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Review Article

Overhydration: A boon or bane

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ABSTRACT

Water is necessary for human cells to function properly. However, consuming more water than necessary might lead to overhydration, which could have major negative effects on one's health. Water intoxication, also known as dilutional hyponatremia, only occurs when a person consumes more water than their kidneys can ordinarily excrete. If the balance between water (fluid) and electrolytes is not kept, dehydration and overhydration can cause morbidity and mortality. Overhydration is associated with cardiopulmonary problems, hyponatremia, edoema, gastrointestinal dysfunction, and surgical complications. To gain a thorough understanding of the causes of and effects of overhydration on human health, a literature study was conducted.

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1. Introduction

Excessive drinking of fluid leads to the expansion of ECW (extracellular water), which is caused by the imbalance in fluid distribution between ECW, and ICW (intracellular water) volumes that results in SCI (systemic chronic inflammation).¹ Overhydration usually causes disturbances in the electrolyte balance of the body and leads to a deficiency of sodium levels in the body which results in cerebral oedema and seizures. Straw-coloured to transparent yellow is the generally urine pigment of a person who drinks the normal amount of water needed by the body. Although it is mostly believed that the healthiest sign of hydration is clear urine, but urine with no colour/pigmentation may be an indication that one is overdrinking fluid. Hydration varies from person to person, the main factors can be an individual's height, weight and exercise patterns. Overhydration or ineffective mechanism of the body to remove it can result in high fluid levels i.e. expansion of ECW; which results in dilution of the body electrolytes.

NAD(2004) fluid recommendation for the women ageing between 19 to 30 years is approximately 2.7 liters of fluid per day and men ageing between 19 to 30 years is 3.7 liters of fluid per day.

When the quantity of water intake exceeds that of water excretion in the kidney, it results in hyponatremia. Symptoms of hyponatremia usually occurs when the person consumes 3 to 4 litres of water.² Healthy adult has about twenty litres per day and does not exceed eight hundred to thousand milli liters per hour of the water excretion rate. Thus, eight hundred to one thousand milli liters per hour is the maximum amount of water to avoid hyponatremia; a person with normal kidney functioning can consume.

Sports person particularly, athletes, are most likely to develop hyponatremia, who mostly drinks excessive amount of water to prevent dehydration in the body. Psychogenic polydipsia is a condition in which people might drink excessive amount of water that results in hyponatremia symptoms and further complications. Overhydration results in excessive fluid and deficiency of sodium in the body. Thus, intake of water or fluid more than required can cause hyponatremia in the blood. If the functioning of the pituitary

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gland, kidneys, liver and heart are normal, then the person who drinks excessive amount of fluid usually does not develop overhydration.

People who suffer from renal diseases and thus are not able to excrete normal urine (ratio of water intake and excretion should be balanced) suffers from overhydration. Overhydration is mostly common among people with a heart disorder, kidneys, or those who have immature kidneys or liver. Antidepressants like certain drugs can also cause overhydration. Syndrome of unsuitable antidiuretic hormone production may also result in hyponatremia.

2. Common Signs and Symptoms

Overhydration most common symptoms are changes in mental state such as confusion or disorientation and symptoms also includes nausea, vomiting and headache due to imbalance in the electrolytes level. If overhydration is not treated, it can cause spasms or cramps in muscles, fits, oblivion (insensibility) and can even lead to coma.

Drinking water in large quantity instantly after ingestion of nutriment, weakens digestion by expanding intestinal pressure and thinning digestive enzymes. When the fluid is ceaselessly taken in excess, it may lead to renal calculus and chronic renal diseases.

Sleeping problem is the common etiology of hyponatremia and overhydration. Recurrent micturation during 10pm till morning, which is commonly known as nocturia, can also break up doze with recurrent trips.

