





Dehydration, stroke and dysphagia: systematic review

Desidratação, acidente vascular cerebral e disfagia: revisão sistemática da literatura

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ABSTRACT

Purpose: this is a systematic review of scientific literature associated with stroke, dehydration and oropharyngeal dysphagia (OD). **Research strategy:** bibliographic survey was conducted in scientific databases: MEDLINE, LILACS, SciELO, Web of Science and Cochrane. **Selection criteria:** studies that met the following inclusion criteria were included: being original article with summary available; have been published in the last seventeen years (2001-2018) and in Portuguese, English or Spanish languages; and addressing dehydration in individuals after stroke. Screening and analysis of the studies were performed by two independent evaluators. **Results:** among the 484 articles found for screening, 43 were selected for full reading and 18 articles were included in the final analysis. Different methods of assessing hydration status have been described in individuals post-stroke, such as ratio analysis blood urea nitrogen (BUN)/creatinine, plasma osmolality, urea / creatinine, urine specific gravity, urine color, water intake, water balance, bioelectrical impedance analysis (BIA), clinical evaluation and analysis of electrolytes. The prevalence of dehydration in post-stroke during hospitalization varied from 11% to 66% and is associated with severity and deterioration in the clinical evolution. **Conclusion:** It was possible to understand the complexity of the measurement of hydration status in individuals after stroke and its association with dysphagia. Studies focusing on the association between dehydration and stroke are very important, due to its influence on mortality and morbidity in this population.

Keywords: Dehydration; Hydration; Stroke; Swallowing disorder; Body water

RESUMO

Objetivos: trata-se de revisão sistemática da literatura científica sobre a associação entre o acidente vascular cerebral, desidratação e disfagia orofaríngea. **Estratégia de pesquisa:** o levantamento bibliográfico foi realizado nas bases de dados científicos: MEDLINE, LILACS, SciELO, Web of Science e Cochrane. **Critérios de seleção:** foram incluídos os estudos que preencheram os seguintes critérios de inclusão: ser artigo original, com resumo disponível; ter sido publicado entre os anos de 2001 e 2018 e nos idiomas português, inglês ou espanhol; abordar o tema desidratação em indivíduos após acidente vascular cerebral. A triagem e análise dos estudos foram realizadas por dois avaliadores independentes. **Resultados:** dentre os 484 artigos localizados para a triagem, 43 foram selecionados para leitura completa e 18 foram incluídos na análise final. Foram descritos diferentes métodos de avaliação do estado de hidratação nos indivíduos após acidente vascular cerebral, tais como: análise da relação BUN / creatinina, osmolaridade plasmática, relação ureia/creatinina, gravidade específica da urina, coloração da urina, ingestão hídrica, balanço hídrico, bioimpedância elétrica, avaliação clínica, análise de eletrólitos isolados. A prevalência de desidratação em pacientes após acidente vascular cerebral, durante a internação, variou de 11% a 66% e está associada à gravidade e piora na evolução clínica. **Conclusão:** foi possível compreender a complexidade do processo de mensuração do estado de hidratação em indivíduos após acidente vascular cerebral e sua associação com a disfagia. Estudos enfocando essa temática são de extrema relevância, visto a sua influência sobre a taxa de mortalidade e morbidade nesta população.

Palavras-chave: Desidratação; Hidratação; Acidente vascular cerebral; Transtornos de deglutição; Água corporal

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INTRODUCTION

Water is the main constituent of human cells, tissues and organs, and the proper hydration status is essential to maintain cellular homeostasis and the functioning of organs and systems⁽¹⁾.

In healthy individuals, even mild changes in hydration status are able to interfere with cognitive functions, alert state and the ability to perform physical activities⁽¹⁻⁴⁾.

Among some of the signs and symptoms related to dehydration are mental confusion, and it can also mention cognitive alterations, mucosal dryness, orthostatic hypotension and tachycardia^(1,2,5). Limitations in motor functions and swallowing pattern, comorbidities often found in individuals after stroke, also contribute to greater vulnerability to dehydration^(6,7).

Oropharyngeal dysphagia (OD) is a disorder in swallowing dynamics, which has a prevalence of above 37% in individuals after stroke^(8,9). It is common that individuals with OD are exposed to dietary restrictions and fluid intake, changes in consistency and/or use of alternative feeding route, until these individuals are able to receive an oral diet⁽¹⁰⁾.

