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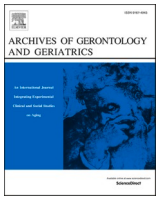

Review

Dysphagia and its association with other health-related risk factors in institutionalized older people: A systematic review

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ABSTRACT

Background: Dysphagia is considered a geriatric syndrome that is characterized by inability to or difficulty in safely and effectively forming or moving the food bolus toward the esophagus. This pathology is very common and affects approximately 50% of institutionalized older people. Dysphagia is often accompanied by high nutritional, functional, social, and emotional risks. This relationship implies a higher rate of morbidity, disability, dependence, and mortality in this population. This review is aimed at studying the relationship between dysphagia and different health-related risk factors in institutionalized older people.

Method: We conducted a systematic review. The bibliographic search was performed in the Web of Science, Medline, and Scopus databases. Data extraction and methodological quality were evaluated by two independent researchers.

Results. Twenty-nine studies met the inclusion and exclusion criteria. A clear relationship between the development and progression of dysphagia and a high nutritional, cognitive, functional, social, and emotional risk in institutionalized older adults was found.

Conclusions. There is an important relationship between these health conditions that shows the need for research and new approaches to considerations such as their prevention and treatment as well as the design of protocols and procedures that will help reduce the percentage of morbidity, disability, dependence, and mortality in older people.

1. Introduction

Dysphagia is a pathology that compromises the safety of swallowing and feeding in those who suffer from it. This pathology frequently occurs secondary to the appearance of specific diseases, such as cerebrovascular accidents or dementias (Sura et al., 2012). In addition, dysphagia produces dysfunction or deterioration of the swallowing process, and its prevalence in the global population is 8%; that is, 590 million people in the world suffer from it (Cichero et al., 2017). This percentage increases between 10 and 33% in the case of people aged 60 and over (Thiyagalingam et al., 2021). Additionally, the percentage of dysphagia among institutionalized people is 50% (Finiels et al., 2001), and among people with a diagnosis of dementia, it reaches 84% (Horner et al., 1994).

Although swallowing disorders are very common among older people, their prevalence is often underestimated and tends to lead to increased morbidity and mortality rates (Lieu et al., 2001), with only 40% of people who suffer from swallowing disorders reporting to or consulting with their general practitioner about this problem (Tibbling et al., 1991).

For these reasons, the European Society for Swallowing Disorders and the European Union Geriatric Medicine Society (Baijens et al., 2016; Lieu et al., 2001) currently recognizes dysphagia as one of the main geriatric syndromes that seriously harms the general health and life of those who suffer from it. In this context, dysphagia is technically defined as the inability to or difficulty in forming or moving the food bolus from the oral cavity to the pharynx and esophagus safely and effectively through a series of voluntary and reflex actions and involuntary symptoms typical of each phase of the swallowing process.

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One of the main reasons why the prevalence of dysphagia is often underestimated is related to the lack of awareness that older people have about a swallowing problem during the initial phase, which is why an evaluation and a specific approach to each case are not always performed (Baijens et al., 2016; Sarabia-Cobo et al., 2016).

The evaluation of this pathology supposes a complex process that is performed through specific detection tests, clinical evaluations, and instrumental examinations. A correct assessment is essential and must be performed very frequently, especially in older people. However, there are still many limitations, some of which are related to the few existing tools for its detection, so it would be very useful to include them in prevention protocols to combat dysphagia's main complications. The need to investigate new treatments and procedures for dysphagia management is also highlighted, and it is a great challenge in the current environment (Abu-Ghanem et al., 2020; Baijens et al., 2016).

The harmful effect on the quality of life and general health of older people caused by dysphagia occurs due to the development of a series of very common consequences, such as malnutrition, dehydration, and frequent aspiration pneumonia, among others (Pujol-Doménech et al., 2001).

The presence of this pathology also increases the risk of developing numerous sequelae at an emotional level and important psychiatric conditions, such as depression, anxiety, and the tendency to isolate. These consequences require careful attention and result in significant public spending (Abu-Ghanem et al., 2020; Tibbling et al., 1991). Therefore, swallowing problems do not usually occur in isolation but coexist with other biopsychosocial pathologies (Chalekrua et al., 2021), and professionals must be alert to any symptoms and quickly identify these consequences (Ekberg et al., 2002).

It is important to bear in mind that as the rate of population aging accelerates, the prevalence of swallowing disorders increases, which has led to an important public health problem worldwide that is being addressed every day (Achem and Devault, 2005). Researchers have shown some interest in the biopsychosocial problems that accompany this pathology in recent years (Ekberg et al., 2002).

Therefore, given the high rate of older people who report swallowing problems, the need to promote lines of research that address the numerous multidimensional health-related risk factors that possibly enhance the appearance and progress of this pathology is becoming increasingly evident. Identifying these factors would be crucial when implementing intervention protocols that help alleviate their incidence and prevalence, improving the quality of life of this group, reducing the health cost it generates, and reducing the associated rate of disability and dependence and even the percentage of mortality.

Thus, the main objective of this review is to identify and study the relationship between a series of multidimensional health-related risk factors in institutionalized older people.

2. Materials and methods

2.1. Search strategy

A systematic review was conducted for studies published from the inception of each database until December 2021. Web of Science (WOS), Medline, and Scopus were used as reference scientific databases. To perform the bibliographic search between the different databases, different terms and keywords were used, such as "dysphagia", "swallow*", "degluti*", "institutional*", "nursing home", "care homes", "residentia*", "nursing-home", "home nurs*", "long-term care" and age* care facilit*", which were integrated into the following search formula: "(dysphagia OR swallow* OR degluti*) AND (institutional* OR "nursing home" OR "care homes" OR residentia* OR "nursing-home" OR home AND nurs* OR "long-term care" OR "age* care facilit*")".

2.2. Inclusion criteria

According to the inclusion criteria, only studies with a sample of a population older than or equal to 65 years and those institutionalized in nursing homes or long-term care gerontological complexes were included.

In addition, studies in which an assessment of dysphagia had been performed by qualified professionals, including standardized techniques and tools, were also included.

2.3. Exclusion criteria

According to the exclusion criteria, documents that did not appear as original articles were excluded, such as reviews, conferences, author notes, commentaries, letters, conference proceedings, books, or book chapters. Scientific articles published in a language other than English or Spanish were also excluded, and articles that were duplicated between the three reference databases were also eliminated.

Regarding the sample, studies incorporating participants who were outside the age range were excluded. In addition, the studies that presented a sample of participants with very specific diseases or pathologies who frequently presented with dysphagia (such as, for example, patients suffering from head and neck cancer or stroke, among others), people who had received treatment or a particular intervention that usually produces dysphagia and older people who use day centers or older people who live in the community.

2.4. Quality assessment and data extraction

All the articles selected and included in this systematic review were subjected to a methodological quality assessment using the Joanna Briggs Institute (JBI) Critical Appraisal tools for systematic reviews. In this case, a 9-item scale was used for prevalence studies; therefore, the resulting score was out of nine points, and an 8-item scale was used for the included cross-sectional studies, so the result was over eight points. The score is given according to the number of "Y" obtained in each item.

The information from each article was collected according to the following characteristics: authors, year of publication and country, type of study, setting in which the study was performed, participants (number of participants, gender, age, and, in some cases, the prevalence of cognitive deficit or dementia and the prevalence of functional deficit are also shown), risk factors associated with dysphagia, instruments used to assess these risk factors, instruments for diagnosis of dysphagia, prevalence or percentage of dysphagia, and main outcomes obtained.

3. Results

As shown in Fig. 1, at first, a total of 2,063 results were obtained, of which 1135 were subsequently eliminated depending on the type of document published, its language of publication, or the duplication of documents between the different databases used here. Next, an analysis was performed using the titles and abstracts of the remaining 928 results. At that stage, a total of 832 documents were eliminated, mostly due to being outside the topic in question or according to the type of document and language of publication. During the next phase, a full-text analysis of the remaining 96 documents was performed. Of all these articles, a total of 67 were eliminated (see Supplementary Table 1) according to the characteristics of the sample and the environment, according to the objective of the study in question, and according to the evaluation method used in each case. Therefore, a total of 29 scientific articles that met the previously proposed inclusion criteria were selected for this systematic review.

3.1. Characteristics of the studies

A total of 29 studies performed in different countries in Europe, Asia,

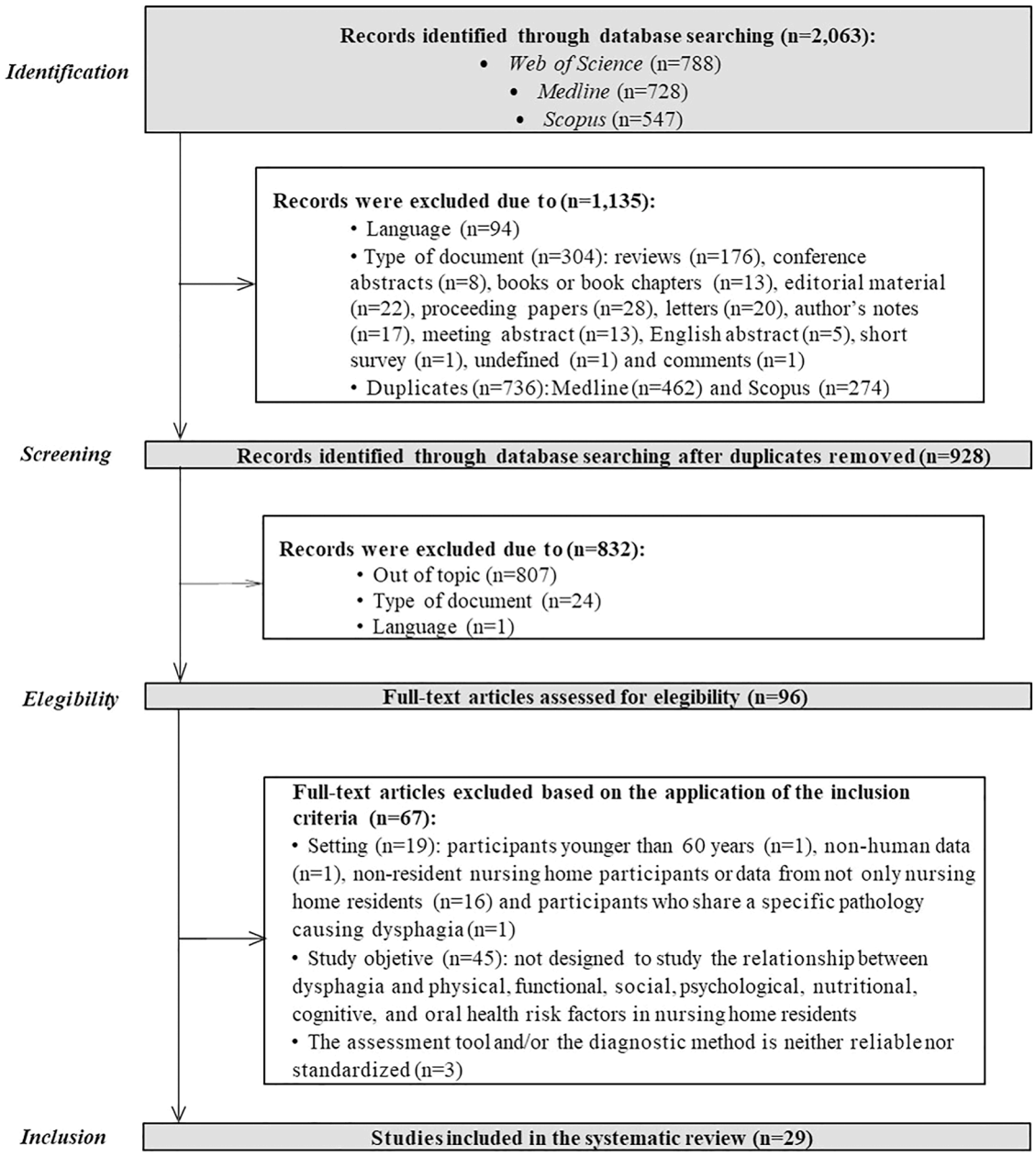

Fig. 1. PRISMA flow chart for the search and selection of primary studies.

