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DEHYDRATION AT SEAFARERS – PREVENTION, SYMPTOMS AND APPROACHES

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Abstract. Dehydration may be caused of either limited water intake, excessive loss of water, or both. The lack of water is much too serious than that of food. Every healthy man loses approximately 2,5% of the general body water a day (which is around 1,200 l) along with the urine, the air which he breathes out, perspiration and the gastrointestinal tract. If we are to put in addition to this loss increased perspiration, as a result from a row of factors caused by external environment, or some disease states in which the sailors on ships are exposed, dehydration could lead to a shock and death in just a few hours. The sailors' training in reference to the importance of this state, is of significant matter for them to prepare themselves properly before going on board, and consciously prevent dehydration during their voyage.

Keywords: dehydration, prevention of dehydration, approaches in dealing with dehydration, seafarers.

1. Introduction

The maintenance of hydration is usually taken for granted. But despite that, the presence of adequate liquids levels is very important for the sustaining of normal body functioning. Although one could stay hungry for a continuous period of time, no one could survive without any water for long [1].

A thorough research of the ones who have survived a shipwreck during the Second World War, shows that the ultimate time those people have survived without any water, is eleven days [2].

The reasons for dehydration can be many, and various types: vomiting or diarrhea; high body temperature; much high perspiration because of the high environment temperature (or the office temperature, or all two of them); chronic or acute blood loss; intake of diuretic medicaments which increases urinating; medicaments which increase the gastrointestinal motility; diabetic ketoacidosis; hyperventilation; burns; insufficient intake of fluids [3,4].

All those preconditions are present in seafarers who sea sail.

The insufficient intake of fluids may also be caused by some depressive states in people, and mental disorders that occur from insularity and the prolonged stay on water, especially in beginner seafarers, who have no experience in this lifestyle and are detached from their families and relatives [1].

Depending on the degree of water deficiency, there are 3 types of dehydration:

- mild degree (which is $\leq 5\%$ of body weight loss);
- moderate degree ((which is from 5,1 to 10% of body weight loss);
- severe degree (which is from 10,1 to 15% of body weight loss).

Depending on whether one loses water and electrolytes in equal proportions, 3 types of water deficiency are being distinguished:

- ✓ isotonic dehydration. This is the most common dehydration – one loses equal proportions of water and electrolytes. It is most common in diarrhea and vomiting, and it is observed in 90% of all cases.
- ✓ hypotonic dehydration. It is observed when one loses more electrolytes and less water – for example, in intensive vomiting caused by pyloric stenosis, or intensive perspiration in people suffering from cystic fibrosis.
- ✓ hypertonic dehydration. It is observed when one loses great amounts of water and less electrolytes, for example in diabetes insipidus [3, 4].

The dehydration symptoms depend on the cause and whether one loses salt. When the lack of water is disproportionately greater than that of electrolytes, the osmotic pressure of extracellular fluids gets higher than the one in cells. Because water goes from an area of lower to an area of higher osmotic pressure, the water from cells goes to the extracellular fluids, aiming to reduce osmotic pressure and increase its content to a normal degree. As a result, cells dehydrate, which leads to thirst. Thirst is observed in 1% loss of intracellular fluids. Thirst is the most common symptom and manifests as mouth aridity, low production of saliva and bad swallowing.

In diseases caused by salt loss, the low concentration of sodium in the extracellular fluid, and the blood serum, leading to reduction of the osmotic pressure and this way, water goes in the cells to make the osmotic pressure even. Thus, we have extracellular dehydration, and intracellular hydration. This state goes without a thirst.

2. Exposition

The lack of water has peculiar symptoms in people. Weight loss comes out to two or three kilos a day. In progressive dehydration, tissues are prone to shrink, the skin gets dry and wrinkled, the eyes sink in and the eye-balls are soft.