3. Etiology of Overhydration

3.1. Overhydration and fluid overload

Some mental disturbance persuade to high level of water intake, such as psychogenic polydipsia; condition in which an individual consumes excess water and which can further results in consequences such as heart and urinary tract fails to perform its function.³ Overhydration results in hyponatremia, which is one of the threat for disrupt bones; hyponatremia usually reduces calcium in the bones and thus reduces the bones density and hence causing osteoporosis and osteomalacia.^{4,5}

3.2. Overhydration in athletes

Overhydration in endurance athlete's is linked with excess fluid consumption which results in hyponatremia usually EAH i.e. Exercise Associated Hyponatremia. When EAH is severe, it results in swelling of cerebral part of brain which further result in death. from 3 percent to 29 percent marathon runners are included in the incidences of EAH.⁶ NSAID's that are used for relief in pain may further aggravate the complications of overhydration in the athletes.

3.3. Subclinical overhydration

Overhydration can also be caused by subclinical fluid overload and overimposing, most particularly in patients who are hospitalized.⁷

Various studies and researches show that inexact recommendation of water results in water overload. Inexact recommendation resulted in heart failure, pulmonary edema, and kidneys impairment where some patients received up to 5 liters of H₂O per day and 500 milli mol/day of excess sodium and chloride.⁸

3.4. Overhydration and intestine role in aciurgy patients

Discernment obstacle such as intestinal obstruction are a common cause of grief following gastrointestinal surgery. Intestinal edema plays a major role in discernment GIT dysfunction.⁹ Surgical injury results in sodium and H₂O retention;¹⁰ excess fluid in the discernment time can lead to edema in the muscles, tissues, peripheries, GIT and lungs. GIT edema is correlated with syndetic swelling,⁹ that is an rise in gastric constraint, lessen splanchnic blood flow and kidneys contractility.¹¹

*Schnuriger et al.*¹² reported that the patients who received ≥ 10.5 L of fluid in the first 72 hours post primary colonic surgery; which is a period where a person is at 5-fold increased risk of syndetic cleave, suffered from syndetic aperture.

3.5. Overhydration and profound vein embolism in hospitalized patients

Deep Vein Thrombosis is common among surgical rehabilitant. Overhydration impaired coagulation is reported in the state of affairs of disquisition.¹³ It has been exemplified by *Ruttman et al.*¹⁴ that elevated agglomeration was associated with reduced RBC in the blood circulation. Hemodilution (reduced RBC in the blood circulation) results in lessen activity of dicoumarol components, therefore, inclines to clot formation.¹⁴

4. Overhydration and Covid-19 Incidence

BI-derived (Bioelectrical impedance analysis) hydration percentage grounded on COVID-19 patients showed a 43 percent assorted with overhydration, 48 percent assorted as euhydrated, and 7.9 percent assorted as dehydrated patients. Chronic overhydration was affiliated with 37.5 percent, moderate overhydration was with affiliated 18.8 percent and mild overhydration was affiliated with 25 percent in non-survivor COVID-19 patients.¹⁵

5. Overhydration and PD (Peritoneal dialysis)

PD patients usually suffers from overhydration, with the frequentness ranging from 56.5-73.1 percent.¹⁶ Recent

focus has shifted from small-molecule clearance to fluid overload, when considering risk factors for mortality and dialysis inadequacy among PD patients.¹⁷ Water overload is considered a contributor to mortality among PD patients due to its association with complications such as hypertension,¹⁸ heart failure, increased heart rate and arterial stiffness, as well as inflammation, undernutrition and loss of residual kidney function.

6. Discussion

Water is essential for life, and maintaining optimum hydration is important for the body to function efficiently. Overhydration is defined as the higher ratio of ECW/TBW. It significantly increases the risk of both grief and morbidity. Fluid encumber has been linked with cardiopulmonary disarray, hyponatremia, edema, GIT dysfunction, and disquisition deterrent. Hence it is always recommended to drink optimum amount of water on a daily basis.

7. Source of Funding

None.


8. Conflict of Interest

None.

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