North America, South America, and Australia were selected. All of them were performed in residences and long-term care gerontological complexes.

3.2. Sample characteristics

As shown in Table 1, a total of 62,755 institutionalized older people participated in the 29 selected studies. Seventy-two percent of them were women, and only two studies included a greater number of men than women among their participants (Simões et al., 2020; Wang et al., 2012). The minimum number of participants per study was 24 people (Izumi et al., 2021), while the maximum number of participants per study was 23,549 people (Streicher et al., 2018).

Sixteen of the studies selected here indicated that the percentage of participants suffering from cognitive impairment reached a mean of 51.8%, so approximately 32,487 participants had an established diagnosis of cognitive impairment or dementia to some degree.

The age of all participants ranged from 65 years onward, and an approximate number of 23,089 people with dysphagia and people with masticatory problems were included since the mean percentage of dysphagia among the selected studies was 36.8%, with 100% being the highest percentage of participants with dysphagia per study (Carrillo Prieto et al., 2016) and 4.6% being the lowest (Ambagtsheer et al., 2020).

3.3. Dysphagia risk factors and their evaluation

This systematic review analyses a series of possible risk factors for the development and progression of dysphagia in institutionalized older people.

Regarding the nutritional level of those with dysphagia, analyses of nutritional status was performed in 12 studies (Beck, 2015; Bonaccorsi et al., 2015; Carrillo Prieto et al., 2016; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Hanson et al., 2013; Huppertz et al., 2018; Landi et al., 2013; Namasivayam-MacDonald et al., 2017; Park et al., 2013; Pezzana et al., 2015; Streicher et al., 2018); in another 9, the body

Table 1
The Joanna Briggs Institute (JBI) critical appraisal checklists.

For analytical cross-sectional studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Score
Bonnacorsi et al. (2015)	Y	Y	U	Y	Y	Y	Y	Y	7
Botigué et al. (2019)	Y	Y	U	U	Y	Y	U	Y	5
Brochier et al. (2018)	Y	Y	U	Y	N	N	Y	Y	5
Chen et al. (2020)	Y	Y	Y	U	Y	Y	Y	Y	7
Chen et al. (2021)	Y	Y	Y	U	Y	Y	Y	Y	7
Hiltunen et al. (2021)	Y	Y	U	N	Y	N	Y	N	4
Huppertz et al. (2018)	Y	Y	Y	U	Y	Y	Y	Y	7
Namasivayam-Macdonald et al. (2017)	Y	Y	Y	Y	Y	Y	Y	N	7
Nogueira & Reis (2013)	Y	Y	Y	Y	Y	Y	Y	N	7
Park et al. (2013)	Y	Y	Y	Y	Y	Y	Y	Y	8
Pezzana et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	8
Rech et al. (2018)	Y	Y	U	U	N	N	U	N	2
Simões et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y	8
Streicher et al. (2018)	Y	Y	U	U	Y	Y	Y	Y	6
Tannen et al. (2012)	Y	Y	Y	Y	N	N	Y	Y	6
Wang et al. (2012)	N	Y	Y	Y	Y	Y	Y	Y	7
Wirth et al. (2018)	Y	Y	Y	Y	Y	Y	Y	Y	8
Yatabe et al. (2018)	Y	Y	Y	Y	Y	Y	Y	Y	8

Note: Q1: Were the criteria for inclusion in the sample clearly defined? Q2. Were the study subjects and the setting described in detail? Q3. Was the exposure measured in a valid and reliable way? Q4. Were objective, standard criteria used for measurement of the condition? Q5. Were confounding factors identified? Q6. Were strategies to deal with confounding factors stated? Q7. Were the outcomes measured in a valid and reliable way? Q8. Was appropriate statistical analysis used?

For analytical prevalence studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Score
Ambagtsheer et al. (2020)	U	Y	Y	Y	Y	Y	Y	Y	Y	8
Beck (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Carrillo Prieto et al. (2016)	Y	Y	N	Y	N	U	U	N	U	3
Fernández Getino (2018)	Y	Y	N	N	N	Y	U	N	N	3
Ferrero López et al. (2012)	U	Y	Y	Y	Y	Y	U	N	N	5
Hanson et al. (2013)	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Izumi et al. (2021)*	Y	N	N	Y	Y	Y	U	Y	Y	6
Izumi et al. (2022)*	Y	N	N	Y	Y	Y	U	Y	Y	6
Landi et al. (2013)	Y	Y	Y	Y	Y	U	U	Y	Y	7
Peladic et al. (2019)	Y	Y	Y	Y	Y	U	U	Y	Y	7
Sarabia-Cobo et al. (2016)	Y	U	Y	N	N	Y	U	N	U	3

Note: Q 1. Was the sample frame appropriate to address the target population? Q2. Were study participants sampled in an appropriate way? Q3. Was the sample size adequate? Q4. Were the study subjects and the setting described in detail? Q5. Was the data analysis conducted with sufficient coverage of the identified sample? Q6. Were valid methods used for the identification of the condition? Q7. Was the condition measured in a standard, reliable way for all participants? Q8. Was there appropriate statistical analysis? Q9. Was the response rate adequate, and if not, was the low response rate managed appropriately?

* Articles with this symbol report data from the same study sample but describe different outcomes.

mass index (BMI) was also studied (Beck, 2015; Chen et al., 2020; Huppertz et al., 2018; Izumi et al., 2022; Park et al., 2013; Streicher et al., 2018; Tannen et al., 2012; Wang et al., 2012); in 7, involuntary weight losses were noted (Beck, 2015; Hanson et al., 2013; Huppertz et al., 2018; Peladic et al., 2019; Streicher et al., 2018; Wang et al., 2012; Wirth et al., 2018); in another 7 articles, oral health and factors at the dental level were explored (Brochier et al., 2018; Chen et al., 2021; Hiltunen et al., 2021; Izumi et al., 2021; Rech et al., 2018; Wang et al., 2012; Yatabe et al., 2018); and, in one case (Botigué et al., 2019), hydration and fluid intake were also analysed.

Notably, the cognitive level and the state of dementia patients with dysphagia were analysed in 14 of the included articles (Chen et al., 2021; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Hanson et al., 2013; Izumi et al., 2022; Nogueira & Reis, 2013; Park et al., 2013; Peladic et al., 2019; Sarabia-Cobo et al., 2016; Simões et al., 2020; Streicher et al., 2018; Wang et al., 2012; Wirth et al., 2018; Yatabe et al., 2018). In addition, the functional level was also assessed; in particular, an analysis of frailty syndrome was performed in one case (Ambagtsheer et al., 2020), and muscle strength was assessed in another case (Chen et al., 2020). In 11 studies, data on patient functional status and/or dependence for activities of daily living were also included (Chen et al., 2020; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Huppertz et al., 2018; Izumi et al., 2022; Nogueira & Reis, 2013; Park et al., 2013; Peladic et al., 2019; Sarabia-Cobo et al., 2016; Streicher et al., 2018; Wirth et al., 2018). Additionally, it was possible to assess the emotional state of patients with dysphagia on 3 occasions (Fernández-Getino Sallés, 2018; Park et al., 2013; Peladic et al., 2019).

To perform an analysis of the above risk factors, an evaluation process is performed that includes the use of standardized and validated instruments by qualified professionals. Regarding the assessment instruments for nutritional aspects, the most commonly used instrument has been the Mini Nutritional Assessment in its most complete version or its shortened version (Carrillo Prieto et al., 2016; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Pezzana et al., 2015). Other instruments were also used, such as the Minimum Data Set of the Resident Assessment Instrument (RAI-NH) version 2.0 (Beck, 2015; Peladic et al., 2019), the Malnutrition Universal Screening Tool (MUST) (Bonnacorsi et al., 2015), the Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS-NH) (Landi et al., 2013; Wang et al., 2012), the Scored Patient-Generated Subjective Global Assessment (PG-SGA) adapted to nursing homes (Namasivayam-MacDonald et al., 2017), the Korean version of the Nutrition Screening Initiative (NSI) (Park et al., 2013) and Nutrition Day questionnaires (Wirth et al., 2018). Notably, researchers have also resorted to the direct observation of the presence of nutritional problems (Hanson et al., 2013; Huppertz et al., 2018; Streicher et al., 2018), diet (Hanson et al., 2013; Streicher et al., 2018), deficient intake (Hanson et al., 2013, Landi et al., 2013; Streicher et al., 2018), weight loss (Hanson et al., 2013) and plate diagrams (Streicher et al., 2018) in some cases. To obtain the BMI data for each user, anthropometric measurements were made in different studies (Park et al., 2013; Streicher et al., 2018; Tannen et al., 2012).

To study the hydration state, the registration of liquids and food

ingested for 24 h within one week by qualified personnel (Botigué et al., 2019) performed. To assess oral health and factors at the dental level, complete oral and dental examinations and the use of prostheses by qualified dentists (Brochier et al., 2018; Chen et al., 2021; Hiltunen et al., 2021; Izumi et al., 2022; Rech et al., 2018; Yatabe et al., 2018) were performed, and instruments such as the Chinese version of the Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS-NH) (Wang et al., 2012) were also used.

To assess cognitive status, the Mini-Mental State Examination (MMSE) (Chen et al., 2021; Izumi et al., 2022; Nogueira and Reis, 2013; Yatabe et al., 2018), the Korean version of the MMSE (Park et al., 2013), the Cognitive Performance Scale (CPS) (Peladic et al., 2019; Wang et al., 2012), the Clinical Dementia Rating (CDR) (Simões et al., 2020) or the Pfeiffer's Short Portable Mental State Questionnaire (SPMSQ) (Fernández-Getino Sallés, 2018; Ferrero López et al., 2012) were used. In other cases, cognitive information was provided by qualified professionals (Streicher et al., 2018; Wirth et al., 2018) or extracted from the patient's medical history (Sarabia-Cobo et al., 2016).

Within the functional field, the assessment of frailty syndrome was performed with the modified version based on Rockwood's Frailty Index (FI; Ambagtsheer et al., 2020), muscle strength was assessed through anthropometric measures (Chen et al., 2020), and basic activities of daily living (ADL) was assessed through standardized tools such as the Minimum Data Set Activities of Daily Living (MDS-ADL; Peladic et al., 2019; Wang et al., 2012). In addition, functional status was assessed by using the Barthel Index (BI) in most cases (Chen et al., 2020; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Izumi et al., 2022; Nogueira and Reis, 2013; Sarabia-Cobo et al., 2016; Yatabe et al., 2018) as well as the Korean version of the Modified Barthel Index (K-MBI; Park et al., 2013) and the Care Dependency Scale (CDS; Huppertz et al., 2018); in other cases, information on this topic was provided by qualified professionals (Streicher et al., 2018; Wirth et al., 2018).

Regarding the assessment of emotional characteristics, the Geriatric Depression Scale-Korean (GDS-K; Park et al., 2013) and the Geriatric Depression Scale (GDS) were used in their original versions (Fernández-Getino Sallés, 2018).

