Review Article

Int J. Alter Comple Medi, Vol: 5, Issue: 1, 2024; 7-11

International Journal of Alternative and Complementary Medicine

Available at www.saap.org.in ISSN: 2583-1305

RUDIMENTARY OVERVIEW: DEHYDRATION (LOSS OF BODY WATER) RECOGNITION AND MANAGEMENT

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Received: 05 Mar 2024 Revised: 15 Mar 2024 Accepted: 23 May 2024

Abstract

Dehydration occurs when the body loses more water than it gains, mostly from the intracellular volume (ICV). Low-intake dehydration is the consequence of consuming insufficient amounts of pure water, which increases the osmolality of both compartments and resulting in the loss of intracellular and extracellular fluid. Clinically, volume depletion affects the interstitial compartment and is brought on by excessive losses of fluid and salt, especially sodium and occasionally other elements. The main cause of the fluid loss is a decrease in extracellular volume (ECV); the serum osmolality will either be low or normal. From a physiological standpoint, it makes sense that many clinicians refer to any loss of total body water as dehydration in their routine clinical practice. Most people who have mild to moderate dehydration as a result of vomiting, diarrhoea, or fever can recover by drinking more liquids, such water. Full-strength fruit juice and soft drinks might make diarrhoea worse. If you work outside or exercise in hot or muggy weather, your best bet is cool water. The best way to treat dehydration is to replenish the body with enough of fluids, such as water, diluted squash, or diluted fruit juice. A salty snack can help you replace lost salt, while a sweet drink can help you replace lost sugar. We go over the causes, prevalence, accessible therapies, and present state of dehydration in this review study.

Keywords: Dehydration, Epidemiology, Etiology, Pathophysiology, Diagnosis, Treatment.

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DOI: https://doi.org/10.46797/ijacm.v5i1.585

Produced and Published by
South Asian Academic Publications

Introduction

Your body loses water on a daily basis due to sweating and perspiration. If it isn't replaced, you get dehydrated. Those who work in the heat, athletes, the elderly, and those with chronic illnesses are some of the groups of people that are at danger. You get dehydrated when your body loses more fluid than it is able to absorb. Dehydration can cause fatigue in a variety of sports, including football; however, the evidence does not support this notion. It's also possible that the only thing causing moderate exercise-induced dehydration is high metabolic activity during a game. Without a doubt, homeostasis is threatened by the variety and duration of physical activity involved in football. Nevertheless, research shows that, for the most part, metabolite accumulation is pretty steady, match-play fluid loss is little (~1-2% loss of body mass), and core temperatures do not increase to the point where activity needs to be halted right away [1]. The World Health Organisation defines dehydration as a condition brought on by an excessive loss of body fluids. The most common causes of dehydration in children are vomiting and diarrhoea. In addition to highlighting the necessity of an interdisciplinary team to treat the illness, this exercise highlights the biology and aetiology of paediatric dehydration. According to public data, chronic dehydration affects 75% of Americans. Although medical studies does not support this, older people frequently experience dehydration. Reports state that between 17% and 28% of senior citizens in the US suffer from it. Dehydration frequently results in hospital admissions. By itself, it can worsen a number of medical conditions and raise morbidity and death. Additionally, over diagnosing dehydration is a possibility. This could lead to an over indulgence in fluids and a false diagnosis of the patient's actual illness. Dehydration can be easily prevented and treated. Being well informed about the causes and diagnosis of dehydration can improve patient care [2].

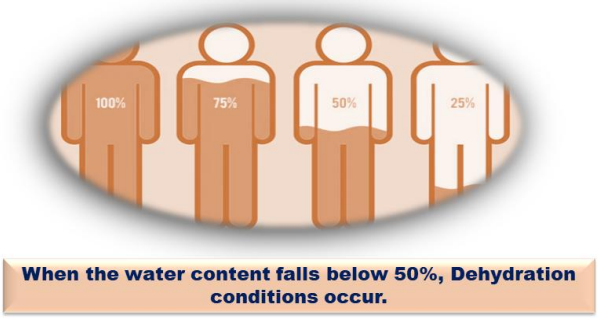

Fig.1: Dehydration conditions.

