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THE IMPACT OF HYDRATION ON SLEEP QUALITY AND DURATION: A LITERATURE REVIEW

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ABSTRACT

Introduction: Adequate hydration is essential for maintaining the body's water balance and overall homeostasis. The relationship between hydration status, fluid intake, and sleep duration and quality remains relatively poorly understood and under-researched. Both insufficient hydration and excessive fluid intake immediately before bedtime may affect the quality of nighttime rest.

Objective: The aim of this paper was to summarize current evidence on the relationship between hydration status, the timing of fluid intake, and selected sleep parameters in adults.

Materials and methods: A narrative review of the literature available in PubMed was conducted. Publications concerning hydration, dehydration, water and other fluid intake, sleep quality and duration, sleep efficiency, and nocturia were analyzed. Particular attention was given to recent observational and interventional studies, systematic reviews, and meta-analyses published in English.

Results: Observational studies provide evidence of associations between hydration status and sleep duration, subjective sleep quality, sleep-onset latency, and sleep efficiency. Findings from experimental studies are less consistent. In some studies, mild dehydration did not significantly affect objective sleep parameters, whereas in others it was associated with greater difficulty falling asleep. Fluid intake before bedtime may increase the risk of nocturia, awakenings, and sleep fragmentation. These relationships were influenced by factors such as age, physical activity, ambient temperature, caffeine, alcohol, chronic diseases, and medications.

Conclusions: Hydration status and the timing of fluid intake may affect sleep, but the available evidence does not permit a clear causal relationship to be established. Distributing fluid intake evenly throughout the day and avoiding large volumes immediately before bedtime may have a beneficial effect.

KEYWORDS

Hydration, Dehydration, Fluid Intake, Sleep Quality, Sleep Duration, Nocturia

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1. Introduction

Adequate hydration is one of the fundamental elements of maintaining the body's homeostasis and is necessary for the proper course of many physiological processes [1]. Sleep is a highly important factor influencing human health. Abnormal sleep duration is associated with adverse health outcomes, including, among others, metabolic disorders, cardiovascular diseases, and impaired cognitive functioning [2].

In recent years, increasing attention has been paid to the possible relationship between the body's hydration status and sleep. Observational studies indicate an association between sleep duration and quality and the body's hydration status [3]. At the same time, more recent studies have demonstrated associations between the amount of fluid consumed and sleep duration, sleep efficiency, and REM sleep duration [4]. However, the available evidence is not entirely consistent, and the direction of the causal relationship remains insufficiently understood.

Not only the total amount of fluid consumed but also the timing of intake may be important. Drinking fluids immediately before bedtime may increase the frequency of nocturia, and the available evidence also suggests that such an intervention may affect selected sleep parameters, including REM sleep [5]. The relationship between hydration and sleep therefore appears to be complex and may be modified by numerous factors. An analysis of the current literature may help determine the importance of adequate hydration for sleep quality and duration and identify areas requiring further research.

The aim of this paper is to review the current literature on the relationship between the body's hydration status and sleep quality and duration, with particular emphasis on the effects of insufficient hydration and the timing and amount of fluid intake on selected sleep parameters. An additional objective is to discuss the potential mechanisms underlying the observed relationships and to identify areas requiring further research.

2. Methodology

A narrative review of the literature concerning the relationship between the body's hydration status and sleep quality and duration was conducted. Publications were searched for in PubMed using, among others, the following keywords: hydration, dehydration, fluid intake, water intake, sleep quality, sleep duration, sleep efficiency, and nocturia.

The review primarily included full-text publications in English concerning adults, with particular emphasis on observational and interventional studies and literature reviews. Publications from the past 5–10 years were preferred.

3. Hydration and Sleep Duration and Quality

3.1. Insufficient Hydration and Sleep

The relationship between the body's hydration status and sleep duration and quality remains the subject of a relatively small number of studies. In a cross-sectional study by Lin et al. involving 380 pregnant women, associations were demonstrated between hydration status and several sleep parameters. Sleep lasting 6–7 hours or at least 8 hours, good subjective sleep quality, shorter sleep-onset latency, absence of sleep disturbances, and greater sleep efficiency were associated with more favorable hydration status [3]. Owing to the cross-sectional nature of the study and the specific population examined, these findings do not, however, permit the direction of causality to be determined or direct generalization to the entire adult population.

Evidence from experimental studies is less consistent. Aristotelous et al. assessed the effect of controlled mild dehydration on sleep in 12 healthy young men using polysomnography. No significant differences were found in the analyzed parameters of sleep quality or duration between dehydration and adequate hydration [6]. These findings indicate that short-term mild dehydration in this population did not cause measurable changes in the assessed sleep parameters.

Similar observations were reported in a 2025 study by Fein et al. In a crossover study involving 15 healthy adults, no significant differences in sleep parameters were found between periods of adequate hydration and induced mild dehydration. In the subgroup of participants in whom mild dehydration was successfully achieved ($n=8$), greater fluid intake was nevertheless positively associated with sleep duration, REM sleep duration, and sleep efficiency [4]. The small sample size limits the generalizability of these findings.

