Fluid Imbalance in Geriatrics: The Need for Optimal Hydration

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Abstract

In the elderly, increased morbidity and mortality are often linked to fluid and electrolyte imbalances due to age-related physiological changes, hence monitoring and maintaining healthy hydration levels is important for the geriatric patient population. Patients recuperating from an illness at home maybe likely to neglect proper fluid intake and energy management, which hampers their timely recovery. In elderly patients with concurrent illnesses and therapies, dehydration is a common condition that often remains unnoticed despite persistent disease symptoms. Oral nutritional supplements such as scientifically formulated oral rehydration therapies (ORTs) have been recommended in such cases. These supplements can be further supported by nutritional counseling, diet modification, nursing interventions, and educating the patients. The main aim of this review is to generate a greater understanding of the fluid intake requirements for the elderly, thus contributing to the prevention of the negative effects of dehydration. This review comprehensively highlights the need for treatment, recovery from illness to supportive care to address a patient’s needs. Maintaining an optimal hydration level aids the efficacy of therapy in elderly patients. Hospitalized patients are considered to be at risk of dehydration, whereas patients at home completely ignore the need for fluid and energy management, leading to hospital readmissions and delayed recovery. Guidelines are available for treating, managing, and maintaining ideal hydration levels; these are considered to be imperative in managing elderly patients with chronic illnesses.

Introduction

In the past 30 years, human life expectancy has increased due to healthier lifestyles that include sufficient food, better hygiene, and improved medical care resulting in a reduction in mortality, although recently, the COVID-19 pandemic had a considerable effect on reducing survival and longevity.1 However, an increase in life expectancy has increased the risk of disability and diseases associated with aging such as cancer, obesity, diabetes, depression, and dementia.2 According to the report from the Office of Disease Prevention and Health Promotion, 60% of the “Baby Boomers” (those born between 1946 and 1964) population, who turned 65 years old in 2011 will be managing more than one chronic condition by 2030.3 Thus, clinical management of these chronic conditions and the patients’ disabilities will increase the financial burden on our healthcare system.4

The average life expectancy has improved globally and by the year 2030, one in every six people will be ≥60 years old, which will double for people in this age bracket (approx. 2.1 billion) by the year 2050.4 The World Health Organization (WHO) 2021 fact sheet projected that the population aged ≥80 years is expected to increase by three times from the years 2020 to 2050 and reach approximately around 426 million.5 Thus, the United Nations General Assembly referred to the years 2021 to 2030 as the “Decade of Healthy Aging.”6

In India, as per the 2019 report, over 139 million people are aged over 60 years, which accounts for >10% of the country’s total population. This is expected to almost double to 19.5% in 2050, with 319 million people over ≥60 years and would mean that one in every five Indians would likely be a senior citizen. These statistics also project an increase in the demand for health services.7

Physiological Changes of Aging

Biological aging is associated with a cellular and molecular impairment that gradually impacts the body. The cellular changes resulting from errors in protein synthesis, free radicals and radiation, and/or protein cross-linking are neither linear nor consistent.7-10 Physiological changes with aging are caused by functional deterioration in the organ systems. Studies have shown a gradual decline in the performance of many organs over the lifespan.8 Part of this is due to a loss of healthy cells from these organs, resulting in the reduction of reserve capabilities. For example, in aging lungs, gas exchange is impaired with reduced vital capacity and compromised expiratory flow rates. Similarly, with age, creatinine clearance reduces while serum creatinine levels remain relatively unchanged because of an age-related proportionate reduction in creatinine production. This showcases an indirect indication of underlying sarcopenia.11 Also, functional changes are observed in the gastrointestinal (GI) system resulting in changed motility patterns that occur with senescence. Consequently, in the elderly population, conditions, like modified hepatic drug metabolism and atrophic gastritis, are common.2-15 Aging also leads to a gradual elevation of blood glucose levels due to multiple reasons. Epidermal atrophy is also associated with aging due to alterations in collagen and elastin that lead to loss of skin elasticity. Moreover, a decline in lean body mass due to muscle atrophy is observed with age. This combined with the loss of muscle mass affects the mobility of elderly patients.16-19