A state of fever occurs. Dehydration itself affects the temperature regulatory centers in brain. In progressive dehydration, and salt loss, however, the plasma volume, and heart debit reduce themselves, which leads to low blood supply of tissues. Perspiration reduces and may stop entirely, and the main way of losing warmth is closed. This way, body temperature may harshly increase [3, 4, 6].

We observe significant changes in both the extracellular and intracellular fluids' content, without that of the blood plasma (which is the last to change, and the least). The plasma volume is maintained more or less constant, on account of the tissue fluids. But if the plasma volume reduces, the heart debit also does, and this shows a dangerous physical state.

The kidney alterations in a prolonged dehydration, and loss of plasma volume occur in a low production of urine. As long as one sustains a urine volume of over 30 milliliters per hour, the kidney could throw away waste substances in maximum effectiveness. After the stream of urine reduces below that level, the kidneys could no longer function properly, the waste substances remain in the body and their concentration in blood increases.

Currently, there are very little hydration researches in seafarers. There are a lot of cases among these people with diseases, which have to do with dehydration. The International Seafarers' Welfare and Assistance Network (ISWAN), conducts a test for a period of 28 days in the spring/summer 2017, in connection with hydration in seafarers in four tankers, with a total of 73 participants, who have noted everything that they have been drinking for those 28 days. At the end of the campaign, the participants have done a test through which they would estimate their basic knowledge in hydration. The results show that every single ship, in the process of the study, has recorded an increased average consumption of water. Since no particular difference in the consumption of water from the experimental ship is observed (in comparison to the other ships), it's possible that the act of recording what the seafarers have drunk daily, could be used as a reminder for a sufficient water intake.

The materials used in the experimental ship are information brochures that remind the seafarers of the necessary amount of water intake, the kind of food they eat, etc. [7]

Since the human body works only within strictly defined limits of chemical and fluid balance, their alteration leads to a reducing capability of functioning. If not treated properly, dehydration could lead to exhaustion of the main fluids and electrolytes (mainly water, potassium, sodium chloride and bicarbonate and the ensuing changes of the acid - base balance). These changes could lead to an altered mental status, headache, spasms, paroxysms, convulsion, shock, coma and even death.

The risk of dehydration increases in hot, humid, windy and cold weather [8]. Dehydration is frequently observed among people who work in a hot environment, like the working zones on a ship. Such people are frequently at least 3% dehydrated and can hardly replace the fluid that is lost by the working process, despite the presence of common beverages. This could be explained with the process of perspiration, which could account for the loss of fluids of up to 1,5l per hour [9]. The loss of electrolytes such as sodium and potassium, is important. In a marine environment, a continuous exposure of components of the environment, or dip in the water may also lead to dehydration.

The estimation of dehydration state in adults is frequently based on observation of clinical signs and symptoms – rate of pulse and breathing, urinating, skin turgor, mental state and muscle strength. The patient complains of asthenia and wooziness while he's standing up. The specific weight of urine increases with dehydration, as the urine becomes more concentrated until urinating doesn't stop, as an adaptation of the kidneys to save fluids.

The most specific test for defining the state of body fluids, are the rates of vital indicators. A change of the body position from a lying down to a standing position, leads to unification of the volume of circulating fluids in the big blood vessels in the body and legs. It is observed that people who aren't dehydrated, easily adapt to the changes in body position. The changes in pulse and blood pressure are compared. It is required to prevent the patient from getting hurt as a result of paroxysm and falling during the estimation process, as he could feel even more asthenia, wooziness and visual disturbances.

Rating of dehydration [10]. After the patient lies on his back for a minute, his blood pressure and pulse are being measured in this position. After that, the patient must sit (on a 90 degree angle) with his feet hanging. After waiting a minute to go, one measures his blood pressure and pulse. At the end, the patient must stay in a vertical position after waiting for another minute to go, and then we measure the indicators again.

Results from the test. The test is considered positive, if some changes occur in the level of consciousness or their state worsens, or if the symptoms get acute when one sits down or stands up, after lying down.

