

The problem of dehydration among in older people

Problem odwodnienia wśród osób starszych

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Abstarct

Introduction. Water in the elderly is about 50% of body weight. It is necessary for the proper course of metabolic processes. Dehydration is the state of excessive loss of water from the body or insufficient supply. The state of dehydration can be life-threatening for a patient. **Aim.** The aim of the study is to present the factors affecting the state of dehydration in the elderly and the associated risk. **Material and methods.** Literature from the PubMed, Medline and Google Scholar database was analyzed. **Results.** The total water content in the body depends on age and gender. Under physiological conditions, there should be a balance between the amount of water consumed and the amount of water excreted by the body. With age, the risk of a dehydration episode increases and the risk of this clinical condition increases. **Conclusions.** Water is a substance necessary for life. With age, there are physiological changes in the composition of the body, which may cause disturbances in the management of water and electrolyte. It is necessary to educate the elderly patient about the proper hydration of the body. (*Gerontol Pol* 2019; 27; 185-190)

Key words: dehydration, older people

Streszczenie

Wprowadzenie. Woda u osób starszych wynosi około 50% masy ciała. Jest niezbędny do prawidłowego przebiegu procesów metabolicznych. Odwodnienie to stan nadmiernej utraty wody z organizmu lub niedostatecznej podaży. Stan odwodnienia może zagrażać życiu pacjenta. **Cel.** Celem pracy jest przedstawienie czynników wpływających na stan odwodnienia u osób starszych i związane z tym ryzyko. **Materiał i metody.** Przeanalizowano literaturę z bazy PubMed, Medline i Google Scholar. **Wyniki.** Całkowita zawartość wody w organizmie zależy od wieku i płci. W warunkach fizjologicznych powinna być zachowana równowaga między ilością pobieranej wody a ilością wody wydalanej przez organizm. Wraz z wiekiem zwiększa się ryzyko epizodu odwodnienia i zwiększa się ryzyko wystąpienia tego stanu klinicznego. **Wnioski.** Woda jest substancją niezbędną do życia. Wraz z wiekiem dochodzi do fizjologicznych zmian w składzie ciała, które mogą być przyczyną zaburzeń w gospodarowaniu wodą i elektrolitem. Konieczne jest edukowanie starszego pacjenta w zakresie właściwego nawodnienia organizmu. (*Gerontol Pol* 2019; 27; 185-190)

Słowa kluczowe: odwodnienie, osoby starsze

Admission

Dehydration of the body is a common problem of old age. Dehydration in the elderly population is a very serious phenomenon. The aging process of the organism and the associated reduction of water content in the body and inferior functioning of individual organs (including kidneys and the thirst center in the brain) predispose

to the occurrence of water and electrolyte disturbances [1]. With increasing age, the percentage of people with disabilities or those affected by dysfunctions increases, which contribute to reduced mobility and, consequently, to the ineptitude of self-consumption of beverages. In addition to disability, older people often deliberately give up taking fluids, which is connected with the necessity of frequent toilet use, which, combined with di-

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sability, carries a lot of difficulties. Suffering from more than one chronic disease and polypragmasy, or taking several drugs at the same time, play an important role in disturbances of water and sodium balance, lead to an increased risk of dehydration [2]. Disorders of water and electrolyte management in the elderly may contribute to the formation of disease processes but also intensify comorbidities [1].

Dehydration in the elderly contributes to cognitive disorders, memory problems, loss of concentration, decrease in psycho-motor skills, mood changes, and visual-motor coordination problems. Also, electrolyte disturbances affect the abnormal heart rhythm (increase in heart rate, fainting, drop in blood pressure). Low fluid intake may have an effect on urinary excretion and consequently lead to pre-renal renal failure. Insufficient hydration also affects problems related to defecation, among others hard stools, and constipation [3].

Aim

The aim of the study is to present the factors affecting the state of dehydration in the elderly and the associated risk.

Material and methods

Literature from medical Medline and Google Scholar databases has been reviewed, for “dehydration” and “older people” key words.