The elderly population is more prone to reduced renal reserve. They have a low tolerance to dehydration and volume loads and are also more likely to have a diminished renin response and accumulate potassium.20,21 There is also a reduction in response to aldosterone and vasopressin. The reabsorption and secretion of solutes are blunted by tubular senescence due to which, electrolyte and acid-base abnormalities are commonly observed in elderly patients. In older individuals, the response of antidiuretic hormone (ADH) is also attenuated, which makes sodium and water conservation difficult.22-25

Water Homeostasis

Thirst is a sensation generated and controlled by the hypothalamus and majorly contributes to maintaining body fluids homeostasis. Water homeostasis in the body is attained
by balancing water consumption and water loss. As depicted in Figure 1, water ingestion is triggered by thirst, whereas water loss is delimited by the antidiuretic action of vasopressin. The ratio of solute content to body water constitutes the osmolality of body fluids, including plasma. The most important determinant of plasma osmolality is the serum sodium concentration (Na+).

Age-related Changes in Water Homeostasis/decreased Thirst Drive: Increased Demands

The elderly population exhibits decreased feelings of thirst resulting in reduced fluid intake. The homeostatic ability also gets reduced with age, accompanied by fluctuations in water intake and excretion. This may predispose the elderly to sodium and water imbalance, leading to alterations in plasma osmolality and body fluid compartment volumes. The frequency and severity of osmolality fluctuations are high in the elderly population. These result in hypo and hypernatremia, as well as hypo and hypervolemia.

In the healthy elderly population, reduced water intake has been observed in response to water deprivation and thermal dehydration; this combined with reduced renal water-conservation capacity, may expose the geriatric population to the risk of dehydration. In diseased states, there is an increase in water losses or physical incapacity of the elderly population which prevents access to water. Global warming and recent recurrent heat waves have affected the elderly population disproportionately. With a reduced capacity to excrete water, water and body fluid can overload along with hyponatremia can occur. The multitude of neuroendocrine changes observed in the elderly affects fluid and electrolyte homeostasis. This is further compounded by the dietary restrictions and concomitant medications consumed by such individuals.

According to the Royal College of Nursing and National Patient Safety Agency (2007), fluids make up 50–65% of the body in healthy males and 45–60% in healthy females. Hydration is pivotal in maintaining the range of bodily functions including cognitive function, and bowel and bladder health in healthy adults. All older adults may need frequent motivation when it comes to fluid intake. In general, an adequate intake of fluid for older adults is defined as 2.0 L/day for men, and 2.5 L/day for women and men, respectively. Women need at least 1.6 L/day of drinks and men 2.0 L/day of drinks, assuming that 20% of fluids come from eating other foods. Clinical and environmental factors (that is, higher temperatures) may alter individual fluid needs in some patient groups.

Water is the major constituent of cells and tissues and an important nutrient, however, it is often forgotten in dietary recommendations. Adequate hydration maintains vascular volume and blood circulation, which is essential for the smooth functioning of all tissues and organs. In case of severe dehydration, the function of the organ systems gets hampered leading to life-threatening conditions.

Dehydration

Dehydration is the deficiency of total body water content and occurs when the body loses more fluid than it takes in and affects delicate fluid-salt imbalance.

There is no universally accepted definition of dehydration however, as per European guidelines it is referred to as “low-intake” rather than “water-loss.” As per the dehydration council, the definition is more focused on “salt-loss” and “water-loss.” Dehydration is a state of inadequate intracellular water content in the body, with or without dys电解rteytemia, caused by either insufficient intake and/or excessive loss of water, which is biochemically and/or clinically significant. There is abundant literature depicting a lack of clarity and consistency in defining dehydration. However, the term dehydration mainly suggests the process of intracellular or extracellular water loss.

