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Hydration In Athletes: A Literature Review

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ABSTRACTS

The aim of this study to review the most recent research on the factors that most influence hydration. This study review using the literature research from google scholar, PubMed, and Elsevier. Many athletes after training experience dehydration due to not consuming enough fluids and electrolytes before, during training, and competition. To assess hydration status cannot be determined by just one factor. The general recommendation of hydration status measures using accurate biomarkers to detect body water fluctuations of 3% of total body water (TBW), using dehydration index, body mass, or color of urine. Therefore, monitoring hydration status is very important to maintain athlete performance. Exercise increases hypohydration due to fluid losses so that should be given to fluid supplementation and intake from certain food for each athlete. The factor that most influences the athlete's hydration is sweat loss and fluid intake.

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1. Introduction

Hydration status is very important to know because that can affect body balance, especially for athletes [1]. Hydration status includes hypohydration, euhydration, and hyperhydration is term used to describe the hydration state of body [2,3]. Total body water, and overall hydration In humans are normally maintained within a relatively narrow range (1% hyperhydration to 3% hypohydration) [4-6]. Extra care is warranted for these individuals to ensure adequate hydration status before physical activity to facilitate safe participation [7]. The benefits of optimal hydration status include maintaining athletic performance [8-14]. Diseases caused by acute dehydration need to be minimized with the athlete's hydration status. One of factor dehydration in athletes caused by fluid balance [15]. Athletes need an adequate supply of fluid and fluid replacement before, during, and after their exercise routines to prevent hypohydration and also to maintain a proper hydration status [3,16]. Hydration status also effected by sweat loss and fluid intake during performances. Frequent monitoring of hydration status can help to avoid the adverse effects of dehydration [1]. Therefore, methods to assess hydration status can be feasibly utilized on a daily [1]. Hydration assessment can be utilized to indicate one's current hydration state, but if taken serially, it can also be used to track changes in hydration and indicate fluid needs that is moment during about of physical activity [17].

No single method can serve as a criterion measure to assess hydration status in all settings that is moment day to day life and exercise, etc.) [14,18]. A useful paradigm for tracking daily changes in hydration status in sporting situations is to consider a combination of assessments to track daily changes [19]. Wide impact of hydration on function and health, unsurprising that there is a large body of research evaluating hydration status in humans [20]. There are many methods to monitor hydration status, some of them involve the collection of urine, blood, changes in body mass, recording an individual's perceptions of thirst or subjective symptoms of hydration [2]. Hydration status should be reassessed regularly until corrected, then monitored periodically alongside excellent support for drinking [21]. Currently, we can discuss body water, dehydration index and color of urine for assessing hydration status.

2. Subjects and Methods

Various topics and methods can be explored in these reviews, we chose to take a narrative review approach rather than a systematic review or meta-analysis. Narrative review literature has a more flexible structure to provide classifications related to hydration status. This literature review was conducted from October-November 2020. The search for the source of articles was carried out using Google Scholar, Pubmed, and Elsevier using the search terms: "hydration status", "body water", "dehydration", "assessment", "measurement", "exercise", and "athletes". The article criteria used in this review literature are articles whose research subjects are athletes.

3. Results and Discussion

3.1 Body Water

The volume and timing of water consumption alter measurements of hydration status [2]. Total body water can provides an objective measurement of hydration status [2,22]. The percentage of all human body fluids is 60-80%, so that body fluids are an important component that makes up the body in addition to protein, minerals, fat, and free fat mass. Water also plays an important role when the athlete is doing training or during a competition

[23]. The balance of body fluids will be balanced if the amount of fluid intake is consumed according to the amount expended. Intensity and duration of an athlete in their activities are higher and compared to society in general. This can be one of the factors that affect the total body fluids in an athlete [24]. In addition to high activity, total body water in athletes can be affected by temperature conditions during training or competitions [6,25].