Epidemiology

Globally, dehydration is a leading cause of morbidity and mortality in newborns and early children. Approximately 760,000 children worldwide suffer from diarrheal illness each year. Acute gastroenteritis is the primary cause of dehydration in children. Infectious diseases are typically the cause of acute gastroenteritis in Americans. Infectious diarrhoea instances are primarily caused by viruses, such as enteroviruses, rotaviruses, and noroviruses. Less than 20 per cent of cases are caused by bacterial infections. Shigella, Escherichia coli, and Salmonella are common bacteria that cause infections. About 10% of bacterial illnesses are caused by Escherichia coli which causes diarrhoea. Less than 5% of cases are caused by parasites like Cryptosporidium and Giardia. Although there are no current statistics on the prevalence of dehydration in the general public, the epidemiology of adult dehydration is well understood. When given access to water, healthy persons rarely experience dehydration. Dehydration can occur in any adult as a side effect of a medical condition like hyperglycemia. Not all cases of dehydration will be found in database searches because dehydration can either cause or result from sickness. Our available evidence indicates that dehydration is more common in older persons. Additionally, due to factors such as falls, diabetes, renal illness, immobility, and decreased thirst mechanism, the aged population is 20% to 30% more likely to get dehydrated [3,4]. The number of deaths in India among children under five has steadily decreased; from 2.5 million in 2001 to 1.5 million in 2012, the mean annual decline in deaths was approximately 3.7% [1, 6]. Notwithstanding this decline, diarrhoea accounts for 13% of deaths in children under the age of five in India, making it the third most common cause of mortality in this age group. Therefore, it is estimated that diarrhoea kills 300,000 children annually in India alone. In Madhya Pradesh (M.P.), where the current study was conducted, the National Family Health Survey-4 (NFHS-4) morbidity data revealed that 9.5% of all U-5 children had experienced diarrhoea in the two weeks before the survey when it came to the number of diarrhoeal episodes each year. M.P. province has the highest rate of neonatal and childhood mortality in the country [5].

Etiology

Dehydration and diarrheal illness are especially dangerous for infants and early children. Higher metabolic rates, an inability to express demands or hydrate oneself and an increase in insensible losses are some of the causes. Other medical conditions that promote fluid loss, such as diabetic ketoacidosis (DKA), diabetes insipidus, burns, excessive perspiration, and third spacing, can also lead to dehydration. Along with continuous losses, a drop in intake can also lead to dehydration. It's possible to have electrolyte imbalances in addition to overall body water losses. Due to their increased metabolic needs, infants and children are particularly vulnerable to dehydration. Water is lost from the body through the GI system, kidneys, lungs, and skin. Dehydration is the loss of bodily water without sodium. The gastrointestinal tract, kidneys, lungs, and skin all lose water. When the body loses more water than it replaces, dehydration occurs. It could result from not replacing required water losses. Dehydration can take various forms. When sodium and water are lost simultaneously, it is known as isotonic water loss. Isotonic water loss can be caused by hyperglycemia, hypoaldosteronism, vomiting, diarrhoea, perspiration, burns, and intrinsic renal disease. When salt losses are greater than water losses, hypertonic dehydration results. In hypertonic dehydration, serum sodium and osmolality will always be higher. Loss of excess pure water passes through the kidneys, lungs, and skin. Fever, elevated breathing, and diabetes insipidus are the etiologies. Diuretics are primarily responsible for hypotonic dehydration because they lose more salt than water. Low sodium and osmolality are characteristics of hypotonic dehydration. source of water loss might be aware of the causes of dehydration:Failure to replenish lost water might cause coma-inducing chemical overdose, altered mental state, immobility, and impaired thirst mechanism. Heat, exercise, burns, and certain skin conditions can cause the skin to lose too much water. Diuretics, acute and chronic renal disease, post-obstructive diuresis, salt-wasting tubular disease, Addison disease, hypoaldosteronism, and hyperglycemia are among the conditions that cause the kidneys to lose excessive amounts of water. Excessive water loss from the gastrointestinal tract caused by fistulas, laxatives, vomiting, and diarrhoea. Losses within the abdomen: pancreatitis, fresh ascites, peritonitis. Oversensible loss: drug overdose, sepsis, hyperthyroidism, asthma, and chronic obstructive pulmonary illness (COPD) [6,7].