3.4. Dysphagia assessment methods

To evaluate the presence and severity of dysphagia, a series of trained professionals performed assessments in which they incorporated different standardized assessment instruments in most cases. The most commonly used standardized tests for dysphagia screening have been the Volume-Viscosity Swallow Test (V-VST; Botigué et al., 2019; Fernandez-Getino Sallés, 2018; Ferrero López et al., 2012), the Modified Water Swallow Test (MWST; Izumi et al., 2021, 2022; Pezzana et al., 2015; Simões et al., 2020; Yatabe et al., 2018), the 3 Ounce Water Swallow Test (3OZwst; Nogueira and Reis, 2013; Sarabia-Cobo et al., 2016), the Dysphagia Self-Test (DST; Nogueira and Reis, 2013) and the relevant items in the Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS-NH) (Landi et al., 2013; Wang et al., 2012). Others were also used, such as the EAT-10 questionnaire for the detection of dysphagia (Chen et al., 2020; Sarabia-Cobo et al., 2016), the items on swallowing and associated symptoms in the National Prevalence Measurement of Care Quality(LPZ) questionnaire (Huppertz et al., 2018), the Screening Tool for Acute Neuro Dysphagia (STAND; Namasivayam-MacDonald et al., 2017), the Gugging Swallowing Screen (GUSS; Park et al., 2013), items from the Nutrition Day questionnaires (Beck, 2015), and specific items on swallowing from the Resident Assessment Instrument (RAI-NH) version 2.0 (Beck, 2015).

In addition to the above methods, information about each participant's swallowing problems was provided by trained workers (Bonnacorsi et al., 2015; Brochier et al., 2018; Chen et al., 2021; Hiltunen et al., 2021; Wang et al., 2012) or was extracted from each participant's medical history (Ambagstheer et al., 2020; Carrillo Prieto et al., 2016; Landi et al., 2013; Navamasivayam-MacDonald et al., 2017; Peladic et al., 2019; Streicher et al., 2018; Tannen et al., 2012). On other occasions, the difficulty in swallowing, the presence of choking with specific textures, and the signs of dehydration or aspiration (Hanson et al., 2013, Rech et al., 2018) were graphically evaluated.

3.5. Dysphagia and risk factors

3.5.1. Nutritional risk factors

Some articles (Beck, 2015; Chen et al., 2021; Huppertz et al., 2018; Park et al., 2013; Streicher et al., 2018; Tannen et al., 2012; Wang et al., 2012; Wirth et al., 2018) have confirmed the relationship between a low BMI and the development of dysphagia. Specifically, in one of the studies (Beck, 2015), it is stated that there is a co-occurrence between swallowing problems and a BMI of less than 18.5 points in many cases. In another case (Huppertz et al., 2018), the BMI was calculated for all individuals, and it was found that this score was lower in the case of people suffering from swallowing problems (23.5±4.3) than in people who did not suffer from swallowing problems (25.0±4.9) ($p<0.001$). Additionally, 65.9% of people with dysphagia were observed to be underweight, while in people who did not suffer from dysphagia, only 27.3% were underweight ($p<0.001$) (Park et al., 2013). Streicher et al. (2018) stated that among people with dysphagia in the total sample, 26.2% were underweight, while only 12.2% maintained a normal weight or were slightly overweight ($p<0.001$). Tannen et al. (2012) found that among users with dysphagia, 17.7% recorded a BMI equal to or less than 20 points (indicates low weight and/or nutritional risk), and only 8.5% of them registered a BMI of greater than 20 points (OR 2.3, 95% CI: 1.9–2.8) ($p<0.01$). It has also been confirmed (Wang et al., 2012) that the lowest BMI (20.9±3.6) is found in people with swallowing problems and not in those who do not suffer from them (232 ±3.8) ($p<0.001$). In addition, Wirth et al. (2018) noted that the BMI of users who do not suffer from dysphagia was 25.3±5.5, while those who did have dysphagia had a mean BMI of 22.4±5.0 ($p<0.001$). Chen et al. (2020) recorded similar data, with an average BMI (with and without dysphagia) of 22.0±3.9, while that of people with dysphagia was 21.2 ± 4.0 and that of people without dysphagia was 22.4 ± 3.8 ($p<0.001$), or slightly higher. In addition, the percentage of people with dysphagia and low weight was 22.4%, and the percentage of people without dysphagia with low weight was 15.2% ($p<0.001$), with a significant difference. In contrast, Izumi et al. (2021) did not find significant differences between the BMI score of each individual and the swallowing function.

For nutritional status, one of the studies included in this review (Beck, 2015) supports the theory that dysphagia is significantly associated with the nutritional risk of each individual. In addition, it is also known that 36.8% of participants with medium-high nutritional risk suffer from dysphagia ($p=0.054$) (Bonnacorsi et al., 2015). Fernández-Getino Sallés (2018) mentioned that the percentage of users with dysphagia and malnutrition was established at 35.7%, while the percentage of malnutrition in users without dysphagia was 6.3%. In concordance, of the participants with dysphagia, only 3% maintained an appropriate nutritional status, 18% were at nutritional risk, and 79% suffered from malnutrition (Carrillo Prieto et al., 2016). In addition, it is argued that only 26.9% of residents with dysphagia maintained good nutritional status, unlike residents without dysphagia, since 78.6% maintained an appropriate nutritional status ($p=0.007$) (Ferrero López et al., 2012). In another case, the percentage of people with dysphagia and malnutrition stood at 17.2%, while the percentage was reduced to 9.4% in the case of users with established malnutrition without swallowing problems ($p<0.001$) (Huppertz et al., 2018). However, in 20.8% of residents with dysphagia, anorexia could also be detected, while the percentage of anorexia decreased to 11.7% in people without swallowing problems ($p=0.0001$) (Landi et al., 2013). It was also possible to verify that the percentage of malnutrition in all participants was 44%, and the percentage of malnutrition and dysphagia simultaneously was 29%, which indicates that malnutrition is more likely to be established when there are swallowing problems (Navamasivayam-Mcdonald et al.,

2017). Thus, 47.1% of residents with dysphagia suffered from a high established nutritional risk, while 38.5% maintained an appropriate nutritional status. This information contrasts with the percentage of participants without dysphagia with a high nutritional risk of 38.5% and those without dysphagia who maintained a correct nutritional status at 42.8% ($p<0.001$) (Park et al., 2013). Additionally, another study (Pezzana et al., 2015) places the percentage of users with dysphagia and malnutrition at 31.4% and the percentage of users with established nutritional risk and dysphagia at 17.9%, although in users with dysphagia who maintained an appropriate nutritional status, the percentage dropped to 3.5% ($p<0.001$). The percentage of malnutrition in individuals with dysphagia also varied and stood at 32.2%, just like the risk of malnutrition, which was 21.2%, and the maintenance of a good nutritional status was 8.5% ($p<0.001$) (Streicher et al., 2018). By contrast, the prospective cohort study (Hanson et al., 2013), which was performed in North Carolina (USA), stated that low food intake does not vary according to the swallowing condition of each user.

Another consideration that is included in the selected documents is the involuntary loss of weight within a short period of time. Thus, of the total sample, almost half suffered involuntary weight loss, and 10% of the total also had swallowing problems (Beck, 2015). Moreover, the percentage of users with dysphagia and low weight was 27.4%, while the percentage of users without dysphagia with low weight dropped to 15.2% and the percentage of normal weight was lower in people with dysphagia than in people without dysphagia ($p<0.001$) (Chen et al., 2020). Additionally, the percentage of people with dysphagia and low weight was 65.9% (Park et al., 2013). We also found that among users with dysphagia, 26.2% had a lower weight than they are expected to have, and only 12.2% remain at a normal weight or are slightly overweight ($p<0.001$) (Streicher et al., 2018). Thus, it has also been claimed that individuals with dysphagia have a higher percentage of involuntary weight loss than those who do not suffer from it ($p<0.001$) (Wang et al., 2012). Wirth et al. (2018) placed the percentage of weight loss greater than five kg in the last year at 20.5% in users with dysphagia, while in individuals with a good swallowing capacity, the percentage was 9.6% ($p<0.001$). However, a study conducted in North Carolina (Hanson et al., 2013) again argued that weight loss does not show significant differences between users with and without dysphagia (OR 3.6, 95% CI: 2.1–6.4).

Oral health and dental factors: It has been shown that there is an important relationship between poorer oral health of residents and the presence of xerostomia with OD. Furthermore, individuals without occlusal pairs (PR 1.52, 95% CI: 1.02–2.40) were more likely to suffer from OD than those who retained 8 to 14 pairs. The correlation between high scores on the Xerostomia Inventory (XI) (a higher score portends the presence of xerostomia) and OD is also evident (OR 2.86, 95% CI: 1.58–5.156) in scores of 30–50 and (PR 3.01, 95% CI: 1.67–5.42) in scores of 20-29 (Brochier et al., 2018).

Notably, within the group of residents with cognitive impairments and healthy mouths, those with mouths considered healthy tended to have normal swallowing function (75.8%). Those with mouths of changing quality usually also had normal swallowing function (68%), although in some cases, it could also be very altered (14.8%). However, of the individuals with mouths considered unhealthy, only 33.3% had normal swallowing, 11.1% had a mild alteration, and more than half (55.6%) had a severe alteration in their swallowing ability (Chen et al., 2021).

Additionally, it was observed that the MWST score was slightly higher in the intervention group (4.5; min. 3-max. 5) that was subject to a complete oral cleaning regimen, including tongue cleaning, than in individuals in the control group who followed their usual hygiene regimen (4; min 1-max 5). This finding indicates that the risk of dysphagia is greater in those who do not perform a more complete oral hygiene routine (Izumi et al., 2021).

In another case, among the total number of residents with dysphagia, it is apparent that 8% had functional prostheses and 18.7% had partially functional prostheses, but the percentage increased notably to 73.3% in residents with nonfunctional prostheses. In residents who also had nonfunctional teeth but did not suffer from dysphagia, the percentage was 47.9% ($p=0.01$) (Rech et al., 2018).

In addition, 10.2% had swollen gums; 9.91% suffered breakage, loss, or caries in their teeth, and 11.08% had natural teeth. However, in residents who were not suffering chewing or swallowing problems, there was a lower percentage of swollen gums (1.6%) ($p<0.001$); dental breakage, loss, or caries (6.0%) ($p=0.043$); and a higher percentage of the conservation of some natural teeth (24.8%) ($p<0.001$) (Wang et al., 2012).

A study performed in Japan found that 15.2% of edentulous people are at risk of suffering from dysphagia. Jagged-toothed individuals at risk of dysphagia have a higher degree of dependence (85.7%) than those without risk of dysphagia (50.0%) ($p<0.001$) (Yatabe et al., 2018).

Last, the results of a cross-sectional study showed that 2% of the participants did not suffer from any symptom of oral frailty or only one; 22% suffered from 2 to 4 symptoms of oral frailty, and 29% of dysphagic patients suffered from 5 to 6 symptoms of oral frailty ($p=0.001$) (Hiltunen et al., 2021).

Hydration and fluid intake: Dehydration and low fluid intake are closely related to the presence of swallowing problems among nursing home residents. Thirty-four percent of them ingested less than 1500 mL/d. Thus, the residents with fluid dysphagia consumed a mean of 1,543.2 ±689.6 mL/d, and the residents who did not suffer from dysphagia consumed a higher fluid mean of 1,884.4±413.6 (p=0.029). Individuals with swallowing safety problems consumed an average of 1,571.1 ±681.1 mL/d liquids, while those who did not suffer from swallowing safety problems consumed an average of 1,878.8±418.5 mL/d ($p=0.046$) fluids (Botigué et al., 2019).