The inability of safe and effective intake of liquids and foods, impairment of alert state and ability to access liquids can be considered a risk factor for the hydration status of an individual after stroke⁽¹⁰⁾. However, literature still does not discuss much the potential relationship between dehydration, stroke and dysphagia⁽⁸⁾.

Clinical guidelines emphasize the importance of adequate hydration after stroke, since dehydration can increase blood viscosity and decrease intravascular flow⁽¹¹⁾. In addition, dehydration is associated with increased risk of venous thromboembolism (VTE) and worsening clinical evolution during hospitalization⁽¹²⁾.

Some techniques are described as used for evaluating the hydration status of individuals after stroke, such as noninvasive techniques (measurement of water intake and analysis of body weight loss, vital signs and skin status and mucous membranes (mucosa)); laboratory tests (plasma osmolarity, urinary osmolarity, blood urea nitrogen (BUN), in other words, BUN)/creatinine and urea/creatinine ratios and bioelectric impedance analysis (BIA)⁽¹²⁾. Other techniques and biomarkers are also used, but there is no consensus in the literature regarding the gold standard^(6-8,13,14).

OBJECTIVE

The objective of this study was to systematize the main studies that evaluate the state of dehydration in post-stroke patients and present the main results obtained from these studies, contributing to a better understanding of the relationship between stroke and possible associations with OD.

RESEARCH STRATEGY

This is a systematic review of the scientific literature on dehydration and dysphagia in post-stroke patients, in which the methodology was based on previous studies and recommendations on the subject^(15,16).

The first stage of bibliographic survey was carried out in the following portals: PubMed, for access to journals indexed in MEDLINE; *Biblioteca Regional de Medicina* (BIREME), for access to scientific databases *Literatura Latino/americana e do Caribe em Ciências da Saúde* (LILACS) and Scientific Electronic Library On Line (SciELO); Web of Knowledge, for access to the Scientific Database Web of Science; Cochrane. The following terms related to body hydration were used: (in PubMed: dehydration [Title/Abstract] OR *desidratação* [Title/Abstract] OR *deshidratación* [Title/Abstract] OR hydration [Title/Abstract] OR *hidratação* [Title/Abstract] OR *hidratación* [Title/Abstract]); neurological alteration (in PubMed: stroke [Title/Abstract] OR *accidente vascular cerebral* [Title/Abstract] OR *accidente cerebrovascular* [Title/Abstract]) and alteration in swallowing pattern (in PubMed: deglutition disorders [Title/Abstract] OR *transtornos de deglutição* [Title/Abstract] OR *transtornos de deglución* [Title/Abstract]). The strategies were adapted for each database, due to differences in search engines and in the terms present in each database. For analysis of MEDLINE articles, two studies were selected: one including terms related to body hydration and neurological alteration, and another including terms related to change in swallowing pattern.

SELECTION CRITERIA

The second stage comprised the screening and analysis of the studies and was performed by two evaluators, independently, based on the title and abstract of the articles. The studies that met the following inclusion criteria were included: an original article, with an available abstract; an article published between 2001 and 2018 in Portuguese, English or Spanish and addressing the theme dehydration in individuals after stroke.

The evaluator results were compared and the articles that obtained “yes” and/or “perhaps” responses from both evaluators were included in the analysis; the existence of two “no” responses excluded the article from the analysis. In case of disagreement, a consensus meeting was held and, when necessary, a third evaluator opinion was requested.

DATA ANALYSIS

For the studies selected in the screening, the articles were read in full and included some issues, such as a sample composed of adults over 18 years old and present, in the methodology, criteria defined on the process of evaluation of hydration status in patients after stroke. Figure 1 describes the flowchart of selection/inclusion of the articles found, selected for screening, reading in full and included for analysis, by data source.

After the selection of the articles, the following data that is relevant to the analysis were collected: researched database; name of the article; first author; year of publication; study design; research objective; sample size; evaluation method used; profile of patients included in the study and results obtained (Chart 1).

In order to evaluate the agreement of the evaluators during the selection of the articles, the analysis of agreement was used using the Kappa statistic, resulting in a value of 0.9 as an excellent reliability⁽³⁰⁾.

