXA 3- HGS- Dynamometer	1- Criterion for the definition of sarcopenia 2- To assess muscle mass 3- To assess muscle strength	Sarcopenia increases the risk of mortality 4x. P= 0,017
6	**Buckinx et al, 2107**	Belgium/ Cohort	To evaluate predictors of falls and mortality in institutionalized elderly in one year	Mean of 83 years	Mortality outcome: 584 Fall outcome: 565	1- EWGSOP 2- Bioelectrical Impedance 3- HGS- Dynamometer 4- SPPB	1- Definition of Sarcopenia by EWGSOP 2- To assess muscle mass 3- To assess muscle strength 4- To asses gait speed	There is a positive correlation between reduced muscle strength and sarcopenia with the occurrence of falls and mortality. Falls: P= 0.09 Mortality: P= 0.01
7	**GADELHA et al, (2018)**	Brazil/ Cohort	To evaluate the relationship between muscle quality and the incidence of falls in the elderly	60 years or +	167	1- Ultrasonography 2- Peak isometric torque of knee extensors through dynamometer	1- To assess muscle mass though muscle thickness 2- To assess muscle strength	Poor muscle quality is associated with a significantly increased risk of falls. P< 0.001
8	**GADELHA et al (2018)**	USA/ Cohort	Associate the different stages of sarcopenia, risk of falls, fear of falling and postural balance.	60 years +	196	1- EWGSOP 2- DXA 3- Peak isometric torque of knee extensors through dynamometer 4- TUG	1- Definition of sarcopenia by EWGSOP 2- To assess muscle mass 3- To assess muscle strength 4- To assess muscle performance	Sarcopenia increases the risk of falls and fear of falling in older. P= 0.02

9	**Reijnierse et al (2018)**	The Netherlands/ Cohort	To assess predictive factors of falls and mortality in elderly patients after 3months of hospital discharge	70 years or +	Fall outcome: 222 Mortality outcome: 291	1- Bioelectrical Impedance 2- Hand Grip Strength (HGS)- Dynamometer	1- To assess muscle mass 2- To assess muscle strength	In hospitalized elderly, muscle mass was an important independent predictor of mortality and falls in 3 months after hospital discharge Mortality P<0.05 Falls P<0.05
10	**LAM et al (2020)**	China/ Cohort	To assess sarcopenia as an adverse event predictor	65 years or +	4000	1- AWGS 2- SARC-F questionnaire 3- DXA 4- HGS- Dynamometer 5- 6 minuteswalk test	1- Definition of sarcopenia by AWGS 2- Screening for sarcopenia 3- To assess muscle mass 4- To assess muscle strength 5- To assess gait speed (muscle performance)	SARC-F, muscle strength and function can predict adverse events in community-dwelling elderly. Mortality CI= 1.35 (1.22, 1.49) Falls CI= 1.52 (1.25, 1.85)
11	**WARZECHA et al (2020)**	Poland/ Cohort	To evaluate the relationship between the risk of falls and skeletal muscle parameters in postmenopausal women	Women aged> 60 years	115	1- EWGSOP 2- DXA 3- HGS- Dynamometer 4- Gait speed in 4 meters and TUG	1- Definition of sarcopenia by EWGSOP 2- To assess muscle mass 3- To assess muscle strength 4- To assess gait speed (muscle performance)	The analysis showed that the risk of falls in the assessed women was statistically significant in relation to their decreased muscle mass. CI= 1.84 (0.29-11.59)
12	**BHURCHANDI et al, (2021)**	India/ Cohort	To evaluate the correlation between sarcopenia and mortality outcomes in patients admitted to an intensive care unit (ICU)	Older than 60 years	70	1- EWGSOP 2- SARC-F S 3- HGS- Dynamometer 4- SPPB 5- Heel circumference	1- Definition of sarcopenia by EWGSOP 2- Screening for sarcopenia 3- To assess muscle strength	Sarcopenia increases the risk mortality in ICU patients. P= 0.032