The simplest method for measuring total body water is by measuring changes in body weight. This method is accurate in a short period, in conditions when you do not consume food or drink, special attention is needed when weighing and other factors that need to be considered such as urination [26-29]. Dilution techniques such as deuterium and bromide are the gold standard in measuring total body water [6,20][30-32]. Calculating body water using this technique requires a calibration procedure for each individual because the measurement is very sensitive to the position and body of the subject. Besides, measurement using total body water requires special space and equipment, thus limiting its use.

3.2 Dehydration index

Estimation of hydration status is needed to anticipated a large body water loss that is moment exercise, one should compare information from two or more hydration assessment techniques, and evaluate body hydration status more than once each day [2]. Urine color was either compared across categories of hydration status or experimental conditions of dehydration vs hydration, thus these studies provided information that could be used to evaluate the urine color method's validity [1,33].

Dehydration is a condition that occurs when the loss of body fluids exceeds the amounts of fluids taken in and disrupts the balance of minerals in body fluids [34]. The degree of dehydration is determined by markers such as alteration of body mass and urinary samples, which are easy-to-apply, low-cost, and reliable tools [2]. Demonstrated dehydration was an important marker of cognitive performance decline, a loss of body fluids of more than 2% of body weight leads to impairment in attention, memory, and psychomotor tasks [35,36].

3.3 Body Mass

Body mass changes are also useful for assessing hydration status between practices on days with multiple workouts and can help educate athletes regarding individual fluid needs [37]. The measurement of body mass change represents a commonly used, safe technique to assess hydration status, especially during dehydration that occurs over 1 to 4 hours, with or without exercise [18]. The level of dehydration is better expressed as a proportion of body mass compared to the proportion of total body water because it is more varied. According to Barker [38], the hydration status using body mass is accurate and reliable. If the hydration status measurement is carried out using changes in body mass and is well controlled, it will result in changes in the total body water value that are more sensitive than using the dilution technique [39].

Body mass can also be affected if dehydration occurs, but measuring hydration status using body mass is not a good indicator. This is because the measurement of hydration status with body mass cannot be clearly described [40]. Besides, weight loss due to decreased body fat and non-existent energy imbalance, water change error is a drawback of measuring hydration status using changes in body mass [39]. Higher levels of body mass loss (3–4%) cause hypohydration on team-sport performance has been studied mostly in soccer, basketball, cricket, race, and baseball [41-43].

3.4 Color of urine

Urine color may be a useful diagnostic tool for assessing dehydration or suboptimal hydration in a variety of populations, including athletes and the general adult population, and for characterizing hydration status across a range of hydration levels [1,33]. The investigators concluded that urine color alone does not adequately assess hydration status. Therefore, urine color changes may be a suitable method for determining hydration status on a day-to-day basis in young adults, but not pre and post-event in athletes [1,44]. A separate study reported that 94% of collegiate athletes were aware that urine color could be used to monitor hydration and 91% believed it was a good indicator of hydration, but only 73% of athletes employed this technique to measure hydration status [16,45].

The color of urine is determined by the amount of urochrome present in the urine specimen. When a large volume of urine is passed, the urine will be thin and pale. Meanwhile, if the volume of urine released is small, the urine that will be issued will be dark and thick. Urine color is determined on a scale of numbers 1-8 [18,2]. Of the various indicators for the assessment of hydration status, urine color shows a high sensitivity to detect urine osmolality in adults [46]. Another study has shown the prevalence of hypohydration among young athletes is very high, as indicated by the USG and urine color value. The majority hypohydration through the day and dehydrated even more during practice despite fluid availability [47]. Young soccer players (93.7%) classified as hypohydration after comparing their urine with the char urine color [48].

Athletes are one of the populations at risk of experiencing dehydration. This is due to a combination of increased sweating, transcutaneous evaporation, and less fluid consumption [49]. When engaging in strenuous exercise the athlete's response to pain is often insufficient to maintain a state of dehydration. Athletes will become dehydrated, especially when in a hot environment, and will sweat as much as 1-2L per hour [26]. Mineral air is the right choice for rehydration after exercise because it can reduce pain before total body water recovers [6].