Classification/Dehydration Types

Electrolyte Imbalance

Fluid and electrolyte balance is vital in maintaining homeostasis in the body, as it has a significant role in maintaining normal body processes. This balance must also be required to be maintained while managing various clinical conditions or diseases. Electrolyte imbalance is a common presentation in many diseases and should be correlated with the clinical findings for an effective treatment. It is also commonly observed in critically ill older patients and is reported in diseases such as severe cardiovascular events (e.g. myocardial infarctions), acute or chronic renal failures, etc. The crucial electrolyte imbalances are indicated by hypo and hyperstates of sodium, potassium, calcium, and magnesium levels.

Dehydration in Geriatric Population

Elderly individuals have a high-risk of developing dehydration vs younger adults. The main factors to consider in preventing dehydration is age-related alterations in

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Fig. 1: Types of dehydration
water metabolism and fluid imbalance. In the elderly, as the thirst sensation decreases with aging, a reduction of liquid intake and an increase in liquid losses are observed. Apart from these signs, other frequent risk factors are, visual issues, decrease in functional status, decrease in mobility, delirium, confusion, and cognitive alterations leading to inability to communicate.44

Other factors which can increase the risk of dehydration in the elderly are medications such as sedatives (which lessen the urge to drink), laxatives, diuretics, and acute pathologies with fever or those that cause diarrhea and/or vomiting.44 In addition, concomitant medications may increase urination in cases of diabetes; cardiac disease, cancer, and acute infections have also been associated with additional fluid loss.45,46 Furthermore, medical restrictions on water intake in patients with renal, cardiac, and hepatic disease may paradoxically cause intravascular dehydration despite an overall fluid overload. Due to aging, many natural changes occur in the body that requires more attention to maintaining homeostasis. Smaller fluid reserve due to decreased body water, decrease in thirst response, and decreased capacity of the kidney to concentrate urine compared to younger adults and children can lead to rapid dehydration in geriatrics.47

In a cross-sectional survey, data obtained from a subgroup of internal medicine (IM) Indian physicians, regarding knowledge, attitude, and practices (KAP) in managing fluid, electrolyte, and energy (FEE) deficits in elderly patients with acute nondiarrheal illnesses were analyzed.48 A four-domain online questionnaire was developed, to assess the KAP of physicians in treating FEE deficits in acute nondiarrheal patients using FEE drinks in India. The domains assessed knowledge of physicians in—(1) FEE deficits, dehydration, definitions, biomarkers, clinical challenges, signs, and symptoms; (2) approach towards the use of FEE drinks in different clinical situations; (3) prescription and recommendations of FEE drink in current practice; and (4) physician-perceived patient outcomes with questions surrounding the impact of FEE management on a patient’s recovery. The questionnaire was developed using a three-phase approach—consultation with key opinion leaders (KOLs) in India, literature search, validation, approval, and improvement through feedback received from the KOLs. The questionnaires were administered through an online platform from September to October 2021. Verified anonymous physicians were recruited to participate and provided informed consent. No ethics approval was required as no identifiable information or patients’ personal data were obtained. This allowed for the examination of the differences in KAP amongst different groups of physicians. Physicians who gave formal written or electronic prescriptions of FEE drinks to 50% or more of their eligible patients for FEE deficit management, were defined as prescribers. As there were no specific guidelines nor literature that defined prescribers and nonprescribers, the criterion of a 50% or more prescription rate was obtained after discussions with the KOLs.48

Among the 59 IM physicians interviewed, 47% were of the opinion that undetected dehydration had a high impact on health, out of which 61% assess their geriatric patients for hydration levels and only 29% recommend FEE to elderly patients to >70% of their eligible elderly patients. This suggests that though the physicians were aware of the causes of the increased risk of dehydration in the elderly, they did not proactively assess the dehydration and oral FEE recommendations in such patients. It was observed that around 25% of the IM physicians spent >5 minutes providing hydration advice to eligible geriatric patients.49

They recommend ready-to-drink (RTD) fluids to only 39% of eligible geriatric patients out of which only 14.5% recommend RTD fluids with electrolytes and energy. Around 76% of the IM physicians agreed that oral FEE management recommendations aid in improving the speed of recovery from nondiarrheal illnesses in their elderly patients while all of them (100%) agreed that recovery duration is shortened in elderly patients taking RTD format compared to those taking non-RTD fluids. The mean estimated decrease in recovery duration was 3.85 days.49