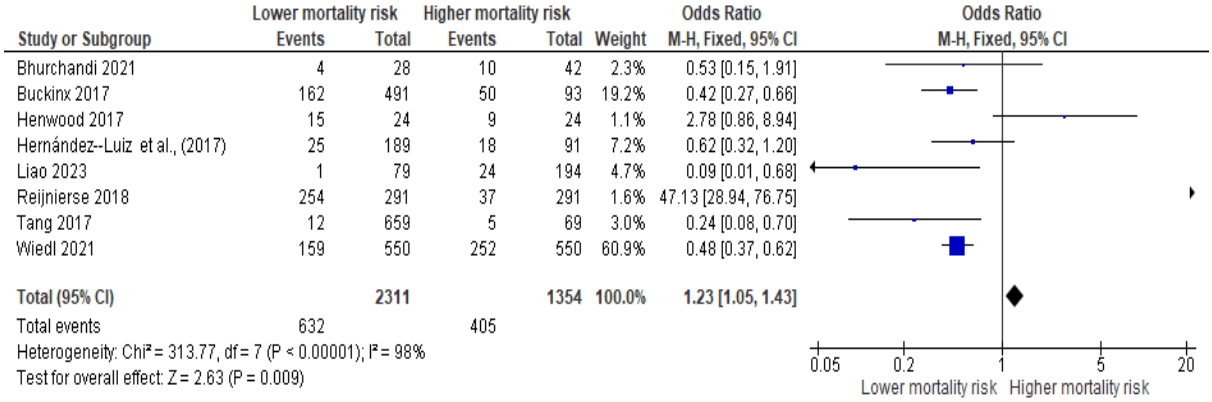
							4- To assess gait speed (muscle performance) 5- To assess muscle mass	
13	**Weid et al, (2021)**	Germany, Cohort	To evaluate predictive factors of mortality in elderly people hospitalized in an orthogeriatric ward.	Older than 75 years	N= 550	1- Calf circumference	1- Circumference <33cm.	Sarcopenia showed a significant relationship with increased mortality and more frequent falls. Mortality P<0.001 Falls P<0.001
14	**Liao et al, (2023)**	Iran, Cohort	To investigate associations between mortality and related illnesses in elderly people in an emergency center.	Older than 74 years	N= 194	1- HGS 2- Calf circumference	1-To assess Muscle Strength 2- To assess muscle mass	Sarcopenia is a physical condition highly associated with mortality in elderly people who visit emergency rooms. Mortality P <0.001 Falls P 0.004

Source: elaborated by the authors (2023). EWGSOP - european working group on sarcopenia in older people; MAMC - mid-arm muscle circumference; HGS - hand grip strength; AWGS - asian working group for sarcopenia; MAMA - mid-arm muscle area; SPPB - short physical performance battery; FNIH - foundation for the national institutes of health; DXA - whole body dual energy x-ray absorptiometry; TUG - timed up-and-go test.

3.1 Meta-Analysis Results

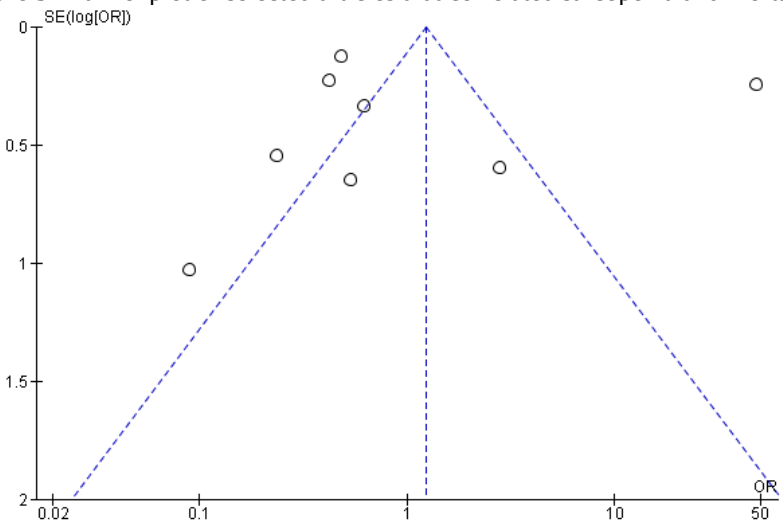
Eight studies, (BHURCHANDI et al., 2021; BUCKINX et al., 2017; HENWOOD et al., 2017; HERNÁNDEZ-LUIS et al., 2018; LIAO et al., 2023; REIJNIERSE et al., 2019; TANG et al., 2018; WIEDL et al., 2021), could be combined in a meta-analysis to analyze the mortality risk ratio in elderly patients with sarcopenia. It was observed that the group of elderly people with sarcopenia had a higher risk of mortality when compared to the group without sarcopenia (1.23 (95% CI 1.05-1.43), p <0.00001, I2 = 98%, Chi2 p = 313.77), as shown in Figure 2.