3.5.2. Cognitive risk factors

It has been found that people with associated cognitive impairment and oral quality problems are more likely to have a severe swallowing disorder (Chen et al., 2021). Thus, the prevalence of dysphagia was related to the cognitive status of each individual. The rate of dysphagia was higher in residents with GDS 7 (88%) than in residents with GDS 6 (77%) ($p=0.03$) (Hanson et al., 2013).

It was possible to verify the coexistence relationship between dysphagia and cognitive impairment (correlation between DST and MMSE: r (272)=−0.0221, $p<0.001$) through individual evaluations of each of these variables (Nogueira and Reis, 2013). The percentage of cognitive impairment is higher in individuals with dysphagia; thus, the results of the CPS indicated that 69.8% of dysphagics suffered moderate-severe cognitive impairment, while in non-dysphagics, this impairment occurred in 37.5% ($p<0.0001$) (Peladic et al., 2019).

Among users with dysphagia, 23% did not suffer from cognitive impairment, 16.7% suffered from mild-moderate Alzheimer's dementia, and this rate rose to 93.3% in the case of severe Alzheimer's dementia. By contrast, only 8.2% of people with severe Alzheimer's disease did not suffer from dysphagia ($p<0.0001$) (Simões et al., 2020). An article also revealed that 28.5% presented severe cognitive impairment ($p<0.001$), 9.9% presented medium-moderate impairment ($p<0.001$), and only 3.9% maintained a cognitive level without deterioration (Streicher et al., 2018).

It should also be noted that among people with dysphagia, 52.7% presented cognitive impairment, and the percentage was reduced in users who did not suffer from dysphagia (7.7%) ($p<0.001$) (Wang et al., 2012). Notably, in dysphagic patients, 64.1% had severe cognitive impairment, while among non-dysphagic residents, the percentage of severe cognitive impairment was 24.7% ($p<0.001$) (Wirth et al., 2018). Lower MMSE scores indicating a higher degree of cognitive impairment were more frequent in users with an established risk of dysphagia (3.8 ±5.5) than in those with no risk (11.5±8.5) ($p<0.001$) (Yatabe et al., 2018).

Regarding the diagnosis of dementia, 57.7% of users with dysphagia

had dementia to some degree, while this percentage dropped to 21.4% in non-dysphagics (p=0.028) (Ferrero López et al., 2012). In addition, it was also verified in terms of the degree of dementia that the percentage was higher in individuals with swallowing problems (68.4%) compared to the total sample (61.8%) (p=0.00) (Sarabia-Cobo et al., 2016).

However, some studies stated that there are no significant differences between cognitive function and the swallowing capacity of each individual (Fernández-Getino Sallés, 2018; Izumi et al., 2021). Here, 83.2% of dysphagic patients and 70.1% of non-dysphagic patients suffered deterioration to a moderate/severe degree, with no significant difference (Park et al., 2013).

3.5.3. Functional risk factors

Functional status and activities of daily living: People with dysphagia obtained a significantly lower average score after assessment with the Barthel Index (24.6 ± 30.8) than people who did not suffer from dysphagia (70.4 ± 32.4) (p<0.001). In addition, among a total sample of people with a high degree of dependence, 56% presented dysphagia. The percentage of people without dependence and dysphagia simultaneously was 30%, while the percentage of dysphagia without dependence was only 3.7% (p<0.001) (Chen et al., 2020).

However, an analysis of the score extracted from the assessments with the CDS was performed, and the score was lower in the case of individuals with dysphagia (30.0 ± 14.4) than in residents without dysphagia (44.1±16.2) (p<0.001) (Huppertz et al., 2018).

It was also possible to verify the close relationship between dysphagia and deterioration at the functional level in older people (correlation between DST and BI: r (272)= −0.268, p<0.001) (Nogueira and Reis, 2013).

Higher dependence was observed with a higher percentage of dysphagia; 65.9% of users with total dependence suffered from dysphagia, while the percentage of users with total dependence without dysphagia decreased to 27.3% (p<0.001) (Park et al., 2013). The functional status of people with dysphagia (MDS-ADL score: 22.9±8.0) was more affected than that of people without dysphagia (MDS-ADL score: 14.3). ±10.3) (p<0.0001). In addition, 35.5% of people with swallowing problems suffered from complete immobility (p<0.001), 8.7% were partially mobile (p< 0.001), and only 3% of dysphagic patients were dependent in terms of mobility (p<0.001) (Streicher et al., 2018). This tendency was also observed by Wirth et al. (2018); 70.9% of the people with dysphagia were also in a situation of immobility, while the percentage of immobility in non-dysphagic people was 22% (p<0.001).

It was also found that individuals at risk of dysphagia had a higher rate of dependence (85.7%) than those who were not at risk (50%) (p<0.001) (Yatabe et al., 2018). Therefore, after the evaluation with the Barthel Index, a lower score (58 ± 25.4) was reported for people with dysphagia compared to the scores of the total sample (65 ± 35.4) (p =0.02). Therefore, people with dysphagia were more exposed to dependence (Sarabia-Cobo et al., 2016). Data were also verified by Ferrero López et al. (2012), with participants with dysphagia obtaining a score of 33.3 ± 36.7 and the non-dysphagic ones obtaining a score of 62.9 ± 31.7, which indicates that the former have a poorer functional status (p=0.011).

However, another article states that there are no significant differences according to the swallowing function of each individual with functional status (Izumi et al., 2022).

It has also been found that people with swallowing problems have a higher dependence rate in performing basic activities of daily living (ADL) (14.3 ± 5.4) than individuals with normal chewing and swallowing (6.5 ± 4.8) (p<0.001) (Wang et al., 2012).

Last, it was also observed that 85.7% of the dysphagic patients presented dependence for severe or total ADL and 14.3% mild/moderate dependence; among the non-dysphagic patients, 43.8% presented dependence for severe or total ADL and 56.3% had a mild/moderate degree (Wilcoxon test, p=0.0279) (Fernández-Getino Sallés, 2018).

Frailty Syndrome: A study performed in Australia demonstrated the close relationship between dysphagia and frailty, since 7.4% of people with frailty suffer from dysphagia, while in non-frail individuals, dysphagia is present in only 2.4% of individuals (p=0.004) (Ambagtsheer et al., 2020).

Muscle strength: Regarding the loss of muscle strength, this condition was observed in 21.6% of patients with dysphagia, while among non-dysphagic patients, it was observed in only 5.2% (p<0.001). Notably, muscle strength at a normal level among dysphagics represented 22%, while the percentage of a normal level of muscle strength in individuals without dysphagia was 61%. Therefore, loss of muscle mass and dysphagia are associated (Chen et al., 2020).

3.5.4. Emotional risk factors

The results of the emotional state analysis show that, in the first case, no significant difference was obtained in terms of the depressive state (Fisher's test, p=0.999), since 55.6% of the dysphagic patients suffered from depression and 54.6% of non-dysphagic patients did as well (Fernández-Getino Sallés, 2018). The same tendency was observed in the second case since the percentage of depressive symptoms in people with dysphagia was similar to that of people without dysphagia (Park et al., 2013).

4. Discussion

Our results have identified several health-related parameters as risk factors for dysphagia: low BMI, malnutrition, involuntary weight loss, poor oral health, oral frailty, dehydration and low fluid intake, cognitive impairment, functional dependence, physical frailty and loss of muscle strength.

The systematic review by Tamura et al. (2013) found a significant association between low BMI and weight loss with dysphagia. Regarding the relationship between dysphagia and the nutritional status of the participants in each of the studies analyzed here, it has been found that in several studies (Beck, 2015; Ferrero López et al., 2012; Pezzana et al., 2015; Wang et al., 2012), dysphagia has a high relationship with nutritional risk between medium and high (Bonnacorsi et al., 2015; Park et al., 2013) and an established state of malnutrition (Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Namavasivayam-Macdonald et al., 2017; Pezzana et al., 2015; Prasse and Kikano, 2004; Streicher et al., 2018). However, Hanson et al. (2013) established that nutritional status does not result in significant differences according to the swallowing function of each individual. Other results of published articles not included in this review also involved detailed analyses of the relationship between dysphagia and malnutrition and ensured that swallowing disorders, which are caused largely by specific medical conditions, are closely linked to nutritional deficiencies (Davis and Spicer, 2007). It is also known that the rehabilitation and therapy of dysphagia suggest benefits in the nutritional status of each individual (Sura et al., 2012). Thus, the close relationship between swallowing disorders and nutritional disorders is demonstrated, since dysphagia increases the probability of suffering from malnutrition (Nishida et al., 2021), and conversely, malnutrition also increases the probability of suffering from dysphagia (Matsuo et al., 2017; Popman et al., 2018; see a meta-analysis, Banda et al., 2022).

However, other authors have stated that both dysphagia and poor nutritional status can dramatically affect older people and increase their likelihood of hospitalization, but they also established that the relationship between dysphagia risk values and malnutrition scores extracted from the MNA was negative (Maciel et al., 2008). Thus, the idea that the risk of dysphagia is independently associated with malnutrition is also strengthened, although it could intervene in the progression of malnutrition (Takeuchi et al., 2014).

Regarding functional status, the results show that there was a greater degree of dependence on activities of daily living (Ferrero López et al., 2012; Fernandez-Getino, 2018; Wang et al., 2012), a greater functional deficit (Chen et al., 2020; Huppertz et al., 2018; Nogueira and Reis,

2013; Park et al., 2013; Peladic et al., 2019; Sarabia-Cobo et al., 2016; Streicher et al., 2018; Wirth et al., 2018) and a high rate of frailty (Ambagtsheer et al., 2020) in people with dysphagia than in those whose swallowing function was correctly preserved. Low scores on the Barthel Index (Sánchez-Heredero et al., 2014) and severe dependence are significantly associated with a higher risk of suffering dysphagia (Mateos-Nozal et al., 2020). In addition, other authors explained that oropharyngeal dysphagia is a strong indicator of frailty and worsening health (Cabré et al., 2014), and it has been shown that oropharyngeal dysphagia is closely associated with frailty, poor functional status, and the presence of geriatric syndromes (Cabré et al., 2008). An independent association of dysphagia with frailty has been found, even irrespective of age, the presence of neurodegenerative diseases, the number of chronic diseases and drugs (Bahat et al., 2019). However, one of the studies that has been included indicates that there were no significant differences between the functional status and the swallowing capacity of each individual (Izumi et al., 2022).