The physicians agreed on the impact of oral FEE management in recovery from nondiarrheal illnesses in elderly patients, however, they spend limited time on hydration advice. There is an opportunity for physicians to educate themselves regarding the importance of screening and proactively managing their elderly patients with acute nondiarrheal illnesses for dehydration.48,49

Low Water Intake and Geriatric Population
Evidence in the literature demonstrates the effect of water supplementation on health and hydration. 50,51 A randomized controlled trial including Japanese men and women with fasting blood glucose levels ranging from 90–125 mg/dL, demonstrated potential benefits of water supplementation are crucial in maintaining body temperature, fading out blood waste materials, lowering blood pressure, and protecting kidney function, indicating that increasing water intake leads to improved health benefits. Nutrition and Health Examination Survey using data from 2011–2014 demonstrated that cognitive performance mainly immediate and delayed recall scores, verbal fluency, and awareness/processing speed were moderately associated with hydration status and water intake.51 A qualitative study on 24 older adults and nine informal caregivers supported a multidisciplinary approach to promote hydration in care for older people with more complex needs.53 These studies on the elderly suggest the need for increasing awareness and ensuring adequate hydration practice as per the individual needs of older people.

Clinical Presentation of Dehydration in Elderly
Identification of symptoms of dehydration in older adults is important for the assessment, management, and treatment of patients at risk. It is not always feasible to diagnose physical symptoms of dehydration in the elderly. There can be many other common health conditions mimicking the symptoms of dehydration in the senior population.

Many of the dehydration symptoms in the elderly are not recognized. The early signs including dry mouth, fatigue, darker urine, lightheadedness, and muscle cramps are nonspecific and could be easily misdiagnosed for other medical conditions, effects medications, or aging. The signs and symptoms may vary among older adults (Table 1). Confusion, delirium, dry lips, sunken eyes, dry skin, strong-smelling urine, oliguria (fewer than four times a day urinating), low blood pressure, and disorientation are some of the other characteristic features to consider.54

Common symptoms of dehydration include thirst, fatigue, headaches, muscle cramps, lightheadedness, dry skin and lips, dark urine or decreased urine output, dizziness, orthostatic hypotension, and palpitations. In case of severe dehydration, patients may present with fever, hypotension, tachycardia and tachypnea, and may appear lethargic upon observation. As per a Cochrane review, predictors of severe dehydration in the elderly are increased capillary refill time, sunken eyes, poor skin turgor, dry axilla, mucous membranes, tongue, blue lips, sudden drops in blood pressure, dizziness, weakness, thirst, urine color, and appetite.55

Complications of Dehydration in Elderly
In older adults with comorbid conditions, dehydration can be fatal. In older adults, it is the most common fluid and electrolyte
**Table 1:** Signs and symptoms assessed for accuracy in detecting dehydration

<table>
<thead>
<tr>
<th>Body system</th>
<th>Sign/symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth (19 tests)</td>
<td>Dryness of tongue and oral mucosa</td>
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<tr>
<td></td>
<td>Tongue furrowing</td>
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<td></td>
<td>Tongue coating</td>
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<td>Decreased saliva</td>
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<td></td>
<td>Ropey saliva</td>
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<tr>
<td></td>
<td>Dry or cracked lips</td>
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<td></td>
<td>Blueness of lips</td>
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<tr>
<td>Eyes (three tests)</td>
<td>Hypotonia of the ocular globes</td>
</tr>
<tr>
<td></td>
<td>Reduced tear secretions</td>
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<tr>
<td>Skin (12 tests)</td>
<td>Reduced turgor</td>
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<tr>
<td></td>
<td>Crinkling and dimpling</td>
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<tr>
<td></td>
<td>Dryness</td>
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<tr>
<td></td>
<td>Reduced axillary and palmar sweating</td>
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<tr>
<td>Cardiovascular (five tests)</td>
<td>Increased capillary refill time</td>
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<tr>
<td></td>
<td>Hypotension</td>
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<tr>
<td></td>
<td>Orthostatic hypotension</td>
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<td></td>
<td>Tachycardia</td>
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<td>Urinalysis (12 tests)</td>
<td>Volume</td>
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<td></td>
<td>Color and cloudiness</td>
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<td></td>
<td>Specific gravity (two measures)</td>
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<td></td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td>Glucose and ketones</td>
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<tr>
<td></td>
<td>Blood, protein, leucocytes, and nitrites</td>
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<tr>
<td>Temperature (one test)</td>
<td>Pyrexia</td>
</tr>
<tr>
<td>Symptoms (four tests)</td>
<td>Thirst</td>
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<tr>
<td></td>
<td>Headache</td>
</tr>
<tr>
<td></td>
<td>Lethargy</td>
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<tr>
<td></td>
<td>Feeling &quot;out of sorts&quot;</td>
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DRIE: dehydration recognition in our elders. Source: Adapted from Bunn to Hooper (2019) and Hooper et al. (2016a)