Dehydration in athletes can cause body temperature to increase, decrease heart stroke volume, and increase cardiovascular tension so that the heart beats 10 times faster accompanied by loss of body mass [50,10]. Also, cognitively, it can increase fatigue, which can be factors that affect an athlete's performance and safety [51].

An athlete's performance can be affected by hydration status. The athlete's hydration status before training with a long enough training duration can affect the athlete's performance. Previous studies have shown that soccer athletes can become dehydrated before the game starts [52]. Losing fluids before exercise can lead to serious dehydration even though fluid intake remains high during the competition [53]. However, not all agree that an athlete's performance is affected by hydration status [54]. Excessive fluid consumption can increase the risk of hyponatremia, but with a good hydration, a status assessor can prevent hyponatremia. Not always athletes experience dehydration can be detrimental, one example is wrestling athletes before the competition will limit fluid intake so that they are dehydrated. The limitation of fluid intake in wrestling athletes aims to adjust the category in the competition [55]. Physically active people eating a balanced diet with adequate calories and fluids need not add ingredients to water to maintain hydration status [56,57].

Body mass is considered a valid measure of hydration status only when losses are acutely observed for example pre exercise versus post exercise or compared with a valid eunhydrated baseline [38,12]. Body mass assessment for hydration status is best used to show short-term changes between pre-exercise and post-exercise or changes in status from baseline or in conjunction with other hydration measurements [37,14]. For the best estimate of

hydration status in an athlete, 3 simultaneous measures are recommended: first-morning urine color (or USG), thirst sensation, and body mass [58].

Loss of water can impair endurance and performance in both temperate and hot climates, especially when training is longer than 90 minutes [38]. Measuring the pre to post exercise body mass in male and female endurance athletes is an accurate and reliable method to assess the total body water after prolonged running in the heat. Athletes can use pre to post exercise body mass to obtain a reasonable estimate of their sweat loss and their hydration status. Therefore, this practice can confidently be used to estimate the athlete's fluid replacement needs during and after exercise [38]. Loss of body mass can occur in every exercise process, about 1-2% of BM in athletes will be lost in each endurance exercise [21]. In maintaining hydration status in athletes, no one needs fluid intake but also needs to pay attention to the intake of other nutrients such as carbohydrates and energy [21].

The literature reviewed generally supported the validity of urine color as a measure of hydration status in the healthy adult population, including athletes [1]. The focus of this review is significant in that although urine color assessment is widely utilized in a variety of settings for hydration status assessment, the validity of this tool has not yet been systematically evaluated [1]. Additionally, bias could have influenced urine color ratings [1]. Research on urine color's sensitivity to change in response to changes in hydration status was limited, which is necessary when using this method to evaluate the effectiveness of interventions aimed at improving hydration status [1,59].

The results of measuring urine color in swimming, running, canoeing, basketball, and gymnastics athletes show that all athletes are hypohydration, urine is used for the first time in the morning and urine after training [47]. Hypohydrated occurs due to the influence of temperature and humidity in the environment [47]. Maintenance of fluid balance for athletes must be considered, this is an important point for professional athletes [47]. Measuring an athlete's hydration status using urine color is one of the easiest ways to monitor hydration status. The results of measuring hydration status using urine color are said to be normal if the urine color is pale yellow and the urine volume is normal [2]. According to Shirref 2003 [60], it can be concluded that there is a linear relationship between urine color, specific gravity, and urine osmolality in predicting hydration status.

4. Conclusions

In other research has examined hydration status in athletes. While the literature review discusses the factors that most influence to hydration status in athletes. The hydration status of the athlete can be corrected by giving the athlete personalized advice on how to rehydrate properly. The prospects of an information session or individual guidance to help players achieve a euhydrated (balance body fluid) state looks promising. Although the effects seem to be durable, sufficient fluid intake throughout the whole season to optimize training, performance, recovery, and athlete´s overall health. This review suggests that urine color, body mass, body water, and dehydration index appears to be a reasonably valid method for determining hydration status in the general adult population and athletes.

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