The results of the analysis have shown that both oral health (Brochier et al., 2018; Hiltunen et al., 2021; Izumi et al., 2022; Rech et al., 2018) and cognition (Chen et al., 2021; Fernández-Getino Sallés, 2018; Ferrero López et al., 2012; Hanson et al., 2013; Nogueira & Reis, 2013; Peladic et al., 2019; Sarabia-Cobo et al., 2016; Simões et al., 2020; Streicher et al., 2018; Wang et al., 2012; Wirth et al., 2018; Yatabe et al., 2018) are potential risk factors for dysphagia. Oral health (mostly loss of teeth, poor oral hygiene or inadequate dental prostheses) is associated with swallowing (see two systematic reviews, Dibello et al., 2023 and Drancourt et al., 2022). This risk is often suffered in institutionalized older people since this population is usually care-dependent with poor oral health (Razak et al., 2014). However, other published results affirm that dysphagia is independently associated with cognitive status and oral frailty (Nishida et al., 2020). Notably, two of the included studies revealed that there were no significant differences between the cognitive state and swallowing of each individual (Izumi et al., 2022; Park et al., 2013). Although other authors did establish a link between cognitive problems and dysphagia (Rodrigues et al., 2020), Horner et al. (1994) found some type of dysphagia in 45% of institutionalized patients with dementia. They also related the presence of oropharyngeal dysphagia to mild cognitive impairment (De Stefano et al., 2020), and differences were observed between the scores extracted from the MMSE between individuals with and without dysphagia, although these were not significant (Yatabe et al., 2018). Nevertheless, a recent systematic review and meta-analysis (Dehaghani et al., 2021) found a significant association between cognitive disorders and swallowing disorders. Moreover, these authors justified the differences found across studies by the use of different assessment methods to evaluate cognitive function. It is necessary to establish consensus guidelines to guide speech and language therapists in assessing and managing dysphagia when supporting people with dementia (Egan et al., 2020). Additionally, the management of dysphagia has a multidisciplinary background with different professionals involved, including speech language pathology, rehabilitation medicine, nursing, surgery, and gastroenterology, and since this condition is not a medical specialty, increased knowledge and understanding of dysphagia must be promoted to manage patients with dysphagia (Clavé et al., 2015).

In addition, two parallel systematic and scoping reviews have demonstrated that dehydration is significantly associated with dysphagia, and strategies are focused on increasing fluid intake (Viñas et al., 2022).

Lastly, regarding emotional risk factors, it has been observed that in the studies included in this review, depression is more common in people with dysphagia, even though the observed differences are not significant (Fernandez-Getino, 2018; Peladic et al., 2019). However, other publications have shown that anxiety is present in 37% of dysphagic patients and depression in 32.6%. Likewise, anxiety and depression have been shown to worsen oropharyngeal dysphagia since affective symptoms increase complaints at the somatic level (Verdonschot et al., 2013). Furthermore, depression was also associated with an increased risk of dysphagia (Han et al., 2011).

This systematic review disclosed enough outcomes to identify potential risk factors for dysphagia, but as a limitation, considerable heterogeneity was found among the analysed studies, and differences could come from the different methods used to assess dysphagia and the difficulty in evaluating this condition in an institutionalized setting because of the variety of tests, clinical evaluations and examinations, which are often derived from the stroke population (Smith et al., 2009). In addition, sample sizes and study designs also varied considerably among the reviewed studies, and some of them (see Tables 1 and 2) have methodological design bias, not considering or measuring confounding factors, not using analytical techniques such as regression or the assessment of risk bias. The cross-sectional studies are limited to infer causality, and only associations were reported. However, this systematic review raises some crucial outcomes since the number of studies included here was relatively good for obtaining evidence. Nevertheless, more future research is needed to elucidate the association of all these risk factors in institutionalized people with dementia.

5. Conclusions

In this systematic review, the search and selection of a series of studies performed to verify the relationship between dysphagia and other health-related risk factors, determinants of prevalence, and the presence of this condition among institutionalized older people. We established a clear relationship between dysphagia and low BMI, malnutrition, involuntary weight loss, poor oral health, oral frailty, dehydration and low fluid intake, cognitive impairment, functional dependence, physical frailty and loss of muscle strength.

Therefore, the link between these risk factors and the development and progression of dysphagia in this large percentage of the population is evident. Thus, the results obtained here and the high prevalence rate of dysphagia, which was 16.7%, among the participants justify the feasibility of promoting new lines of research that address different areas such as prevention, identification, and treatment. These approaches are key to reducing public costs, hospitalizations, high rates of disability, dependency, morbidity, and even mortality in institutionalized older populations.

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Author statement

Ana Maseda, Julia Leira, and José C. Millán-Calenti: Conceptualization and Methodology; **Julia Leira and Ana Maseda:** Literature search, Selection of articles, Quality analysis of articles, Writing – Original draft preparation; **Ana Maseda and José C. Millán-Calenti:** Supervision. **All authors:** Writing – Reviewing and Editing, Critical revision, and Approval of final version to publish.

Declarations of Interest

None.

Table 2
Characteristics of the studies analyzed.

Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
Ambagtsheer et al. (2020), Australia	Retrospective cohort	Aged care facilities	$n = 592$ (66% females); Mean age: 88.0 ± 9.0; 50.7% memory and cognitive impairment	Frailty syndrome	Modified version based on Rockwood's FI	ACFI database	4.6%	7.4% of frail and 2.4% of non-frail individuals suffer from dysphagia. Significant association between dysphagia and frailty (p=0.004)
Beck (2015), Denmark	One year longitudinal	11 nursing homes	$n = 441$ (80% females); Mean age: 85.2 ± 7.5	BMI and nutritional status	RAI-NH version 2.0	RAI-NH version 2.0	10%	Most of the participants were underweight, almost half suffered weight loss and 10% suffered swallowing problems. Significant simultaneous occurrence between swallowing problems and nutritional risk, with a BMI lower than 18.5 points (OR 1.74, 95% CI: 0.97-3.11)
Bonaccorsi et al. (2015), Italy	Cross-sectional	67 nursing homes	$n = 2.395$ (74.5% females); Age range: 65–79 ($n = 641$), 80-85 (n=579), 86-90 (n=622), >90 (n=553); 56.1% physical impairment and 45.5% cognitive impairment	Nutritional status	MUST	Information provided by 89 trained staff members	58.1%	36.8% of residents with a medium-high nutritional risk suffered from dysphagia (p=0.054), but it is important to highlight that 43% of the residents were not evaluated for the severity of their dysphagia
Botigué et al. (2019), Spain	Cross-sectional	1 nursing home	$n = 53$ (79.2% females); Mean age: 86.5±8.1; 67.9% functional dependence and 71.7% cognitive impairment	Hydration and fluid intake	Registration of liquids and food ingested 24 h a day for 1 week by the center staff	V-VST	34% dysphagia to liquid viscosity and 35.8% impaired swallowing safety	Dehydration and low fluid intake are closely related to the presence of swallowing problems among nursing home residents. 34% of them ingest an amount less than 1500 mL/d. Residents with fluid dysphagia consume an average amount of liquids of 1543.2 ±689.6 mL/d versus 1884.4 ±413.6 mL/d in those who do not suffer from dysphagia (p=0.029). Individuals who suffer impaired swallowing safety consume an

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Table 2 (*continued*)

Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								average of 1571.1 ±681.1 mL/d, versus 1878.8 ±418.5 mL/d in those who do not suffer from it (p=0.046)
Brochier et al. (2018), Brazil	Cross-sectional	3 nursing homes	n =115 (67% females); Age range: 60–70 (n=22), 71–80 (n=42), 81 or more (n=51)	Oral health and dental factors	Complete oral and dental examination and evaluation of the prosthesis used in each case carried out by a dentist	Clinical diagnosis established from a speech evaluation	60.9%	Important relationship between poorer oral health and the presence of xerostomia with oropharyngeal dysphagia (OD). Those individuals without occlusal pairs (PR = 1.52, 95% CI: 1.02–2.40) are more likely to suffer OD than those who retain 8 to 14 pairs. Positive correlation between high scores on the Xerostomia Inventory (XI) and OD in 30–50 score (PR = 2.86, 95% CI: 1.58-5.156) and 20-29 score (PR = 3.01, 95% CI: 1.67–5.42)
Carrillo Prieto et al. (2016), Spain	Cross-sectional	2 nursing homes	n = 33 (84.4% female); Mean age: 86.7±7.7	Nutritional status	Anthropometric measurements and MNA	Information extracted from the medical diagnosis	100.0%	Inclusion criteria included to have swallowing problems and presenting 3% normal nutritional status, 18% under risk of malnutrition, and 79% malnutrition
Chen et al. (2020), China	Cross-sectional	18 nursing homes	n = 775 (60.6% females); Mean age: 81.3±9.3; 18.2% dementia	BMI, muscle strength, and functional status	Anthropometric measurements and BI	The Chinese version of the EAT-10 scale	31.1%	The individuals with dysphagia registered a significantly lower score on the Barthel Index (24.6±30.8) than those without dysphagia (70.4 ±32.4) (p<0.001). 56% of completely dependent people were also dysphagic and 10.5% did not suffer from dysphagia. Individuals without dependence and dysphagia represented 30% while individuals without dependence but with dysphagia

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Table 2 (*continued*)

Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								reached 3.7% ($p<0.001$). Furthermore, the total loss of muscle strength was 21.6% in dysphagic patients, vs. 5.2% in non-dysphagic patients ($p<0.001$). Muscle strength at normal levels in dysphagic individuals only represented 22%, vs. 61% in non-dysphagic individuals. Higher dependence and higher muscle loss are more likely in individuals with dysphagia
Chen et al. (2021), China	Cross-sectional	42 nursing homes	$n = 657$ (56.6% females); Mean age: 85.7±8.3; Age range: 78.09-89.87; 62.7% cognitive impairment	Oral health and cognitive status	Comprehensive oral health assessment and MMSE	Professionals performed an examination and classified swallowing function into five grades	14.5%	Within the group of residents with cognitive impairment, "healthy mouth" was associated with normal swallowing function (75.8%), "changing mouth" was associated with normal (68%) or severely altered (14.8%) swallowing function, and "unhealthy mouth" was associated with normal (33.3%), slight (11.1%) and severe (55.6%) alterations of the swallowing capacity. Residents without cognitive impairment refer to normal swallowing, independent of the mouth quality: "healthy mouth" (97%), "changing mouth" (93%), and poor oral quality (100%). Individuals with associated cognitive impairment and oral quality problems were more likely to have a severe swallowing disorder
	Retrospective					V-VST	46.7%	

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
Fernández-Getino Sallés (2018), Spain		1 nursing home	$n = 30$ (90% female); Mean age: 89.6; Age $\geq$ 80	Nutritional, emotional, cognitive, and functional status	MNA-SF, GDS-Yesavage, Pfeiffer's SPMSQ, and BI			85.7% of dysphagic individuals presented severe or total dependence in ADL and 14.3% had mild/ moderate dependence. In non-dysphagic individuals, 43.8% had severe or total dependence in ADL and 56.3% had a mild/ moderate degree (p=0.0279). No significant differences between cognitive impairment, depressive status or nutritional status and dysphagia
Ferrero López et al. (2012), Spain	Prospective, longitudinal	5 nursing homes	$n = 40$ (72.5% female); Mean age: 83.7±6.3; 52.5% cognitive impairment and 45% dementia	Nutritional, cognitive, and functional status	MNA, Pfeiffer's SPMSQ, FAST and BI	V-VST	65%	34.6% of dysphagic individuals had been previously diagnosed. Lower results with the BI (33.3±36.7) in dysphagic residents vs. non-dysphagic (62.9 ±31.7) (p=0.011). Only 26.9% of the dysphagic maintain a normal nutritional status vs. 78.6% in non-dysphagic (p=0.007). 65.4% of the dysphagic have a risk of malnutrition vs. 21.4% of non-dysphagic. Malnutrition occurred in 7.7% of the dysphagic, while no case was detected in the non-dysphagic. No significant differences between cognitive impairment and dysphagia, but significant association (p=0.028) with dementia (57.7% dementia with dysphagia vs. 21.4 without it)
Hanson et al. (2013), United States	Prospective, cluster randomized trial	24 nursing homes	$n = 256$ (77% females); Mean age:	Weight loss, nutritional and	MDS guidelines to classify weight loss and the presence of	Graphic evaluation of swallowing difficulty,	80%	The dysphagia rate is related to cognitive status, being higher in