Assessment of Hydration Status

The assessment of dehydration with the help of only physical examination may often be challenging in the geriatric population as many signs and symptoms are overlapping with the natural process of aging.57 Clinical assessments using combinations of serum biomarkers as an indicator of dehydration such as serum urea, sodium, creatinine, urine specific gravity, and osmolality, can be more useful to reach a definitive diagnosis.58 Furthermore, body fluid loss by weight change as a percentage of body weight is also a good assessment measure to confirm dehydration. The fastest way to diagnose dehydration in the elderly is rehydration and to see if the patient recovers. Nevertheless, medical diagnosis using clinical examination, lab tests, and physical examination is still essential.58

The best way to diagnose dehydration in an elderly population using signs, symptoms, and lab parameters is given below:

- Urine color chart—careful monitoring of the urine color chart is the most effective way to identify the risk of dehydration. However, certain medications, vegetables, and fruits can also affect the urine color, hence this can be preferred in healthy populations with intact renal function.57,58
- Serum markers—increased serum sodium, serum osmolality, and the ratio of blood urea nitrogen–creatinine, hematocrit, hemoglobin, and urea are reliable indicators of dehydration. However, the accuracy may vary at an individual level.58
- Clinical examination—clinical history, comorbidities, and medication history may help in diagnosis as well as identifying the cause of dehydration. Some important signs and symptoms include a dry tongue, thirst, altered sensorium, weakness, high-colored urine, dry tongue, loss of skin turgor, delayed capillary refill time, postural alterations in blood pressure and heart rate, and in cases of volume depletion. Skin turgor on the sternum and axillary sweating is more reliable in younger than older adults.
- Laboratory parameters—the parameters considered for diagnosing dehydration include checking urine color and specific gravity, serum sodium, and blood urea nitrogen-creatinine ratio.40,57,58

**Special Situations**

**Use of Concomitant Therapy (Antidiabetic, Antihypertensive Medications, etc.)**

There are certain groups of drugs that predispose the elderly to dehydration. The use of anticholinergic drugs causes dry mucous membranes in the mouth.59 A cross-sectional study reported diuretics, angiotensin receptor blockers (ARBs), angiotensin-converting-enzyme inhibitors (ACEi), statins, and β-blockers contributing to dehydration. Diuretics reduce the diluting capacity of the kidney and exert sodium wasting. Inhibition of ACE can affect the natriuretic and diuretic action of atrial natriuretic peptides.60 Cardiac glycosides and amphetamines can also increase the risk of dehydration.38

**End-of-Life**

Patients with a deteriorating chronic illness at the end of life have a reduced oral intake. This may be caused due to illness, treatment-related symptoms, medications, or complications, such as dysphagia, nausea or vomiting, and generalized weakness. There is also a reduced urge to drink during the end-of-life days. All these factors contribute to dehydration and decreased quality of life.51,62

**Key Challenges in Poor Fluid Management in Geriatrics**

- Water loss, if not replaced in a timely manner, may lead to impaired thirst mechanism, altered mentation, immobility, and overdose of drugs leading to coma.
- Loss of water from kidneys due to acute and chronic renal disease, medications such as diuretics, postobstructive diuresis, salt-wasting tubular disease, hypoadosteronism, Addison disease, hypoglycemia, etc.
- Gastrointestinal (GI) tract-related water loss due to vomiting, fistulas gastric suctioning.
Fluid Imbalance in Geriatrics