Results

Water – a substance necessary for life

Water is the main inorganic compound in the body that is necessary for life and proper functioning of a human being. The total water content in the body is divided into ECF extracellular fluid and ICF intracellular fluid. Extracellular ECF fluid includes plasma and interstitial fluid. It is fluid located outside the wall of blood vessels. ICF accounts for about two-thirds of the total water content in the body, and the ECF about one-third. The total water content in the body depends on the amount of body fat. Newborns have a low fat mass, therefore they contain 70% or more of water. The water content in the body decreases with age, in the elderly it is about 45-50% [4]. This is due to a decrease in lean body mass and an increase in the percentage of adipose tissue in water [5]. The body's water content in women is slightly lower than in men. This difference is due to the fact that

women have higher fat mass and lower skeletal muscle mass [6,7].

Total body water, depending on gender and age, is presented in Table I.

Table I. Total water content in the body depending on sex and age expressed in percent [4].

Age	Men (%)	Women (%)
10-18	59	57
18-40	61	51
40-60	55	47
Above 60	52	46

Water in the human body performs a number of important functions such as: it is the main environment where most metabolic processes occur in the body, it participates in intracellular transport of nutrients, it is necessary for the proper course of the digestive process, enables efficient mobility of joints or participates in the regulation of body temperature [8].

A man is not able to produce adequate amount of water to fully meet the needs, which depend on many factors such as: physical activity, ambient temperature, sex, body weight, dietary fiber intake, etc. Physiologically in the metabolism process, a man is able to produce about 300 ml/day [9]. The sources of dietary water supply are food products and liquids. One should constantly supplement its amount, because the body does not have storage capacity. Water is constantly excreted from the body, which, if insufficient supply, can lead to dehydration [10,11].

The group that is particularly exposed to disturbance of homeostasis are the elderly. Not only the inadequate supply of fluids and foods can lead to dehydration, but also the diseases abundant in this group of patients leading to disturbances of water absorption or excessive excretion.

The water balance

The water balance is the ratio of the amount of water supplied to the body from outside with the amount of water discharged. Under physiological conditions, there is a balance between the volume of water taken up and excreted by the body [4,7,12]. Water balance should be equal to zero, which means that the amount of water collected and excreted within 24 hours should be equal [15].

During the day, the human body produces in biochemical processes about 300 ml of the so-called metabolic water. In addition, about 700 ml of water is taken from food intake and 1500 ml from direct intake of liquids. Together with the urine, 1500 ml of water is excreted,

with a 100 ml in stool, through skin and lungs – 900 ml [12]. In order to cover the daily demand for liquids, the appropriate amount of fluids should be taken [10,11].

The demand for water depends on age, ambient temperature, composition of the diet, fat content, type and intensity of physical activity. The factors leading to an increase in water demand are: high ambient temperature, low humidity, increased physical activity [8,12].

The average water requirement is 30-35 ml / kg body weight, and the water consumption should not be less than 1500 ml / day or 1-1.5 ml/1 kcal. In the elderly with reduced efficiency, the need for water is 100 ml of water for the first 10 kg of body weight, 50 ml for a further 10 kg of body weight and 15-20 ml for the remaining kilograms of body weight [10]. According to the current Norms of the Institute of Human Nutrition in 2017, the demand for water at the level of sufficient intake (AI) is 2500 ml/day for men, and 2000 ml / day for women [10,13]. Similar recommendations were issued by the European Agency for Safety and Food in 2010 [16]. According to the WHO recommendations (2003), the total water intake in the form of fluids and foods should be 2.200 ml for women and 2.900 ml for men in a day.

The daily water demand can be calculated based on the body surface area. One to one square meter should take 1-1.5 liters of water. To calculate the body surface, use the DuBois formula [4,12].

$$0.007184 \times \text{body weight}^{0.425} \times \text{body weight}^{0.725}$$

Another method to determine the body's need for water is to calculate the calories of the diet. According to this method, 1 ml of water falls on every 1 kcal of the energy value of the diet. It should be mentioned that the calorie diet should comply with certain standards [16].

To assess the degree of hydration, a thorough interview, physical examination and laboratory tests should be performed. During the interview, the patient should be asked about vomiting, diarrhea, profuse sweating, feeling thirsty, dry mouth, the amount of urine discharged per day, medications.