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
			85.3; GDS 6–7	cognitive status	nutritional, and feeding problems and check if the intake was less than 75% of the meals in the last 14 days	choking with different textures, dehydration, or signs of aspiration		GDS 7 (88%) than in GDS 6 (77%) (p=0.03). However, weight loss and poor intake were not significantly associated
Hiltunen et al. (2021), Finland	Cross-sectional	Long-term care facilities	n = 349 (72.2% female); Mean age: 82; 74.8% dementia	Oral frailty	Comprehensive oral clinical examination	The nursing staff reported the existence of swallowing problems through dichotomous responses	18.6%	2% of patients did not suffer any or only one symptom of oral frailty. 22% had 2-4 symptoms of oral frailty. 29% of dysphagic patients suffered from 5 to 6 symptoms of oral frailty (p=0.001)
Huppertz et al. (2018), The Netherlands	Cross-sectional	Nursing homes	n = 6349 (70.2% female); Mean age: 84.5±7.5	BMI, nutritional and functional status	Anthropometric measurements (staff observation if BMI is less than 18.5 kg/m^2 or reduced BMI combined with recent unintended weight loss) and CDS	The standardized LPZ questionnaire, which includes items on the presence of swallowing problems and associated symptoms	12.1%	The CDS score was lower in residents with dysphagia (30.0±14.4) vs. without dysphagia (44.1 ±16.2) (p<0.001), with dependence being closely related to swallowing problems. The mean BMI is also lower in individuals with swallowing problems (23.5 ±4.3), which implies greater nutritional risk than in individuals without swallowing problems (25.0 ±4.9) (p<0.001). 17.2% of residents with swallowing problems and malnutrition, vs. 9.4% without swallowing difficulties and malnutrition (p<0.001)
Izumi et al. (2021), Japan*	A 1-year randomised controlled trial	2 nursing homes	n = 24; Control group, n = 12 (87.5% females) and Intervention group, n = 12 (91.7% females); Age: ≥ 65	Oral health	Clinical oral health exams	MWST	Not specified but some residents have established risk	The MWST score has been slightly higher in the intervention group (4.5; min. 3-max. 5) with a complete oral cleaning regimen including tongue cleaning than in the control group with a routine hygiene regimen (4; min 1- max 5). The risk of dysphagia is higher under a lack of complete

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								oral hygiene routine
Izumi et al. (2022), Japan*	A 13-month longitudinal prospective study	3 nursing homes	$n = 52$ (78.8% females); Mean age: 89.5 (Age range: 67–104)	Functional and cognitive status and BMI	BI, the Japanese version of the MMSE, and anthropometric measurements	MWST	25%	No significant differences between cognitive or functional status or BMI and swallowing function
Landi et al. (2013), Italy	Multicentre	1904 nursing homes that participated in the Ulisse project	$n = 1.904$ (71.6% female); Mean age: 83.5±8.1; 44.7% dementia	Nutritional status and anorexia	An item from MDS-NH that assesses the residents' food intake and records whether the resident ate 1 or fewer meals per day in at least 4 of the last 7 days	Medical history; swallowing problems from the MDS-NH	12.9%	20.8% of the residents had swallowing problems and anorexia, decreasing to 11.7% without anorexia (p=0.0001). Therefore, the risk of anorexia is associated with swallowing problems (OR 1.98, 95% CI: 1.40-2.80)
Namasivayam-MacDonald et al. (2017), Canada	Cross-sectional multisite	32 nursing homes	$n = 639$ (69,9% females); Mean age: 86.8 ± 7.8	Malnutrition	PG-SGA adapted to nursing homes	STAND	59.2% risk of dysphagia	44% of the participants presented malnutrition and the correlation between these two occurred in 29% of the cases. Malnutrition is more likely to occur with dysphagia than without it
Nogueira & Reis (2013), Portugal	Cross-sectional, descriptive, and correlational	8 nursing homes	$n = 272$ (75% females); Mean age: 82 ±10; 44.9% cognitive impairment	Cognitive and functional status	MMSE and BI	3OZwst and DST	38-40%	Significant relationships (p<0.001) between dysphagia and cognitive impairment (correlation between DST and MMSE: r=0.221), through individual evaluations of each of these variables, and dysphagia and functional impairment (correlation between DST and BI: r=−0.268)
Park et al. (2013), Korea	Cross-sectional	2 nursing homes	$n = 395$ (76.5% females); Mean age: 80.7±8.0 (76.7% 75 or more years); 76.5% severe cognitive impairment	BMI, functional, nutritional, cognitive, and emotional status	Anthropometric measurements, the Korean versions of the Modified BI (K-MBI), NSI, MMSE (MMSE-K), and GDS (GDS-K)	GUSS	52.7%	65.9% of residents with dysphagia are underweight and have higher nutritional risk (47.1%), showing a significant difference (p<0.001) between the nutritional status and dysphagia. Among the dysphagic, 38.5%

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								have a good, 14.4% have a moderate, and 47.1% have a high nutritional risk. Among the non-dysphagic, 42.8% have good, 18.7% moderate, and 38.5% high nutritional risk. 65.9% of dysphagic patients are underweight vs. 27.3% of non-dysphagic patients ($p<0.001$). People with total dependence are mostly dysphagic (65.9%), decreasing in non-dysphagic individuals (27.3%) ($p<0.001$). Severe dementia, male gender, or being aged 75 years or older were also factors associated with dysphagia. Depressive symptomatology was not associated with dysphagia.
Peladic et al. (2019), Italy	Prospective observational	31 nursing homes	$n = 1490$ (71.5% female); Mean age: 83.5±8.1; 43.7% dementia	Weight loss, depression, cognitive and functional status	Anthropometric measurements, the Italian version of RAI-NH, MDS-ADL, and CPS	Gathering information, reviewing medical history, observing relevant signs, speech and swallowing structure, conducting test swallows, and interviewing staff responsible for meals	12.8%	Individuals with dysphagia showed a greater dependence in performing ADLs (22.9±8.0) than those without dysphagia (14.3 ±10.3) ($p<0.0001$); and they obtained a poorer score on the CPS (4.6±1.8) than those without dysphagia (3.0 ±2.1) ($p<0.0001$). 69.8% of the dysphagic have a severe cognitive impairment vs. 37.5% in non-dysphagics ($p<0.0001$). There is also a significant difference ($p<0.0001$) between individuals with dementia with dysphagia (61.8%) and

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								without dysphagia (41%). There is also greater weight loss in residents with dysphagia (14.6%) vs. without dysphagia (6.3%) ($p<0.0001$). However, there were non-significant differences for depression in non-dysphagic (20.6%) vs. dysphagic individuals (18.3%)
Pezzana et al. (2015), Italy	Cross-sectional, multicentre	90 nursing homes	$n = 1394$ (73.6% female); Mean age: 84 ±8.3; 55.5% dementia	Malnutrition	MNA-SF	MWST	20.9%	14.4% of dysphagic residents have not been treated. 31.4% of residents with swallowing problems had malnutrition and 17.9% had a risk of malnutrition. Only 3.5% of participants with normal nutritional status had swallowing problems ($p<0.001$)
Rech et al. (2018), Brazil	Cross-sectional	Local nursing homes collaborating with the University	$n = 123$ (65.9% female); Age range: 60–65 (n=6), 66–70 (n=17), 71–75 (n=21), ≥ 76 (n=79)	Oral health	Complete oral examination by a qualified dentist, observation of the presence/absence of teeth, examination, and classification of the functionality of the dental prostheses used	Direct and indirect swallow tests with three food consistencies, anatomy and physiology exploration, and observation of clinic signs.	61%	8% of residents with dysphagia had a functional denture, and 18.7% had a partially functional denture, but the percentage increased notably with 73.3% in residents who had a non-functional denture. In residents who also had non-functional teeth but did not suffer from dysphagia, the percentage was 47.9% (p=0.01)
Sarabia-Cobo et al. (2016), Spain	Prospective, observational, and multicentre	12 nursing homes	$n = 2.384$ (73.4% female); Mean age: 88.7±6.8; 61.8% dementia	Cognitive and functional status	Medical history and BI	EAT-10 and 3OZwst	69.6% oral dysphagia	The dysphagic individuals obtained a lower score on the BI (58 ±25.4) compared to the total sample (65±35.4) (p=0.02), meaning a higher level of dependence in dysphagic individuals. Additionally, a

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								higher degree of dementia was observed in dysphagic individuals (68.4% vs. 61.8%, $p<0.001$)
Simões et al. (2020), Brazil	Cross-sectional	1 nursing home	$n = 280$ (37.9% female); Age range: 70–80 (n=80), ≥ 81 (n=200); 33.1% mild to moderate cognitive impairment and 66.9% severe Alzheimer's disease	Cognitive impairment and dementia stage	CDR	MWST	45.7%	Only 23% of people with no cognitive impairment had dysphagia, reaching 16.7% in mild-moderate Alzheimer's dementia, and increasing to 91.8% in individuals with severe Alzheimer's ($p<0.0001$)
Streicher et al. (2018), 19 countries from Europe and North America	Cross-sectional	926 nursing homes	$n = 23.549$ (75.7% females); Mean age: 85, Age range: 79–90	BMI, nutritional, functional, and cognitive status	Anthropometric measurements, plate diagrams, observation of the portion consumed during lunch, and information about potential factors associated with dysphagia	The staff of each NH answered dichotomously (yes/no) if the resident presented dysphagia according to the medical history	10.8%	Among the dysphagic individuals, 26.2% were underweight ($p<0.001$), 5.5% were obese ($p<0.001$), and 12.2% were normal and overweight. 23.3% had weight losses of more than 5 kilos since last year ($p<0.001$). In addition, 32.2% presented malnutrition ($p<0.001$), 21.2% had a risk of malnutrition ($p<0.001$), and only 8.5% had normal nutritional status. In addition, 28.5% presented severe cognitive deterioration ($p<0.001$), 9.9% had medium-moderate deterioration ($p<0.001$), and only 3.9% had normal cognitive status. Regarding their functional status, 35.5% of them were immobile ($p<0.001$), 8.7% were partially mobile ($p<0.001$), and only 3% could move without problems. Additionally, note that 33.4% were

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								dehydrated ($p<0.001$)
Tannen et al. (2012), Germany	Cross-sectional multicentre	76 nursing homes	$n = 6.962$ (79.7% females); Mean age: 84.9±9.8	BMI	Anthropometric measurements	Diagnosis obtained from the medical history	7.5%	Among users with dysphagia, 17.7% had a BMI ≤20 (interpreted as underweight or at nutritional risk), and only 8.5% had a BMI>20 (OR 2.3, 95% CI: 1.9–2.8) ($p<0.01$)
Wang et al. (2012), China	Cross-Sectional	City public long-term care institutions and nursing homes	$n = 781$ (39.3% female); Mean age: 79.4±10.3; 27.4% cognitive impairment	BMI, weight loss, cognitive impairment, ADL, and oral health	The Chinese version of the MDS-NH, CPS, and ADL assessment tool	Relevant items from the Chinese version of MDS-NH	44.2% (chewing problems included)	10.2% had inflamed gums; 9.9% have suffered ruptures, losses or caries in their teeth, 11.1% kept natural teeth. In residents who did not suffer from chewing or swallowing problems, there was a lower percentage of inflamed gums (1.6%) ($p<0.001$); of dental rupture, loss, or caries (6.0%) ($p=0.043$); and a higher percentage of the preservation of some natural teeth (24.8%) ($p<0.001$). In addition, residents with swallowing and chewing problems presented a higher percentage of oral pain (3.2%) than those without them (0.9%) ($p=0.033$). Notably, the percentage of psychiatric conditions was also higher in residents with chewing and swallowing problems (16.8%) than in those without them (7.1%) ($p<0.001$). Residents who suffered from these problems also had a lower BMI (20.9±3.6) than those who without them (23.2±3.8) ($p<0.001$); they also had a higher percentage of weight loss (8.8%) than their peers (2.0%) ($p<0.001$);