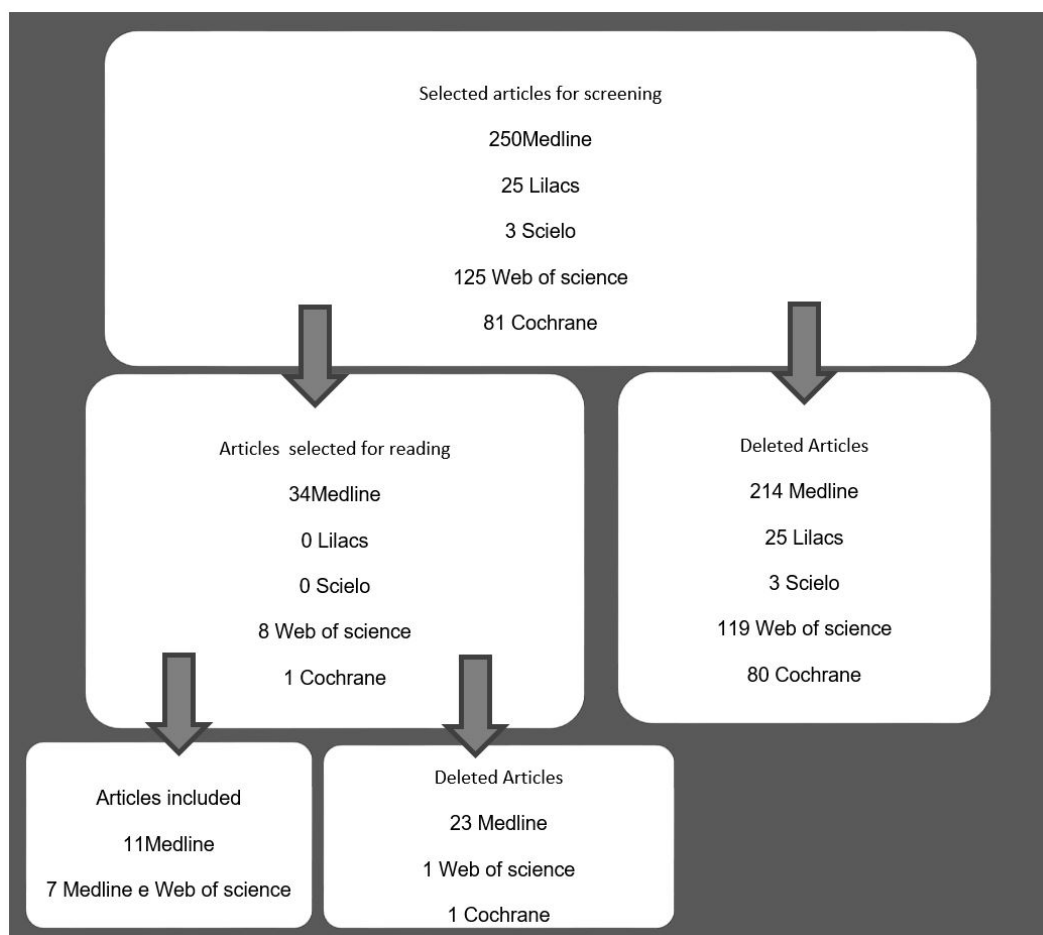


Figure 1. Flowchart of articles selection included in the systematic review of the literature

RESULTS

Among the 484 articles found for screening, 43 were selected for complete reading and 18 were included in the final analysis^(6-8,12,14,17-29). The excluded articles did not evaluate hydration or swallowing status of patients hospitalized after stroke, or the age group of the research subjects did not fit the established inclusion criteria. The final sample included four articles^(12,27-29) published between 2001 and 2004, 10 articles^(6-8,14,21-26) between 2005 and 2013, two articles^(19,20) in 2016 and two articles^(17,18) in 2018.

All articles included in the final analysis were researched in the MEDLINE database, and 41% of them were also indexed in the Web of Science database. Of the 18 publications, 100% were in English. There were no publications in Spanish or Portuguese compatible with the inclusion criteria established for the study. None of the selected studies was conducted in Brazil or Latin American countries.