Pathophysiology

Water is essential to the body's ability to maintain several physiological processes. 55% to 65% of the human body is made of water. That water is made up of one-third extracellular and two-thirds intracellular. Intravascular

water makes up one-fifth of extracellular water. The body has an intricate system in place to keep euvolemia stable. The digestive system is the route by which water is absorbed. The brain's osmoreceptors are the main mechanism responsible for maintaining water homeostasis. These osmoreceptors sense dehydration, which activates the hypothalamic thirst centre [8] and causes water intake. The kidney's ability to conserve water can also be attributed to these osmoreceptors. The posterior pituitary releases antidiuretic hormone (ADH) in response to the hypothalamus's detection of a decrease in water concentration. This action prompts the kidneys to reabsorb more water. Reduced blood pressure, which frequently follows dehydration, causes the kidney to secrete renin. Angiotensin I is changed into angiotensin II by renin, which causes the adrenal glands to release more aldosterone. Aldosterone promotes the kidney's ability to absorb water and salt. The body uses these systems to control water and salt concentrations as well as body volume [8]. Total body water in the intracellular and extracellular fluid quantities decreases with dehydration. There is a strong correlation between volume depletion and dehydration signs and symptoms. Two main compartments in the human body contain the total body water (TBW). The intracellular compartment contains two-thirds of the total body weight (TBW), with the remaining one-third being split between the interstitial space (75%) and plasma (25%). Compared to adults, babies and children have higher total body water content. It accounts for 70% of the total weight in infants, 65% in children, and 60% in adults. Volume depletion is the reduction in the circulatory volume, while dehydration is the complete loss of water to salt, as previously mentioned. Anaphylaxis and sepsis are associated with distributive volume depletion, while burns and acute blood loss are associated with volume depletion. Dehydration and volume depletion are not clearly distinguished in much of the literature. Dehydration in infants and children can cause metabolic acidosis, which has a complex aetiology. Some forms of renal tubular acidosis are characterized by an excess of bicarbonate loss in the urine or the stool from diarrhoea. Ketosis brought on by the loss of glycogen, which occurs earlier in infants and children than in adults after hunger. Low tissue perfusion is the secondary cause of lactic acid generation. kidney's retention of hydrogen ions as a result of reduced glomerular filtration rate and renal perfusion [9].

Aspects of Impact and Risk

Older adults typically experience less thirst because their bodies are less sensitive to the antidiuretic hormone (ADH). Several studies have demonstrated that healthy elderly individuals typically retain a state of adequate hydration. However, several factors can raise the risk of dehydration, including physical or mental diseases, trauma, and surgery. In a six-month research, 31% of nursing home residents reported being dehydrated at some point, and of those, two-thirds had experienced episodes of dehydration before. Among the risk factors for dehydration among residents of dysphagic nursing homes were speech disorders, severe impairments of cognitive and/or functional function, and inadequate assistance during mealtimes. It has also been demonstrated that being a woman, taking many medications, and receiving inadequate nursing staff training raise the risk of dehydration.Dehydration is a serious problem for elderly individuals with acute infections and/or chronic illnesses (cancer, diabetes, cardiovascular disease), particularly those with many medical conditions. Dehydration has been directly connected to dysphagia. Research has indicated that dysphagia worsens the clinical prognosis for the elderly. Elevated serum osmolality (>300 mOsm/kg) has been associated with a higher risk of impairment and death. The two chief physiological responses to decreased fluid intake—thirst and primary urine concentration (via the kidney)—seem to be lessened with age. Furthermore, as bodily water diminishes with ageing, fluid reserves also decrease. Furthermore, popular pharmaceutical treatments for elderly patients, such as diuretics and laxatives, may exacerbate fluid loss. Nonetheless, it seems that the degree of cognitive and functional impairment matters more than just getting older. In a study including patients with dysphagia getting thickened fluids, the water supply was evaluated, taking into account water from artificial nutrition (enteral and parenteral nutrition) as well as from food and drinks (thickened beverages). According to this study, none of the patients' estimated hydration needs were satisfied without the administration of enteral or parenteral fluids [10].