In physical examination, attention should be paid to skin elasticity, the degree of hydration of the mucous membranes and the value of arterial pressure. Laboratory tests should include blood count (red blood cells, hemoglobin, hematocrit, MCV, MCHC) concentration of sodium and total protein in plasma [14].

The water balance can be disturbed by medications that can affect the feeling of thirst. Decreased thirst may result in selective serotonin reuptake inhibitors, ACE inhibitors, drugs used in Parkinson's disease, lithium salts and thermoregulatory-impaired compounds such as: neuroleptics, beta-blockers, anticholinergic drugs [4].

Symptoms of dehydration and associated risks

Dehydration is one of the most frequent disturbances of water and electrolyte metabolism in the elderly population [17]. In 48% of patients > 75. years of age, those who report to the SOR state laboratory features of chronic dehydration, and 23% show signs of dehydration [18]. This problem may affect up to 31% of nursing home residents [19]. With age, the risk of a dehydration episode increases, and the risk of this clinical condition, which is dangerous for health and life, increases. It was estimated that the highest risk of death among patients with symptoms of dehydration exists in the group of women > 91 years of age [17]. This is due to age-related changes in water content in the body, decreased feeling of thirst, sensitivity to vasopressin, as well as impaired renal function [20]. A frequent risk factor in older people is also limiting the amount of fluids consumed, associated with a decrease in thirst, habitual avoidance of fluid intake, inadequate amount of water consumed in the presence of increased body requirements, disability related factors or with accompanying diseases such as heart failure. Telenga et al. in their studies determined the incidence of individual risk factors for dehydration in geriatric patients [17]. Thus, the most common risk factors for dehydration are reduced fluid intake (21.3%) and fever infections (13.6%) [17]. Other risk factors include vomiting, diarrhea, diabetes, cancer, chronic kidney disease, restriction of fluid intake, dementia syndrome, and alcohol abuse [17]. The deterioration of organ function and the decline in homeostatic reserves, which increases with age, means that even small disturbances of water and electrolyte management may initiate a disease process or lead to exacerbation of comorbidities, which often requires treatment in a hospital setting [1]. Headache and dizziness, disturbed consciousness, blurred vision, tachycardia, weakness, loss of skin elasticity and sunken eyes, constipation, falling tendency are but a few clinical symptoms of dehydration [18,19]. Weight loss, drying of tongue and oral mucosa, reduction of skin tone, prolonged capillary recovery time, hypotonia, tachycardia and reduction of diuresis are considered to be the most significant clinical signs of dehydration. The clinical picture of hypertonic dehydration depends on the degree of hypovolaemia and the time in which it developed. With longer-lasting dehydration, CNS symptoms may appear, such as confusion, anxiety, agitation, hallucinations (in the case of rapidly progressing dehydration of brain cells) [1]. Long-term dehydration can even lead to life-threatening necrotic changes in the CNS's blood vessels, thrombosis and focal neural tissue necrosis [20,21].

The problem of dehydration

The body is unable to store large amounts of water and should therefore be topped up regularly [1]. Insufficient fluid intake leads to disturbances of water and electrolyte balance, which may result in dehydration. It means a deficiency of water in the body resulting from inadequate supply of this nutrient, or its absorption or excessive excretion from the body [8]. Older people are particularly at risk of dehydration [8]. Studies conducted in the USA showed that in 2004, dehydration was the main cause of 518,000 hospitalizations [24]. According to the results of the Menten and Bennett studies, dehydration was found in 48% of patients over 75 years old admitted to the hospital emergency department [19,23]. The problem of dehydration concerns about 31% of older people staying in nursing homes in Poland [11].

There are three types of dehydration: isotonic, hypertonic and hypotonic [25]. The most common type of dehydration found in the cases of older people is hypertonic dehydration resulting most often from insufficient supply of liquids [21]. PolSenior's Polish study showed that over 11% of people in the study population received less than 1000 ml of fluids per day (in the group of 90-year-olds, 26.5% of subjects) [26]. Other causes of hypertonic dehydration include excessive water loss in people with diarrhea, fever, or kidney disease, which results in decreased glomerular filtration [23,27].