The sample size varied from 13 to 2591 individuals, and in five studies^(8,22,23,25,28), the sample consisted only of individuals who had just the first diagnosis of stroke. The history of previous stroke was not defined as exclusion criterion of patients, in 72% of the studies^(6,7,12,14,17-21,24,26,27,29). In nine studies, the sample was composed only of ischemic stroke^(6-8,12,14,17,19,22,25), in three studies, by ischemic and hemorrhagic stroke^(18,24,28) and six studies did not specify the type of stroke^(20,21,23,26,27,29).

Regarding the design of the selected studies, it was observed that all 18 studies were observational, 12 of them prospective^(7,8,12,20-25,27-29) and six, retrospective^(6,14,17-19,26).

Few studies conducted a comparative analysis between OD and dehydration. In 33% of them^(6,7,12,14,25,26), no swallowing evaluation was performed and, in 17%^(21,23,24), the authors did not specify the evaluation method used. In studies where the evaluation was performed (n=9)^(8,17-20,22,27-29), the use of clinical evaluation associated with video fluoroscopy was verified (n=4)^(8,20,27,29) or only the clinical evaluation at bedside (n=5)^(17-19,22,28).

Different methods of evaluation of hydration status were described in individuals after stroke, such as analysis of BUN/creatinine ratio (n=10)^(6-8,17-20,25-27), plasma osmolarity (n=4)^(12,14,21,26), urea/creatinine ratio (n=3)^(12,23,24), specific severity of urine (n=2)^(24,25), urine color (n=1)⁽²⁴⁾, water intake (n=3)^(22,28,29), water balance (n=1)⁽²⁶⁾, BIA (n=1)⁽²¹⁾, clinical evaluation (n=1)⁽²⁴⁾ and analysis of isolated electrolytes (n=4)^(12,26,27,29). In 44% of the selected studies, there was an association of two or more methods of hydration status evaluation^(12,17,21,24-27,29). Among the studies that used only one evaluation method, the BUN/creatinine ratio showed a higher prevalence^(6-8,17-20).

Regarding the frequency of hydration status assessments, it was found that most studies (n=13)^(8,12,17-20,22-28) performed more than one evaluation throughout hospitalization, with an average of five evaluations, the first evaluation being always performed at the time of hospital admission and the others, during hospitalization or at the time of hospital discharge.

Chart 1. Data collection form: key characteristics of selected studies

Year	Main author	Study design	Objectives	Sample / population	Type of stroke	Hydration Assessment	On hydration assessment moment	Swallowing Evaluation	Conclusion
2018	Goroff et al. ⁽¹⁷⁾	Retrospective	To describe the use of oral hydration protocols for dysphagic patients after stroke.	674	Ischemic	BUN / creatinine ratio	On admission and throughout hospitalization	Clinical evaluation	Interventions can begin in a wiser manner based on the dysphagia severity.
2018	Murray et al. ⁽¹⁸⁾	Retrospective	To investigate demographic and stroke comorbidities, including dysphagia, more significantly oral fluid intake, hydration status, and specific adverse health outcomes for rehabilitation after stroke.	100 individuals	Ischemic and hemorrhagic	BUN / creatinine ratio	On admission and throughout hospitalization	Clinical evaluation	Overall, functional dependence was the most predictive factor of low fluid intake.
2016	Crary et al. ⁽¹⁹⁾	Retrospective	To identify associations between clinical management variables and hydration status in acute stroke patients.	67 individuals	Ischemic stroke	BUN / creatinine ratio	1.4 days of admission and again on discharge or on the 7th day after admission	Clinical evaluation	Dietary and fluid changes resulted in worsening hydration at discharge.
2016	Murray et al. ⁽²⁰⁾	Randomized	To contribute to evidence of the water protocols effectiveness, with particular emphasis on health outcomes, especially hydration.	69 individuals recruited from a stroke unit	Not specific	BUN / creatinine ratio	On admission and throughout hospitalization (once a week)	Clinical evaluation and videofluoroscopy	The water protocol employed in the study did not result in improved hydration. However, those who could drink water without thickener showed improvement in hydration levels.
2013	Crary et al. ⁽⁸⁾	Prospective	To evaluate the association between malnutrition, dehydration and dysphagia in post stroke patients.	67 individuals / 25 with dysphagia / 42 without dysphagia	First stroke / Ischemic	BUN / creatinine ratio	On admission and after 7 days or at hospital discharge	Clinical evaluation and video fluoroscopy	Patients after stroke with dysphagia were at risk of dehydration during hospitalization.
2013	Kafri et al. ⁽²¹⁾	Prospective	To investigate the diagnostic accuracy of MF-BIA in monitoring hydration status compared with plasma osmolality.	27 post stroke patients	First or recurrent stroke / Does not specify type	Electrical bioimpedance and plasma osmolality	On hospital admission	Not specific	Electrical bioimpedance was not considered effective in the evaluation of dehydration in post stroke patients.
2012	McGrail et al. ⁽²²⁾	Prospective	To evaluate water intake of individuals after stroke, check the difference between individuals that use thickener and who receive liquids, and compare ingestion of hospitalized individuals after stroke with healthy individuals in the community.	30 individuals / hospitalized (10 using thickener and 10 receiving fluids) and 10 healthy individuals	First stroke / Ischemic	Water intake	During the first 72 hours of hospitalization	Clinical evaluation	Hospitalized stroke patients had lower water intake than recommended.