- Insensible losses due to acute illnesses like fever, malaria, dengue, typhoid, sepsis, hyperthyroidism, chronic obstructive pulmonary disease, asthma, medications, etc.
- Misdiagnosis—the dehydration symptoms may be mistaken for a diagnosis of other illnesses like cognitive dysfunction or depression.
- Risk of overhydration or fluid overload—overhydration is an independent risk factor for morbidity and mortality in elderly people with heart failure, acute, or chronic renal failure, or those on dialysis.
- Hydration health literacy—there is a need to collect more information about the specific amount of fluid that the elderly individuals consume and understand the elderly population’s awareness of hydration, and educate/support necessary fluid management practices.
- Lifestyle management—unhealthy lifestyle and stress (unhealthy diet, smoking, alcohol consumption, and drug abuse) could affect daily hydration.
- Nutrition management.
- Lack of compliance.

**Concept of Appropriate Hydration (Under/Overhydration: Water and Electrolytes Balance Together)**

American Society for Parenteral and Enteral Nutrition (ASPEN)/European Society for Parenteral Nutrition and Metabolism (ESPEN)/National Institute of Nutrition—Indian Council of Medical Research (NIN-ICMR) Guidelines

- American Society for Parenteral and Enteral Nutrition (ASPEN)—acute illnesses are associated with increased fluid (about 3 L/day) and nutritional requirements, which can impact recovery. 
- European Society for Parenteral Nutrition and Metabolism (ESPEN)—elderly women at least 1.6 L (~8 glasses) and elderly men at least 2 L (~10 glasses) of drinks per day recommended by ESPEN. 
- National Institute of Nutrition—Indian Council of Medical Research (NIN-ICMR)—water requirement guidelines mention 32–58 mL/kg body mass in women and 27–52 mL/kg body mass in men. However, water requirements for older age are 33 mL/kg for a sedentary lifestyle and 38 mL/kg for moderate activity.

**Current Guidelines for Water Intake: National Institute for Health and Care Excellence (NICE) guidelines/WHO/Indian Guidelines**

- The WHO recommendations for those over 70 years are 3.7 L/day and 2.7 L/day for males and females, respectively.
- The NICE guidelines suggest 25–30 mL/kg/day of water with 1 mmol/kg/day electrolytes (sodium, chloride, and potassium), 50–100 gm/day glucose for normal daily FEE requirement, and maintenance intravenous (IV) fluids.

**Management of Dehydration with Concomitant Therapies**

Elderly patients with concomitant condition and treatments are at a high-risk of dehydration, which remain undetected due to ongoing disease conditions and symptoms. Patients on diuretics are most of the time affected by the two most common electrolyte disorders—hyponatremia and hypokalaemia. The adverse effects could be carefully monitored with dose adjustment and replacement of electrolyte losses.

The risk factors associated with hyponatremia include a low sodium diet, low body mass, impaired renal function, water intake increasing behavioral disorders (e.g., polydipsia and psychosis), volume reduction with enhanced sodium loss, coexisting conditions like hypothyroidism, potassium and magnesium depletion. Concurrent medications that affect water balance include antipsychotics, antidepressants, antiepileptics, nonsteroidal antiinflammatory drugs, and chemotherapeutic agents. Elderly patients on thiazide diuretics have been found to be most commonly affected by hyponatremia. The symptoms may vary from headache to nausea in mild hyponatremia to seizures and coma in severe cases depending on the severity and rapidity of the onset. Delirium has also been reported in elderly patients with diuretic-associated hyponatremia in addition to the existing burden of dementia in elderly patients.

Hyponatremia is managed to avoid excessive rapid alteration or overalteration of fluids administered to the patients, which may increase the possibility of developing iatrogenic cerebral edema, which may lead to severe consequences. Selecting appropriate hypotonic infusates and considering the ongoing fluid losses while treating hyponatremia is important.