Figure 2– Meta-analysis of selected articles that correlated sarcopenia and mortality.



Source: elaborated by the authors (2023).

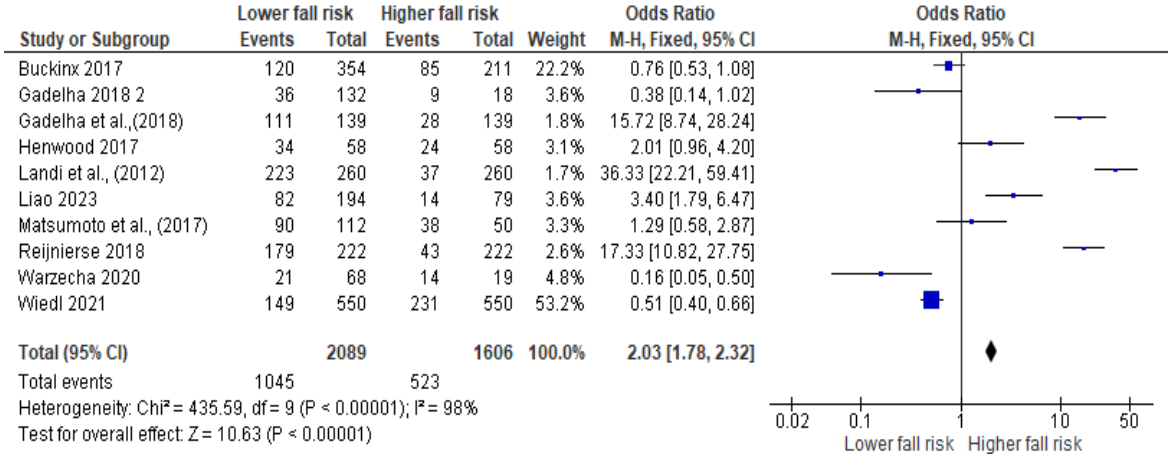
Figure 3– Funnel plot of selected articles that correlated sarcopenia and mortality.



Source: elaborated by the authors (2023).

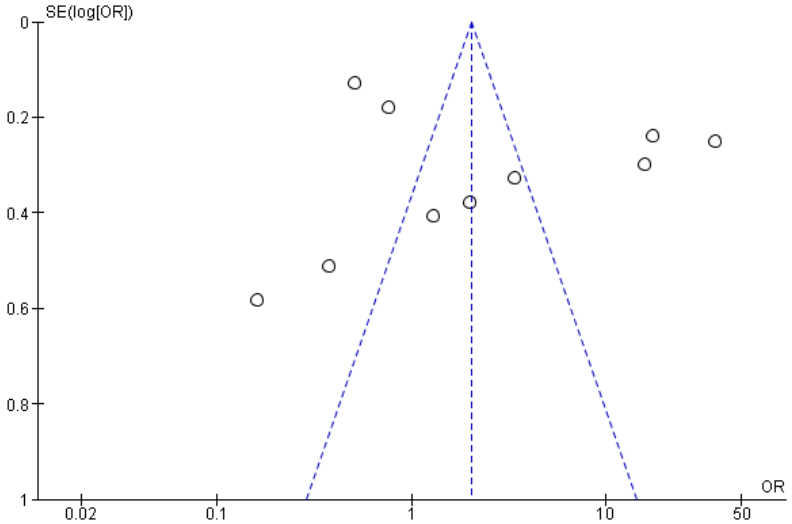
Ten studies, (BUCKINX et al., 2017; GADELHA et al., 2018a, 2018b; HENWOOD et al., 2017; LANDI et al., 2012; LIAO et al., 2023; MATSUMOTO et al., 2017; REIJNIERSE et al., 2019; WARZECHA et al., 2020; WIEDL et al., 2021), could be combined in a meta-analysis to analyze the risk ratio for falls in elderly people with sarcopenia. It was observed that the group of elderly people with sarcopenia had a higher risk of falls when compared to the group without sarcopenia (2.03 (95% CI 1.78-2.32), p <0.00001, I2 = 98%, Chi2 p = 435.59), as shown in Figure 4.