Subtitle: BUN = blood urea nitrogen; MF-BIA = multifrequency bioelectrical impedance analysis

Chart 1. Continued...

Year	Main author	Study design	Objectives	Sample / population	Type of stroke	Hydration Assessment	On hydration assessment moment	Swallowing Evaluation	Conclusion
2012	Rowat et al. ⁽²³⁾	Prospective	To assess prevalence of dehydration in individuals after stroke and the factors of associated risks.	2591 medical records	First Stroke / Does not specify type	Urea / creatinine ratio	On admission and during hospitalization	Not specific	Changes in hydration status are common in patients after stroke and are associated with stroke severity and care during hospitalization.
2012	Schrock et al. ⁽⁷⁾	Prospective	To assess whether the increase in BUN / creatinine ratio indicates worsening in clinical evolution of individuals after stroke.	324 medical records, 163 women.	Does not specify if it is the first stroke / ischemic	BUN / creatinine ratio	On hospital admission	Not evaluated	Patients with altered hydration status worsened their clinical evolution.
2011	Akimoto et al. ⁽⁶⁾	Retrospective	To investigate prevalence of dehydration in individuals after stroke, related to the increase in BUN / creatinine ratio.	97 individuals	Does not specify if it is the first stroke / ischemic	BUN / creatinine ratio	On hospital admission	Not evaluated	Association between stroke subtypes and hydration status.
2011	Rowat et al. ⁽²⁴⁾	Prospective (Pilot Study)	To verify whether urine specific gravity and color may predict dehydration in patients after stroke, when compared to urea/creatinine ratio.	20 patients	First or recurrent stroke / ischemic or hemorrhagic	Urine specific gravity, urine color, urea / creatinine ratio and clinical evaluation	During the first 10 days of hospitalization	Not specific	Urine specific gravity and color were not considered effective methods in predicting dehydration.
2011	Lin et al. ⁽²⁵⁾	Prospective	To verify whether urine specific gravity is an effective method for dehydration prediction in individuals after stroke.	317 patients / 274 non-progressing stroke / 43 with stroke in progress	First Stroke / Ischemic	Urine specific gravity and BUN / creatinine ratio	On hospital admission and during the first three days	Not evaluated	Specific urine severity greater than 1,010 may be related to progressing stroke.
2009	Rodriguez et al. ⁽¹⁴⁾	Retrospective	To evaluate the association between dehydration and stroke.	428 patients / 214 post-stroke and 214 without a history of stroke, divided into two groups: > 65 years old and <65 years old	Does not specify if it is the first stroke / ischemic	Plasma Osmolarity	On hospital admission	Not evaluated	Elderly patients after transient or ischemic stroke had increased plasma osmolarity.
2007	Oh et al. ⁽²⁶⁾	Retrospective	To evaluate hydroelectrolytic changes in individuals after stroke using alternative feeding route.	85 medical records	Not specific	Analysis of sodium, potassium, glucose, BUN, creatinine, plasma osmolarity and water balance.	During the first four days of hospitalization	Not evaluated	Significant changes were observed only in glucose values after the use of an alternative feeding route.

Subtitle: BUN = blood urea nitrogen; MF-BIA = multifrequency bioelectrical impedance analysis

Chart 1. Continued...