One of the reasons for hypotonic and isotonic dehydration can be excessive loss of electrolytes as a result of poorly selected therapeutic dose of loop or thiazide diuretics [28]. Another reason may be an incorrect dosage of laxatives [29].

Discussion

The issue of hydration, which should be updated as often as possible, is the amount of water ingested with food and in the form of liquids. This fact is associated with high variability in the amount of water ingested, depending on the time and location of the research. While the influence of geographic location on the volume of drinking water is obvious, which is clearly visible, juxtaposing areas with extreme climatic conditions (eg water-rich floodplains compared to desert areas), the significance of the passage of time is often erroneously underestimated. A comparison of surveys from 1965 and 1977-1978, together with surveys conducted in 1988, 1994 and 199-2002, on the adult population of the United States, however, confirms the importance of the said factor. The task of the questionnaires was to register the amount of drinks consumed, such as alcohol and sweet

or diet drinks, in society. According to the results of new surveys, the consumption of drinks, and therefore also water, increased in comparison to previous years. However, this is not entirely good news, because a significant part of the said fluids were sweet drinks, which led to an increase in the number of calories taken with liquids by as much as 222 per day [30]. Higher intake of fluids at present may indicate a high risk of dehydration in older people who spent their teenage years in times of overall lower water consumption.

Limiting the amount of water that can be consumed is often the material situation. The issue of the impact of economic, climatic and social factors on the volume of water received was addressed in research conducted in Germany. Comparing around 600 German water-supplied areas, it was found that with the increase in affluence of the studied area, the volume of drinking water per capita decreased. As an example, a nearly 30% difference in the consumption of liquids between areas formerly belonging to Germany, compared to the former East Germany, indicated a greater level of hydration in Eastern Germany. As the reason, the authors suggest differences in the price for drinking water in various areas of the discussed country, but this thesis was not supported by evidence [31]. Observations aimed at determining the impact of economic and social factors on population hydration seem to be statistically significant and useful in clinical practice, especially in the treatment of elderly people in Poland, who are often deprived of sufficient funds to provide basic life needs [32].

Factors affecting the volume of fluid intake are extremely diverse and their range far exceeds purely medical issues. To ensure proper hydration of the patient, it is necessary to pay attention to many elements, often difficult to see [33]. The group particularly complicated in controlling the water intake are the elderly, mainly due to the disturbed functioning of the thirst center, which leads to the lack of willingness to consume fluids even in the situation of their deficiency in the body [34]. Repeatedly this forces us to provide appropriate care, in which the scope of duties will be, among others, to control the volume of water consumed. The problem of high risk of dehydration in older people should also be noticed by people who are not professionally caring for seniors but who have contact with them. Observation of any early signs of dehydration such as weight loss, dry mouth, dry skin and mucous membranes, nausea or slight diuresis [35] is a warning that the elderly person may be dehydrated, which is the basis for urgent and controlled hydration.

Care for the proper hydration of seniors, if carried out in a suitable manner, is a high-efficiency treatment.

According to a study conducted by Simmons et al. on a group of 63 elderly people using home care, encouraging subjects to drink liquids by verbal methods leads to an increase in hydration as high as 78% of seniors [36]. Actions aimed at increasing the frequency of conversations with the elderly, during which attention should be paid to the importance of controlling the degree of hydration, should therefore be an important element in combating the problem of dehydration in society.

Conclusions

Dehydration of the body is a common problem of old age. The aging process of the organism and the associated reduction of water content in the body and inferior functioning of individual organs (including kidneys and the thirst center in the brain) predispose to the occurrence of water and electrolyte management disorders [1]. Knowing the risk factors for life-threatening elder-

ly dehydration, first of all, preventive treatment, which involves getting geriatric patients and constantly remind them about the need to consume the right amount of fluids during the day. Characteristic symptoms of dehydration allow to recognize and treat them quickly in the elderly. It should be remembered that these symptoms may be expressed very discreetly in geriatric patients, and dehydration may be clinically revealed only at the time when the patient's health or life is in danger. Therefore, first of all, emphasis should be placed on prevention and rapid diagnosis of dehydration in this group of patients.

Conflict of interest

None

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