The positive test expresses itself in change of the vital signs, with reduction of systolic blood pressure by 20mmHg or more, and the pulse by 20/min or more.

Behavior in signs of dehydration. The best way of hydration in mild dehydration is via having table-water. You better drink in small sips and more often, than in big gulps and holus-bolus, since that could make you vomit.

If you have more serious dehydration that is caused by vomit or diarrhea, you would have lost important salts and sugars. A good way to replace them is using rehydration sachets that can be added to the water [10].

If you have more severe dehydration in addition to the aforementioned signs, a weak or fast heart rate could be observed, as well as blurred consciousness and even a collapse.

In this case, there are two ways of providing water: oral and intravenous. The solutions of oral rehydration must contain water, salt and sugar. The World Health Organization (WHO) recommends a solution: 20g of glucose, 3,5g of sodium chloride, 2,5g of sodium bicarbonate, and 1,5g of potassium chloride to be added in 1liter water. A good interpretation and convergence of those measures could be achieved by adding 1 ½ tablespoon of sugar, ½ teaspoon of salt, 3/4 teaspoon of baking soda and 1/4 teaspoon of salt substitute (which contains high amounts of potassium) on 1 liter of water. The solution received could be spiced by some lemon juice.

In dehydration that is caused by diarrhea or other type of gastrointestinal disorder, one could start with starch water, in which either rice, potatoes or macaroni are being boiled, to add some sugar polymers [11].

Amounts of 50ml/kg are applied for mild dehydration, and 100ml/kg in moderate dehydration in every 4, or even more hours. After every diarrheal defecation we add 10ml/kg from the solution. The intake must be done in small sips [12].

There are electrolyte formulas for oral rehydration in different trademarks that can be found on the market. Such marks are Dehydratin alpha, Stoperol hydra, Hydroton, etc., that are indicated in dehydration as a result of diarrhea, intensive sweating and hard physical work. They solute in a glass of 200ml water, and contain basic minerals (sodium chloride, potassium chloride, sodium citrate and glucose). There are also combined medicines with lactic acid probiotics added.

The intravenous rehydration (IV) is best achieved by the isotonic solution – a common physiological solution, or Ringer - lactate solution. Those intravenous fluids remain longer in the cardiovascular system, and support circulation much longer than those containing glucose [13].

When there is a disease present, the main reason of losing fluids and electrolytes must be identified and treated with the help of a medical consultant. Medicaments that might be useful are antiemetics (in vomit), antipyretics (in fever and headache), and some antibiotics (in diarrhea with blood) [3, 4].

The early communication with medical specialists on shore is of crucial matter in care toward a severely dehydrated patient in the sea. To make yourself useful, you need to gather some information of the reason that has led to loss of fluids, current rates of vital indicators (pulse and blood pressure rates), the current symptoms, also measure and record the amounts of urine per hour, and the patient's respond to the treatment provided to this moment [1,2,14].

3. Conclusion

Taking into account the reasons leading to dehydration, it is clear that a lot of preconditions for dehydration can be observed in seafarers. To avoid this, it's necessary for them to be informed of the importance of the water and electrolyte balance, so their organisms could properly function. It's important to regard the working conditions, weather conditions, the opportunity of detaching from work and having access to table-water anytime.

Encouraging the seafarers to consume more water is beneficial for their general health and efficient work onboard.

A problem for the sufficient hydration could be the lack of free access to table-water anytime a day, as well as the food served on board – if the dishes cooked are too salty or too sweet, or do not contain enough vegetables. Another reason for the deliberate avoidance of water is the imposing detachment from work to go to the toilet, especially for the inferior personnel and trainee seafarers.

Considering the prolonged stay on water, the seafarers must be prepared to face unexpected situations concerning their health. The periodic training and reminding of the troubles that may affect them and their health, would reduce the risk of diseases.

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