Hypokalaemia on the contrary leads to serious consequences like fatal cardiac arrhythmias. Heavy doses of thiazides and loop diuretics (nonpotassium-sparing diuretics) used in such cases were linked with a greater risk of sudden death for unknown reasons. Hypokalaemia may also lead to increased blood pressure, increased risk of stroke, apart from the other cardiovascular risk factors. Thiazide-related hypokalaemia may also lead to glucose intolerance due to reduced insulin secretion and insulin sensitivity.

Mild hypokalaemia may be managed by terminating diuretics and administering oral potassium supplements (potassium chloride). Patients with underlying cardiac disease require more attention with prompt replacements even in cases of mild hypokalaemia. In such cases, IV replacement is considered more appropriate. Since chronic thiazide or loop diuretics usage can cause magnesium deficiency, it is crucial to check for serum magnesium levels and adequately replace them with potassium replacement. It is important to balance the potassium levels in elderly patients as aging leads to decreased capability of kidneys in excreting excess potassium which may lead to dehydration due to high levels of potassium accumulation in the blood.

**Fluid Intake Recommendations are Less Common and Detailed than Food Recommendations**

The absence of studies and national guidelines that are specifically intended for the elderly considerably compromises the safety and quality of life of the geriatric population. There is significant literature and guidelines available for food recommendation but the recommendation for fluid intake is scarce. Understanding the existing recommendations regarding fluid intake for the elderly is crucial since it helps to recognize the potential complications associated with aging, develop specific guidelines, and support the overall well-being of older adults.

**De-escalation Phase of Therapy—transitional from Inpatient to Outpatient (IV Fluids to Oral) Management of Conditions**

Oral rehydration therapy, which according to WHO reduced osmolarity oral rehydration salts (ORS) containing 13.5 gm/L glucose, 75 mEq/L sodium, 65 mEq/L chloride, 20 mEq/L potassium, and 30 mEq/L citrate with osmotic pressure of 245 mOsm/L should always be the preferred method if the patient is able to eat and drink. IV fluid management is a preferred approach to rehydrating in certain conditions where dehydration cannot be managed using ORTs such as patients with severe dehydration and in physical conditions/disabilities where ORT cannot be administered. ORT is the giving
of fluid by mouth to prevent and/or correct the dehydration caused due to nondiarrheal illness with ORS therapy. The elderly may require IV therapy for several acute or chronic health conditions. The transition from IV to oral fluid that is, the de-escalation phase of therapy should be performed safely and carefully. Considering the physiological and anatomical changes that occur due to aging, de-escalation from IV to oral should include formulations with the right balance of FEE. Oral fluids should be encouraged as part of the de-escalation process upon stabilization.

Gaps in Current Knowledge
Resources available to guide ideal water intake in the geriatric population are limited. The recommendation in guidelines such as ASPEN, ESPEN, WHO, NIN-ICMR, and NICE has provided a range of adequate water intake needed in older adults. Despite the availability of these guidelines, there is a paucity of clinical evidence-based data on the geriatric population in India. The guidelines and recommendations are mainly available for older adults with diabetes but not in nondiarrheal cases with comorbidities and concomitant therapies. The need for a recommendation for the management of nondiarrheal acute and chronic conditions in the elderly is needed. The research areas to address the identified evidence gaps for treatment decision-making will mainly include monitoring of prescription and intake assessment, prescription habits, identifying indicators for early detection, and early treatment and management.