Year	Main author	Study design	Objectives	Sample / population	Type of stroke	Hydration Assessment	On hydration assessment moment	Swallowing Evaluation	Conclusion
2004	Churchill et al. ⁽²⁷⁾	Prospective	To evaluate the effect of using diuretics in the state of hydration in individuals after stroke.	296 individuals / 55 in diuretic use and 241 without use, being 61 with dysphagia and 234 without dysphagia	Not specific	BUN/creatinine ratio and analysis of BUN and sodium	On hospital admission and during hospitalization	Clinical evaluation and video fluoroscopy	Diuretic use is associated with increased BUN / creatinine ratio in post-stroke patients.
2004	Kelly et al. ⁽¹²⁾	Prospective	To evaluate the relationship between the biochemical indices of dehydration and venous thromboembolism (VTE) after stroke.	102 individuals	First or recurrent stroke / Ischemic	Plasma osmolality, urea and creatinine ratio	On hospital admission and on the ninth day of hospitalization	Not evaluated	Dehydration after stroke is associated with VTE, and adequate hydration in the acute phase of stroke is important.
2001	Finestone et al. ⁽²⁸⁾	Prospective	To evaluate the difference in water intake of individuals with dysphagia in alternative power supply route and use of thickener.	13 individuals / 7 individuals with dysphagia on alternative feeding route and six individuals with oral diet.	First Stroke / Ischemic or Hemorrhagic	Water intake	During five days of hospitalization	Clinical evaluation	Individuals with dysphagia using thickener had lower water intake than recommended.
2001	Whelan ⁽²⁹⁾	Prospective	To evaluate water intake of individuals with dysphagia post-stroke and investigate the incidence of dehydration.	24 individuals with dysphagia using thickener	Not specific	Water intake and analysis of sodium, urea and creatinine concentration	During 14 days of hospitalization	Clinical evaluation and video fluoroscopy	Individuals with dysphagia had lower water intake than recommended.

Subtitle: BUN = blood urea nitrogen; MF-BIA = multifrequency bioelectrical impedance analysis

The increase in the values of BUN/creatinine ratio was related to changes in hydration status, when it was higher than 15:1 (n=3)^(7,8,25), 20:1 (n=2)^(19,20) and 25:1 (n=2)^(6,27). On the other hand, the urea/creatinine ratio was considered indicative of dehydration, when it was higher than 60:1 (n=1)⁽²⁴⁾ or 80:1 (n=2)^(12,23).

In patients with OD, using thickener to modify food consistency, the results obtained showed correlation with decreased water intake during the hospitalization period^(19,20,22,28,29).

The use of electrical bioimpedance and the analysis of urine specific gravity associated with its color were not considered effective methods in predicting dehydration in patients after stroke, when compared with plasma osmolarity and urea/creatinine ratio, respectively^(21,24). However, one study found a possible association between urine specific gravity greater than 1,010 with stroke in progress⁽²⁵⁾.

In another study, the use of diuretics by patients with OD was observed in 20% of the sample (11/55) and was considered a risk factor for dehydration when the BUN/creatinine ratio was evaluated⁽²⁷⁾.

Values of the main electrolytes (sodium, potassium, chloride) did not show significant variations in patients with OD after beginning using an alternative feeding route. However, there was an increase from 93% to 97.4% in the percentage of individuals with alterations in glucose values⁽²⁶⁾.

Biochemical indices that show a change in hydration status, identified in patients in the acute phase after stroke, during the hospitalization period, are directly associated with the development of venous thrombosis⁽¹²⁾.

Regarding the time of hospital admission, there was a prevalence of dehydration in 11%, 34% and 55% of patients after stroke and, during hospitalization, dehydration rates increased to 36%, 46% and 66%^(8,12,19).

DISCUSSION

Dehydration is usually found in patients after stroke and is associated with clinical evolution worsening, including increased morbidity and mortality. In the initial phase of stroke, the change in hydration status may be a consequence of decreased conscious water intake, or due to the presence of OD^(24,28,29).

During hospitalization, it is common to verify the decrease in BUN/creatinine ratio in patients after stroke, however, studies have shown that those patients with OD have increased rates and decreased water intake in this period, indicating worsening hydration status^(8,12,23,24).