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								a higher dependence ratio in performing ADL (14.3±5.4) than individuals with normal mastication and deglutition (6.5 ±4.8) (p<0.001); and more cognitive deterioration (52.7% vs. 7.7%, p<0.001)
Wirth et al. (2018), 14 European countries and the USA	Cross-sectional	191 nursing homes	n = 10,185 (78% female); Mean age: 85 ±8.1; 30.8% severe cognitive impairment	BMI, weight loss, cognitive and functional status	All the information on the associated risk factors (cognition, mobility, BMI, etc.) has been registered in the nutritionDay questionnaires	Information on diagnosis has been taken from each patient's medical history and marked as a dichotomous answer (yes/no) on nutritionDay questionnaires	15.4%	Among the dysphagic residents, 64.1% had severe cognitive impairment, versus 24.7% in the non-dysphagic residents (p<0.001). In addition, 70.9% of the dysphagics were immobile while the non-dysphagic had an immobility rate of 22% (p<0.001). Regarding the BMI, the figures were also lower in the dysphagic (25.3±5.5) than in the non-dysphagic (22.4 ±5.0) (p<0.001) individuals. In addition, 33.9% of the dysphagics had a BMI of lower than 20, decreasing to 14.8% in the non-dysphagic (p<0.001). A higher percentage of weight loss of more than 5 kg in the last year could also be observed among the dysphagic (20.5%) than in individuals with normal deglutition (9.6%) (p<0.001)
Yatabe et al. (2018), Japan	Cross-sectional	8 nursing homes	n = 236 (79.2% female); Mean age: 87.8±2.4	Oral health, functional and cognitive status	Oral examination by a qualified dentist, BI, and MMSE	MWST	16.9% established risk of dysphagia	18.9% of dentulous individuals and 15.2% of edentulous individuals were at risk of suffering from dysphagia. Dentulous individuals at risk of dysphagia presented a higher degree of

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Author, year, country	Type of study	Setting	Participants	Risks factors associated with dysphagia	Screening tool used to assess associated risk factors	Screening tools used for the diagnosed of dysphagia	Percentage of dysphagia	Main Outcomes
								dependence (85.7% vs. 50.0% in those without risk of dysphagia, $p<0.001$) and worse scores on the MMSE, indicating a higher degree of cognitive impairment (3.8 ±5.5) than those without an established risk of dysphagia (11.5 ±8.5) ($p<0.001$). Edentulous individuals at risk of dysphagia also showed lower scores on the MMSE (6.4±8.2) than edentulous patients without risk (11.5±8.2) ($p<0.05$)

Note. *Articles with this symbol report data from the same study sample but describe different outcomes. Abbreviations: 3OZwst: The 3 Ounce Water Swallow Test; ACFI: Aged Care Funding Instrument; BI: Barthel Index; BMI: Body Mass Index; CDR: Clinical Dementia Rating; CDS: The Care Dependency Scale; CI: Confidence Interval; CPS: Cognitive Performance Scale; DST: Dysphagia Self-Test; EAT-10: 10-item Eating Assessment Tool; FAST: Functional Assessment Staging Tool; FI: Frailty Index; GDS: Global Deterioration Scale; GDS-Yesavage: Geriatric Depression Scale; GUSS: Gugging Swallowing Screen; LPZ: The National Prevalence Measurement of Care Quality MDS: Minimum Data Set; MDS-ADL: Minimum Data Set of Daily Living; MDS-NH: Minimum Data Set for Nursing Homes; MMSE: Mini-Mental State Examination; MNA: Mini Nutritional Assessment; MNA-SF: Mini Nutritional Assessment Short-Form; MUST: Malnutrition Universal Screening Tool; MWST: The Modified Water Swallow Test; NSI: Nutrition Screening Initiative; OR: Odds ratio; PG-SGA: Patient-Generated Subjective Global Assessment; PR: Prevalence Ratio; RAI-NH: The Resident Assessment Instrument Minimum Data Set for Nursing Homes, version 2; SPMSQ: Pfeiffer's Short Portable Mental State Questionnaire; STAND: The Screening Tool for Acute Neuro Dysphagia; V-VST: Volume-Viscosity Swallow Test.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.archger.2023.104991.

References

Abu-Ghanem, S., Chen, S., & Amin, M. R. (2020). Oropharyngeal dysphagia in the elderly: evaluation and prevalence. *Curr. Otorhinolaryngol. Rep., 8*, 34–42.

Achem, S. R., & Devault, K. R. (2005). Dysphagia in aging. *J. Clin. Gastroenterol., 39*(5), 357–371.

Ambagtsheer, R. C., Beilby, J., Seiboth, C., & Dent, E. (2020). Prevalence and associations of frailty in residents of Australian aged care facilities: findings from a retrospective cohort study. *Aging Clin. Exp. Res., 32*(9), 1849–1856.

Bahat, G., Yilmaz, O., Durmazoglu, S., Kilic, C., Tascioglu, C., & Karan, M. A. (2019). Association between dysphagia and frailty in community dwelling older adults. *J. Nutr. Health Aging, 23*(6), 571–577.

Baijens, L. W. J., Clavé, P., Cras, P., Ekberg, O., Forster, A., Kolb, G. F., Leners, J.-C., Masiero, S., Mateos-Nozal, J., Ortega, O., Smithard, D. G., Speyer, R., & Walshe, M. (2016). European Society for Swallowing disorders –European Union geriatric medicine society white paper: oropharyngeal dysphagia as a geriatric syndrome. *Clin. Interv. Aging, 11*, 1403–1428.

Banda, K. J., Chu, H., Chen, R., Kang, X. L., Jen, H. J., Liu, D., Shen Hsiao, S. T., & Chou, K. R. (2022). Prevalence of oropharyngeal dysphagia and risk of pneumonia, malnutrition, and mortality in adults aged 60 years and older: a meta-analysis. *Gerontology, 68*(8), 841–853.

Beck, A. M. (2015). Weight loss, mortality and associated potentially modifiable nutritional risk factors among nursing home residents – a Danish follow-up study. *J. Nutr. Health Aging, 19*(1), 96–101.

Bonaccorsi, G., Collini, F., Castagnoli, M., Di Bari, M., Cavallini, M. C., Zaffarana, N., Pepe, P., Mugelli, A., Lucenteforte, E., Vannacci, A., & Lorini, C. (2015). A cross-sectional survey to investigate the quality of care in Tuscan (Italy) nursing homes: the structural, process and outcome indicators of nutritional care. *BMC Health Serv. Res., 15*, 1–10.

Botigué, T., Masot, O., Miranda, J., Nuin, C., Viladrosa, M., Lavedán, A., & Zwakhalen, S. (2019). Prevalence and risk factors associated with low fluid intake in institutionalized older residents. *J. Am. Med. Dir. Assoc., 20*(2), 317–322.

Brochier, C. W., Hugo, F. N., Rech, R., Baumgarten, A., & Hilgert, J. B. (2018). Influence of dental factor son oropharyngeal dysphagia among recipients of long-term care. *Gerodontology, 35*(4), 1–6.

Cabré, M., Serra-Prat, M., Force, L., Palomera, E., & Pallarés, R. (2008). Functional status as a risk factor for mortality in very elderly patients with pneumonia. *Med. Clin. (Barc), 131*, 167–170.

Cabré, M., Serra-Prat, M., Force, L. L., Almirall, J., Palomera, E., & Clave, P. (2014). Oropharyngeal dysphagia is a risk factor for readmission for pneumonia in the very elderly persons: observational prospective study. *J. Gerontol. A Biol. Sci. Med. Sci., 69*(3), 330–337.

Carrillo Prieto, E., Aragón Chicharro, S., García Meana, J. F., Calvo Morcuende, B., & Pajares Bernardo, M. (2016). Disfagia y estado nutricional en ancianos institucionalizados [Dysphagia and nutritional status in institutionalized elderly population]. *Gerokomos, 27*(4), 147–152. Spanish.

Chalekrua, S., Janop, K., & Wattanapan, P. (2021). Swallowing problems among community-dwelling elderly in Northeastern Thailand. *J. Prim. Care Commun. Health, 12*, 1–5.

Chen, L., Gu, L., Li, X., Chen, W., & Zhang, L. (2021). Oral health matters in cognitive impaired aged residents in geriatric care facilities: a cross-sectional survey. *Nurs. Open, 8*, 792–798.

Chen, S., Cui, Y., Ding, Y., Sun, C., Xing, Y., Zhou, R., & Liu, G. (2020). Prevalence and risk factors of dysphagia among nursing home residents in Eastern China: a cross-sectional study. *BMC Geriatr., 20*(1), 352.

Cichero, J. A. Y., Lam, P., Steele, C. M., Hanson, B., Chen, J., Dantas, R. O., Duivestein, J., Kayashita, J., Lecko, C., Murray, J., Pillay, M., Riquelme, L., & Stanschus, S. (2017). Development of international terminology and definitions for texture-modified foods and thickened fluids used in dysphagia management: the IDDSI framework. *Dysphagia, 32*(2), 293–314.

Clavé, P., & Shaker, R. (2015). Dysphagia: current reality and scope of the problem. *Nat. Rev. Gastroenterol. Hepatol., 12*(5), 259–270.

Davis, L. A., & Spicer, M. T. (2007). Nutrition and dysphagia in older adults. *Top. Geriatr. Rehabil., 23*(3), 211–219.

De Stefano, A., Di Giovanni, P., Kulamarva, G., Gennachi, S., Di Fonzo, F., Sallustio, V., Patrocinio, D., Candido, S., Lamarca, G., & Dispenza. (2020). Oropharyngeal