Water Intoxication: Etiology and Pathophysiology
Water intoxication is an uncommon condition observed in a variety of different clinical settings. Most of the time this condition remains unrecognized in the early stages with the symptoms of disorientation, confusion, nausea changes in mental state, and psychotic symptoms. Timely diagnosis of this condition will help prevent severe hyponatremia leading to seizures, coma, and death. The increase of extracellular water without a corresponding increase of intracellular solutes causes imbalance and dilutes the extracellular fluids driving excess water to move into the cells to balance the solute concentration in the cellular environment. Syndrome of inappropriate ADH (SIADH) secretion is characterized by hyponatremia, excessive urine sodium, increased urine osmolality, and decreased serum osmolality in a euvolemic patient without edema. Elderly patients are more prone to the risk of developing SIADH due to elevated ADH and atrial natriuretic hormone levels along with the increased response to osmotic stimulation. Congestion also known as fluid overload, is commonly observed in patients presenting with heart failure, kidney failure, and protein deficiency. Congestion is not easily diagnosed with simple clinical examination and hence more objective measures for diagnosing congestion at early stages are required. A commonly used treatment for congestion is diuretics however, there is no evidence of randomized trials demonstrating the effect of diuretics on mortality in chronic heart failure (CHF) patients. There is a need for future research to determine a robust method of detecting and then treating clinical congestion for better outcomes. Additionally, in patients undergoing pituitary surgery, special care has to be provided since strict monitoring of their fluid intake and serum sodium levels is essential.

Overhydration and water retention can occur because of administering IV fluids, blood transfusions, and steroids. The symptoms may range from nausea, fatigue, blurred vision, and headache in the early stages while pulmonary and brain edema in extreme cases leads to fatal effects or death. Elderly people have decreased ability to excrete water load compared to younger people and thus are more prone to dilutional hyponatremia (water intoxication). Excess-free water ingestion is iatrogenic in a few cases. Patients with CHF, hypoproteinemia, and liver or renal disease are at an increased risk of water intoxication.

Recommendations Summary
Interventions
Interventions for adequate hydration and maintenance of electrolyte balance in older people need to be implemented routinely in clinical practice. These interventions should be individualized and comprehensive and need a multidisciplinary approach.

Counseling
Prevention is the first step in the management of dehydration. Counseling plays a pivotal role in the prevention and management of consequences of dehydration, once it sets in, in older adults. Awareness about physiological changes occurring due to age, medical history, environmental factors, awareness among caregivers, and healthcare providers is crucial. Elderly people are most of the time dependent on their family members for many daily activities; hence counseling the caretakers for their nutritional and dietary needs, fluid restoration and rehydration therapy is equally important.

Nutritional/Food Modification
- Commercial ORT solutions over homemade solutions are recommended to avoid the risk of preparation errors.
- Scientifically formulated oral drinks for ORT should be preferred.
- Carbonated beverages and fizzy energy drinks should be avoided.
- High potassium in fruit juices is a concern in patients with diabetes, chronic kidney disease, renal failure, adrenal disease, and people on Angiotensin—ACEI, ARBs, or potassium-sparring diuretics.

Oral Nutritional Supplements
Scientifically formulated oral drinks and ORTs are easy sources of calories. The ideal characteristics of oral nutritional supplements include—they should be RTD, formulated with predefined quantities of ingredients of the drink, noncaffeinated, nonalcoholic, noncarbonated, with a natural and adequate amount of sugars or electrolyte content, and hygienic. According to the ASPEN recommendations, oral nutrition supplements of a minimum of 150 calories and 15–30 gm of protein per 8 ounces are recommended to optimize intake. Adding extra oral nutrition supplements when unable to eat regular food and sipping chilled oral nutrition supplements throughout the day using a variety of flavors to avoid taste fatigue.

Recommendations for Older Patients with Specific Diseases
Acute illnesses are associated with increased fluid and nutritional requirements, which can impact recovery. The amount and dosage of restoration fluid should be clearly prescribed similar to any other drug.

Conclusion
Dehydration in the elderly requires a comprehensive approach towards successful recovery from illness to at the same time maintain healthy hydration levels leading to a healthy lifestyle. Treatment of and recovery from diseases requires therapies aiming at the illness and supportive care addressing the patient’s needs. Maintenance of body composition is the key to enhancing the efficacy of any therapy or line of treatment followed.

Dehydration and malnutrition are frequent among hospitalized patients and influence clinical outcomes. Fluid management and energy support are frequently overlooked in...
Fluid Imbalance in Geriatrics

patients at home and recovering from disease, thereby increasing hospital readmission and delaying functional recovery. The recommendations and guidelines mentioned above are supposed to be taken into consideration while assessing and treating elderly patients for dehydration.

Disclosures

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