Diagnosis

Hypo- or hyper-anorexia and dehydration may be related. Hyponatremic dehydration is the most common type. Electrolyte abnormalities may occur in certain conditions. This includes imbalances in the amounts of sodium and acidosis, which is indicated by low or high bicarbonate or lactate levels. Hypoglycemia may be evident in patients who have not been able to accept oral fluids due to vomiting. Dehydration assessment can be aided by measuring urine specific gravity and looking for ketones. Free water consumption during an episode of diarrhoea in children can result in hyponatremic dehydration, excess free water consumption along with sodium excess, and bicarbonate loss during diarrhoea. This phenomenon is also observed in the syndrome of inappropriate antidiuretic hormone secretion (SIADH). The kids in these situations seem to be more dehydrated, and they might also exhibit hyponatremic seizure activity. Hypernatraemic dehydration can also occur in newborns given oral rehydration solution made with too much salt or who have lost too much free water, as in the case of diabetes insipidus [11,12]. The gold standard test for dehydration does not exist. Although tests for serum and

plasma osmolality are frequently employed in diagnosis, their accuracy may be impacted by fluid loss or acuity. A serum osmolality of more than or equal to 295 mOsm/kg is a plausible definition of dehydration brought on by water loss. Serum osmolality of more than 294 mOsm/kg was used in the 2015 Cochrane study to determine dehydration. If this information is available, weight loss of 3% or more over seven days may also be indicative of dehydration. The osmolality of urine, saliva, or tears, tear volume, number of pee voids, urine volume, bioelectrical impedance analysis, urine specific gravity, and the 2015 Cochrane review of diagnostic tests for dehydration in senior patients were not helpful as stand-alone tests for dehydration in the elderly. Dehydration should cause a blood urea nitrogen to creatinine ratio of more than10:1, yet this can be caused by an upper gastrointestinal haemorrhage, low creatinine from low muscle activity, and high urea generation. Urine tests may indicate volume depletion. Urine sodium excretion should be less than 1%, urine osmolality should be higher than 450 mOsm/kg, and urine sodium concentration should be low. In addition to being abnormal in heart failure, cirrhosis, nephrotic syndrome, and other kidney disease causes, these tests measure the renal perception of decreased blood flow.By detecting the inferior vena cava's (IVC) collapsibility with respiration, ultrasound can be used to determine a patient's fluid volume. A collapsible IVC is indicated by a fluctuation in the IVC diameter higher than 50% with respiration. Intravascular volume and right atrial pressure may be correlated with IVC collapse during inspiration. Ventilation (either mechanical or spontaneous) and cirrhosis may have an impact on the ultrasound examination of the IVC. The predictive power of IVC ultrasonography for fluid response is weak. It might be used across the board in the clinical picture [13,14].