Figure 4– Meta-analysis of selected articles that correlated sarcopenia and risk of falls.



Source: elaborated by the authors (2023).

Figure 5– Funnel plot of selected articles that correlated sarcopenia and risk of falls.



Source: elaborated by the authors (2023).

4. DISCUSSION

This study aimed to systematically review the available literature and correlate sarcopenia with the risk of falls and mortality in the elderly, through observational studies.

The definitions of sarcopenia currently proposed in the scientific literature are diverse (SANTILLI et al., 2014). Although there are well-established definitions, such as the one proposed by the EWGSOP (CRUZ-JENTOFT et al., 2010), used by most of the studies in this review, the lack of standardization of diagnostic criteria for sarcopenia can lead to differences in studies on the subject.

We selected 14 studies in our systematic review and 13 for the meta-analysis. Of these studies, we identified eight with outcomes for mortality and ten for falls. The most frequently studied consequence of sarcopenia is mortality, as demonstrated in other recently published systematic reviews (BEAUDART et al., 2017; XU et al., 2022). In our

review, seven studies suggested a significant relationship between sarcopenia and mortality, whereas one article did not observe this correlation. Our study corroborated the aforementioned meta-analyses, which also indicated that patients with sarcopenia face a higher mortality risk than non-sarcopenic individuals (BEAUDART et al., 2017; XU et al., 2022).

Sarcopenia has consequences for the functionality of the elderly, making their activities of daily living difficult to perform. The studies that reported functional decline as a result of sarcopenia showed a significant association (XU et al., 2022). It has been suggested that sarcopenic individuals have a higher risk of functional decline or functional disability and this decline results in frequent falls, which can lead to hospitalizations and, in more severe cases, death.

Currently, it is known that low muscle mass is an isolated risk factor for morbidity and mortality in the elderly population. This finding is extremely relevant, since, after nutritional interventions associated with an exercise program, the patient may have this condition minimized or reversed, which is a potentially reversible risk factor. This differentiates low muscle mass from most others. non-modifiable risk factors such as age, cognition and most chronic diseases (REIJNIERSE et al., 2019). However, it is still unknown whether the increase in muscle mass would subsequently lead to a reduction in adverse outcomes, thus requiring further studies to prove this theory.

There are other risk factors for increased morbidity and mortality in the elderly. In addition to sarcopenia, which is evident in the studies, age >85 years, chronic diseases such as heart failure, atrial fibrillation and lung diseases, are some other examples (LIAO et al., 2023).

A systematic review carried out in 2022 by XU et al, (XU et al., 2022), demonstrated that sarcopenia is associated with mortality in the elderly, regardless of the population studied and the definition of sarcopenia. This finding is consistent with previously published reviews anteriormente (VERONESE et al., 2019,BEAUDART et al., 2017; CUI et al., 2018) Original studies and systematic reviews have shown that individuals with sarcopenia are at risk of functional decline, frailty, decreased mobility, falls, fractures and hospitalization, which can contribute to a higher risk of mortality, corroborating the result of this review (XU et al., 2022),

Due to the academic relevance and importance for the implementation of public health policies presented by this topic, more observational studies are necessary, as well

as proposals for effective interventions to improve sarcopenia through randomized and controlled clinical trials.

5. CONCLUSION

The present study showed that sarcopenia is a risk factor for falls and increased mortality in the elderly, demonstrating the need for an early diagnosis, as well as the need to initiate intervention, prevention and early treatment of sarcopenia.

Some limitations were observed in this systematic review. An important limitation was the criterion used by the studies to define sarcopenia, which was quite diverse. For this reason and because the number of elderly people assessed differs greatly between the studies, we had a high heterogeneity between the articles, as demonstrated by the I^2 of 98%.

The result of this study is of utmost importance as it signals the need to implement measures for the prevention of sarcopenia, which can improve the quality of life for the elderly, reduce healthcare costs, minimize the risks of injuries and falls, and promote healthier aging. Therefore, it is essential for public healthcare systems to implement strategies to identify and address sarcopenia in their aging populations.

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