dysphagia in elderly population suffering from mild cognitive impairment and mild dementia: understanding the link. *Am. J. Otolaryngol., 41*(4), 1–4.
Dehaghani, S. E., Doosti, A., & Zare, M. (2021). Association between swallowing disorders and cognitive disorders in adults: a systematic review and meta-analysis. *Psychogeriatrics, 21*(4), 668–674.
Dibello, V., Lobbezoo, F., Lozupone, M., Sardone, R., Ballini, A., Berardino, G., Mollica, A., Coelho-Júnior, H. J., De Pergola, G., Stallone, R., Dibello, A., Daniele, A., Petruzzi, M., Santarcangelo, F., Solfrizzi, V., Manfredini, D., & Panza, F. (2023). Oral frailty indicators to target major adverse health-related outcomes in older age: a systematic review. *Geroscience, 45*(2), 663–706.
Drancourt, N., El Osta, N., Decerle, N., & Hennequin, M. (2022). Relationship between oral health status and oropharyngeal dysphagia in older people: a systematic review. *Int. J. Environ. Res. Public Health, 19*(20), 13618.
Egan, A., Andrews, C., & Lowit, A. (2020). Dysphagia and mealtime difficulties in dementia: speech and language therapists' practices and perspectives. *Int. J. Lang. Commun. Disord., 55*(5), 777–792.
Ekberg, O., Hamdy, S., Woisard, V., Wuttge-Hannig, A., & Ortega, P. (2002). Social and psychological burden of dysphagia: its impact on diagnosis and treatment. *Dysphagia, 17*(2), 139–146.
Fernández-Getino Sallés, C. (2018). Prevalencia de disfagia orofaríngea en ancianos institucionalizados y su relación con síndromes geriátricos [Prevalence of oropharyngeal dysphagia in institutionalized elderly patients and itsrelationship with geriatric syndroms]. *Rev. Logop. Foniatr. Audiol., 38*(2), 69–76. Spanish.
Ferrero López, M. I., García Collarte, J. F., Botella Trelis, J. J., & Vidal, O. J. (2012). Detección de disfagia en mayores institucionalizados [Detection of dysphagia in the institutionalised elderly]. *Rev. Esp Geriatr. Gerontol., 47*(4), 143–147. Spanish.
Finiels, H., Strubel, D., & Jacquot, J. M. (2001). Deglutition disorders in the elderly. Epidemiological aspects. *Presse Med., 30*(33), 1623–1634.
Galán Sánchez-Heredero, M. J., Santander Vaquero, C., Cortázar Sáez, M., de la Morena López, F., Susi García, R., & Martínez Rincón, Mdel C. (2014). Malnutrición asociada a disfagia orofaríngea en pacientes mayores de 65 años ingresados en una unidad médico-quirúrgica [Relationship between dysphagia and malnutritition in patients over 65 years of age]. *Enferm Clin., 24*(3), 183–190. Spanish.
Han, M., Ohnishi, H., Nonaka, M., Yamauchi, R., Hozuki, T., Hayashi, T., Saitoh, M., Hisahara, S., Imai, T., Shimohama, S., & Mori, M. (2011). Relationship between dysphagia and depressive states in patients with Parkinson's disease. *Parkins. Relat. Disord., 17*(6), 437–449.
Hanson, L. C., Ersek, M., Lin, F. C., & Carey, T. S. (2013). Outcomes of feeding problems in advanced dementia in a nursing hombre population. *J. Am. Geriatr. Soc., 61*(10), 1692–1697.
Hiltunen, K., Saarela, R. K. T., Kautiainen, H., Roitto, H. M., Pitkälä, K. H., & Mäntylä, P. (2021). Relationship between Fried's frailty phenotype and oral frailty in long-term care residents. *Age Ageing, 50*(6), 2133–2139.
Horner, J., Alberts, M. J., Dawson, D. V., & Cook, G. M. (1994). Swallowing in Alzheimer's disease. *Alzheimer Dis. Assoc. Disord., 8*(3), 177–189.
Huppertz, V. A. L., Halfens, R. J. G., Van Helwoort, A., De Groot, L. C. P. G. M., Baijens, L. W. J., & Schols, J. M. G. A. (2018). Association between oropharyngeal dysphagia and malnutrition in dutch nursing home residents: results of the national prevalence measurement of quality of care. *J. Nutr. Health Aging, 22*(10), 1246–1252.
Izumi, M., Sonoki, K., Ohta, Y., Fukuhara, M., Nagata, M., & Akifusa, S. (2022). Swallowing dysfunction and the onset of fever in older residents with special care needs: a thirteen-month longitudinal prospective study. *Odontology, 110*(1), 164–170.
Izumi, M., Sonoki, K., Ohta, Y., Nagata, M., & Akifusa, S. (2021). Tongue cleaning maintains respiratory function in older individuals: a 1-year randomised controlled trial. *J. Oral Rehab., 48*(8), 730–737.
Landi, F., Lattanzio, F., Dell'Aquila, G., Eusebi, P., Gasperini, B., Liperoti, R., Belluigi, A., Bernabei, R., & Cherubini, A. (2013). Prevalence and potentially reversible factors associated with anorexia among older nursing home residents: results from the ULISSE project. *J. Am. Med. Dir. Assoc., 14*(2), 119–124.
Lieu, P. K., Chong, M. S., & Seshadri, R. (2001). The impact of swallowing disorders in the elderly. *Ann. Acad. Med. Singapore, 30*(2), 148–154.
Maciel, J. R. V., Oliveira, C. J. R., & Tada, C. D. M. P. (2008). Association between risk of dysphagia and nutritional risk in elderly inpatients at a university hospital of Brasília, Brazil. *Rev Nutr., 21*(4), 411–421.
Mateos-Nozal, J., Montero-Errasquín, B., Sánchez García, E., Romero Rodríguez, E., & Cruz-Jentoft, A. J. (2020). High prevalence of oropharyngeal dysphagia in acutely hospitalized patients aged 80 years and older. *J. Am. Med. Dir. Assoc., 21*(12), 2008–2011.
Matsuo, H., Yoshimura, Y., Ishizaki, N., & Ueno, T. (2017). Dysphagia is associated with functional decline during acute - care hospitalization of older patients. *Geriatr. Gerontol. Int., 17*(10), 1610–1616.
Namasivayam-MacDonald, A. M., Morrison, J. M., Steele, C. M., & Keller, H. (2017). How swallow pressures and dysphagia affect malnutrition and mealtime outcomes in long-term care. *Dysphagia, 32*(6), 785–796.
Nishida, T., Yamabe, K., & Honda, S. (2020). Dysphagia is associated with oral, physical, cognitive and psychological frailty in Japanese community-dwelling elderly persons. *Gerodontology, 37*(2), 185–190.
Nishida, T., Yamabe, K., & Honda, S. (2021). The influence of dysphagia on nutritional and frailty status among community-dwelling older adults. *Nutrients, 13*(2), 512.
Nogueira, D., & Reis, E. (2013). Swallowing disorders in nursing home residents: how can the problem be explained? *Clin. Interv. Aging, 8*, 221–227.
Park, Y. H., Han, H. R., Oh, B. M., Lee, J., Park, J. A., Yu, S. J., & Chang, H. (2013). Prevalence and associated factors of dysphagia in nursing home residents. *Geriatr. Nurs., 34*(3), 212–217.
Peladic, N. J., Orlandoni, P., Dell'Aquila, G., Carrieri, B., Eusebi, P., Landi, F., Volpato, S., Zuliani, G., Lattanzio, F., & Cherubini, A. (2019). Dysphagia in nursing home residents: management and outcomes. *J. Am. Med. Dir. Assoc., 20*(2), 147–151.
Pezzana, A., Cereda, E., Avagnina, P., Malfi, G., Paiola, E., Frighi, Z., Capizzi, I., Sgnaolin, E., & Amerio, M. L. (2015). Nutritional care needs in elderly residents of long-term care institutions: potential implications for policies. *J. Nutr. Health Aging, 19*(9), 947–954.
Popman, A., Richter, M., Allen, J., & Wham, C. (2018). High nutrition risk is associated with higher risk of dysphagia in advanced age adults newly admitted to hospital. *Nutr. Diet, 75*(1), 52–58.
Prasse, J. E., & Kikano, G. E. (2004). An overview of dysphagia in the elderly. *Adv. Stud. Med., 4*(10), 527–533.
Pujol-Doménech, J., de Azpiazu, P., Salamero, M., & Cuevas, R. (2001). Sintomatología depresiva de la demencia. Escala de Cornell: validación de la versión en castellano. *Rev. Neurol., 33*, 397–398.
Razak, P. A., Richard, K. M., Thankachan, R. P., Hafiz, K. A., Kumar, K. N., & Sameer, K. M. (2014). Geriatric oral health: a review article. *J. Int. Oral Health, 6*(6), 110–116.
Rech, R. S., Hugo, F. N., Baumgarten, A., Dos Santos, K. W., de Goulart, B. N. G., & Hilgert, J. B. (2018). Development of a simplified dysphagia assessment by dentists in older persons. *Commun. Dent. Oral Epidemiol., 46*(3), 218–224.
Rodrigues, D., Corrêa, L., Almeida, G. M., & Bittante, I. (2020). The relationship between dysphagia and clinical and cognitive aspects in elderly patients presented with dementia. *Cefac, 22*(2), e5719.
Sarabia-Cobo, C. M., Pérez, V., de Lorena, P., Domínguez, E., Hermosilla, C., Nuñez, M. J., Vigueiro, M., & Rodríguez, L. (2016). The incidence and prognostic implications of dysphagia in elderly patients institutionalized: a multicentre study in Spain. *Appl. Nurs. Res., 30*, 6–9.
Simões, A. L. S., Oliva Filho, A., & Hebling, E. (2020). Signs for early detection of dysphagia in older adults with severe Alzheimer's disease. *J. Nutr. Health Aging, 24*(6), 659–664.
Smith, H. A., Kindell, J., Baldwin, R. C., Waterman, D., & Makin, A. J. (2009). Swallowing problems and dementia in acute hospital settings: practical guidance for the management of dysphagia. *Clin. Med. (Lond.), 9*(6), 544–548.
Streicher, M., Wirth, R., Schindler, K., Sieber, C. C., Hiesmayr, M., & Volkert, D. (2018). Dysphagia in nursing homes- results from the nutritionDay project. *J. Am. Med. Dir. Assoc., 19*(2), 141–147. .e2.
Sura, L., Madhavan, A., Carnaby, G., & Crary, M. A. (2012). Dysphagia in the elderly: management and nutritional considerations. *Clin. Interv. Aging, 7*, 287–298.
Takeuchi, K., Aida, J., Ito, K., Yamashita, Y., & Osaka, K. (2014). Nutritional status and dysphagia risk among community-dwelling frail older adults. *J. Nutr. Health Aging, 18*(4), 352–357.
Tamura, B. K., Bell, C. L., Masaki, K. H., & Amella, E. J. (2013). Factors associated with weight loss, low BMI, and malnutrition among nursing home patients: a systematic review of the literature. *J. Am. Med. Dir. Assoc., 14*(9), 649–655.
Tannen, A., Schütz, T., Smoliner, C., Dassen, T., & Lahmann, N. (2012). Care problems and nursing interventions related to oral intake in German nursing homes and hospitals: a descriptive multicentre study. *Int. J. Nurs. Stud., 49*, 378–385.
Thiyagalingam, S., Kulinski, A. E., Thorsteindottir, B., Schindelar, K. L., & Takahashi, P. Y. (2021). Dysphagia in older adults. *Mayo Clin. Proc., 96*(2), 488–497.
Tibbling, L., & Gustafsson, B. (1991). Dysphagia and its consequences in the elderly. *Dysphagia, 6*(4), 200–202.
Verdonschot, R. J. C. G., Baijens, L. W. J., Serroyen, J. L., Leue, C., & Kremer, B. (2013). Symptoms of anxiety and depression assessed with the hospital anxiety and depression scale in patients with oropharyngeal dysphagia. *J. Psychosom. Res., 75*(5), 451–455.
Viñas, P., Bolivar-Prados, M., Tomsen, N., Costa, A., Marin, S., Riera, S. A., Barcons, N., & Clavé, P. (2022). The hydration status of adult patients with oropharyngeal dysphagia and the effect of thickened fluid therapy on fluid intake and hydration: results of two parallel systematic and scoping reviews. *Nutrients, 14*, 2497.
Wang, T. F., Chen, I. J., & Li, I. C. (2012). Associations between chewing and swallowing problems and physical and psychosocial health status of long-term care residents in Taiwan: a pilot study. *Geriatr. Nurs., 33*(3), 184–193.
Wirth, R., Pourhassan, M., Streicher, M., Hiesmayr, M., Schindler, K., Sieber, C. C., & Volkert, D. (2018). The impact of dysphagia on mortality of nursing home residents: results from the nutrition day project. *J. Am. Med. Dir. Assoc., 19*(9), 775–778.
Yatabe, N., Takeuchi, K., Izumi, M., Furuta, M., Takeshita, T., Shibata, Y., Suma, S., Kageyama, S., Ganaha, S., Tohara, H., & Yamashita, Y. (2018). Decreased cognitive function is associated with dysphagia risk in nursing home older residents. *Gerodontology, 35*(4), 376–381.