Treatment Opinion for Dehydration

The goal of treating dehydration is to quickly replace lost fluids while also determining the source of the loss. Isotonic fluid boluses that are customized for each patient's situation should be administered to those who are dehydrated. Patients receiving higher doses of isotonic fluid are those who are more severely dehydrated. In older patients and those with heart and kidney disease, more caution is required. Small boluses should be administered to these patients, followed by regular reevaluations and further boluses as necessary. Assessments of the volume deficit and response to fluids can be made using blood pressure, heart rate, serum lactate, hematocrit (if bleeding, no blood loss), and urine output. Most cases of dehydration should be treated with an isotonic crystalloid solution. While albumin and other colloids may be useful in some circumstances, they do not enhance results. The crystalloid that is chosen should be specific to the patient. You can use a balanced crystalloid solution or regular saline lactated Ringer's solution. In large amounts, normal saline may result in hyperchloremic metabolic acidosis. Hyponatremia may result from deteriorated crystalloids. Since lactated Ringer's solution also includes potassium, people with hyperkalemia or renal failure shouldn't take it. No fluid has shown itself to be better in every patient. A rapid rise in sodium can occur in patients with severe hyponatremia and dehydration due to rapid volume replacement. Central pontine myelinolysis (CPM) may result from this. A practitioner must balance the hazards of CPM with the risks of continuing dehydration.Serum salt levels and the patient's volume status need to be closely monitored. While the patient is receiving resuscitation, the goal of the clinical and laboratory examinations should be to identify and address the cause of the dehydration [15,16]. Early symptom recognition, determining the level of dehydration, stabilization, and rehydration techniques are priorities in the management of dehydration. *Minor Dehydration*: For individuals with minor dehydration, the American Academy of Pediatrics advises oral rehydration. Babies who have been breastfed ought to keep nursing. Drinks with a lot of sugar should be avoided since they can make diarrhoea worse. Age-appropriate food can be given to children often but in moderation. *Moderate Dehydration*: To replace the estimated fluid deficit, the Morbidity and Mortality Weekly Report advises giving 50 mL to 100 mL of oral rehydration solutions per kilogram of body weight for two to four hours. Additional oral rehydration solutions should be given to replace ongoing losses.*Severe Dehydration*: Patients who are severely dehydrated need to have their fluids restored as soon as possible. Severe dehydration can cause patients to exhibit indications of poor perfusion, weak thread pulses, hypotension, tachycardia, impaired mental status, and delayed capillary refill. Intravenous fluids are necessary, with boluses of normal saline commencing at 20 ml/kg. It could be necessary to give children in hypovolemic shock multiple boluses. A point-of-care glucose test, electrolytes, and a urinalysis to check for increased specific gravity and ketones are additional priorities. At the point of care, hypoglycemia should be evaluated with a glucometer and venous blood gas testing with electrolytes or serum chemistries. Intravenous glucose should be used as a treatment for it. Between 0.5 and 1 gm/km is the dosage. This means that 5 ml/kg to 10 ml/kg of D10, 2 ml/kg to 4 ml/kg of D25, or 1 ml/kg to 2 ml/kg of D50 are being expressed. D50 is often only used with big bore intravenous lines in individuals who are adolescents or adults in size [11,17–20].

Discussion and Conclusion

An introduction to dehydration illnesses, including their different origins, epidemiology, and alternate treatments, is given at the beginning of our review articles. Our results show that ORS and other supplements work well as drugs. More RCTs are required to address dehydration problems. We want to do an initial study on dehydration conditions in the future. Future counselling-based research in our nation or state will evaluate patients' physical and mental

health and generate more precise data on dehydration conditions and their treatment, thanks to the assistance of our colleagues.

Funding
Nil

Ethical Statement
Honest and moral behaviour is required of pharmacists. A pharmacist abstains from behaviours, attitudes, and unfavourable working conditions that contradict their commitment to acting in their patient's best interests and impair their capacity to make informed decisions. A pharmacist stays in good standing with their profession.

Acknowledgement
The authors would like to thank, Azad Institute of Pharmacy & Research (AIPR), Lucknow, U.P, India, Lucknow, Uttar Pradesh, India for extending their facilities.

Conflict of Interest
The authors attest that they are free of any known financial or personal conflicts of interest that would taint the findings of this study.

Informed Consent
Using websites, review articles, and other sources to produce research content.

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