Although searches were conducted in the main scientific research bases related to the theme, it was found a small number of publications specifically addressed the diagnosis/evaluation of dehydration in patients after stroke. It was observed that the relationship between stroke, dysphagia and dehydration is still little investigated, when compared, for example, with the association between stroke, dysphagia and malnutrition. This is probably due to the absence of definition of a gold standard method of dehydration diagnosis and the great heterogeneity of methods and reference values cited in the literature^(6-8,13,14).

Regarding the inclusion and exclusion criteria defined, it was found that several studies did not consider relevant previous history of stroke^(6,7,12,14,17-20,22,25,26,28,30).

Among the various techniques for assessing hydration status used in the clinical routine of emergency services, methods of

analysis of BUN/creatinine ratio and plasma osmolarity have been adopted with relative frequency, because its practicality and speed⁽⁷⁾.

In general, BUN/creatinine ratio from 20:1 indicates alteration in hydration status, however, recent studies used indices of 15:1, since it could be observed statistical significance of this value with stroke in progress and worsening in clinical conditions^(7,8,25). However, varying degrees of increased BUN/creatinine ratio were also observed in patients with gastrointestinal tract hemorrhage or excessive protein catabolism, associated with high consumption of proteins, burns, fever and corticosteroid administration⁽⁶⁾.

Regarding the time of hospital admission, there was a relatively high prevalence of dehydration in patients after stroke. Studies correlated the findings with increased risk of cardioembolic stroke⁽⁶⁾ and neurological deterioration^(6,25). During hospitalization, dehydration rates increased, indicating worsening in clinical evolution^(8,12,19,23,24).

The use of diuretics by patients with severe OD using thickener was considered a risk factor for dehydration, demonstrating that changes in swallowing pattern may prevent increasing water intake, usually necessary to compensate for the effects of diuretics⁽²⁷⁾.

Study recommended minimum daily water intake of 1500 ml to compensate for all water losses from urine, feces and sweat, in patients weighing between 50 Kg and 80 Kg⁽¹⁹⁾. However, patients with OD, using thickener, intake less water than the recommended amount (455 – 947 ml/day), requiring, in some cases, to use alternative feeding complementation^(22,26,28).

There was only a change in glucose levels in patients with OD after the use of alternative feeding route. A previous study reported that hyperglycemia is a common complication in patients using alternative feeding route⁽²⁰⁾.

Biochemical indices that indicate dehydration are directly associated with the development of venous thrombosis in individuals after stroke. Researchers considered the possibility of venous thrombosis before hospitalization, however, multivariate analysis showed there was a non-significant trend for the association, on the second day of hospitalization, and increased rates in the period between the second and ninth day. The results indicated an increase in dehydration during hospitalization and causal association between dehydration and venous thrombosis⁽¹²⁾.

This study included only two articles that used the analysis of urine specific gravity as a diagnostic method of dehydration in individuals after stroke^(24,25). Despite the similar methodology used in the studies mentioned, one of them considered the method ineffective when compared to the analysis of the urea/creatinine relationship⁽²⁴⁾.

Although electrical bioimpedance is considered a fast and noninvasive method for estimating body compartments⁽²⁰⁾, some authors do not recommend the use of the method in measuring acute variations in body fluid in individuals after stroke since electrical bioimpedance demonstrated low diagnostic accuracy when compared with plasma osmolarity analysis⁽²¹⁾.

Due to the methodological differences of the studies selected for final analysis, it was not possible to make comparisons, through meta-analysis, among the results found. In addition, the time of hydration assessment was also different among the studies included, since some mentioned the data only at a time, on admission or throughout hospitalization.

Through this systematic review, it was possible to understand the complexity of the process of measuring hydration status

in patients after stroke and the association with OD. Studies focusing on the association between stroke, dehydration and dysphagia are of extreme relevance, because of its influence on the mortality and morbidity rate in this population.

CONCLUSION

Dehydration during the hospitalization period is associated with the severity of stroke and worsening clinical evolution. Despite the impossibility of generalizing the results, due to the heterogeneity of the studies, it could be observed the importance of strategies for monitoring the state of hydration, to prevent health problems during the period of hospitalization, with consequent decrease in length of stay and risk of readmission. However, there is a need for further studies evaluating the relationship between dehydration and stroke with OD.

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