Somewhat different findings were obtained by Ky et al. in 2025. In a study involving 18 young men, mild dehydration induced by 24-hour fluid restriction was associated with longer self-reported sleep duration and greater difficulty falling asleep compared with the period following renewed unrestricted fluid intake [7]. The authors did not, however, find significant differences in the other assessed sleep parameters. It should also be noted that sleep was assessed using subjective methods.

The available evidence therefore indicates a possible association between hydration and sleep; however, it cannot be used to conclude unequivocally that mild dehydration leads to a deterioration in sleep duration or quality. Findings differ depending on the method used to assess sleep, the characteristics of the study population, and the method used to induce and assess dehydration.

3.2. Evening Fluid Intake and Sleep Quality

When analyzing the effect of fluid intake on sleep, the timing of intake is also crucial. Large volumes of fluid consumed shortly before going to bed are associated with nighttime urine production, which may result in repeated awakenings. According to the International Continence Society definition, nocturia means waking during the main sleep period to urinate, with urination preceded by sleep and followed by a return to sleep [8].

Nocturia may result from excessive evening fluid intake, increased nighttime urine production, reduced bladder capacity, or comorbid conditions [9,10]. In some cases, the need to urinate directly awakens the person, whereas in others urination occurs after an awakening caused by another factor. The relationship between nocturia and sleep disorders may therefore be bidirectional [10].

Frequent nighttime awakenings caused by urination disrupt sleep continuity and affect sleep efficiency. Returning to sleep is not always immediate, particularly in older adults and people with insomnia. Consequences may include fatigue, daytime sleepiness, and impaired concentration and quality of life [10,11]. Observational and meta-analytic evidence indicates that people with nocturia are more likely to have poorer sleep quality than those without the condition [12,13].

The type of beverage consumed is also important. Caffeine may prolong sleep-onset latency and reduce total sleep time and sleep efficiency [14]. Alcohol may initially facilitate falling asleep, but later in the night it promotes REM sleep disturbances and sleep fragmentation [15]. Beverages containing these substances may therefore affect sleep independently of the volume of fluid consumed.

Restricting evening fluid intake should not lead to insufficient hydration. A more reasonable approach appears to be distributing fluid intake evenly throughout the day and avoiding the consumption of large volumes at one time immediately before bedtime. For people experiencing nocturia, keeping a diary recording the times of fluid intake and the frequency of urination may be helpful [9].

3.3. Factors Modifying the Relationship Between Hydration and Sleep

Age is an important factor affecting both hydration and sleep. In older adults, chronic disease and nocturia are common, and nocturia-related awakenings may have more serious consequences because returning to sleep can be more difficult [11]. In later life, nocturia is also associated with poorer functional status and frailty [16].

Physical activity and temperature are factors that influence the body's fluid requirements. High temperatures and physical activity substantially increase water loss through perspiration and thereby raise the body's fluid needs. If fluids are not replenished sufficiently early, increased thirst may occur in the evening. Drinking a large amount of water immediately before bedtime may then increase the risk of nighttime urination.

Caffeine and alcohol are also important factors because they may impair sleep independently of hydration status [14,15]. Chronic diseases and medications are relevant as well. Chronic kidney disease may disrupt fluid and electrolyte balance and promote nocturnal polyuria [17]. Nocturia is also more common in people with obstructive sleep apnea [18,19,20]. Diuretics may also be important, particularly when taken in the evening, because the timing of their administration may affect nighttime diuresis [9,17].

4. Discussion

The studies analyzed indicate a possible association between hydration and sleep duration and quality, although the findings are inconsistent. Lin et al. demonstrated that more favorable hydration status was associated with better sleep quality and efficiency [3]. Experimental studies, however, did not always find that mild dehydration impaired sleep [4,6].

Ky et al. observed greater difficulty falling asleep after fluid restriction, but also a longer self-reported sleep duration [7].

The relationship may therefore be bidirectional. Insufficient hydration may cause thirst and discomfort that make it difficult to fall asleep, whereas short or interrupted sleep may affect fluid balance. Rosinger et al. demonstrated an association between short sleep and more concentrated urine and a higher likelihood of insufficient hydration [21]. However, the study was observational and therefore could not determine the direction of causality.

Similarly, nocturia may both interrupt sleep and be a consequence of insomnia, sleep apnea, or other diseases [10,18,19,20]. Interpretation of the findings is complicated by the predominance of observational studies, small participant groups, and differences in methods used to assess hydration and sleep. Further prospective and interventional studies are needed that simultaneously account for fluid intake, hydration biomarkers, the frequency of nocturia, and objective sleep parameters.

5. Conclusions

1. The body's hydration status may affect sleep duration, continuity, and subjective quality. The available findings are not fully consistent; therefore, it cannot be concluded unequivocally that mild dehydration directly impairs all sleep parameters.

2. Both insufficient hydration and drinking large amounts of fluid immediately before bedtime may adversely affect nighttime rest. Dehydration may cause thirst and discomfort, whereas excessive evening fluid intake may increase the risk of nocturia, sleep fragmentation, and reduced effective sleep time.

3. Distributing fluid intake evenly throughout the day and limiting the consumption of large volumes at one time in the hours immediately before sleep may be crucial. Hydration practices should be tailored to age, physical activity, ambient temperature, health status, and medications.

4. The relationship between hydration and sleep may be bidirectional. Hydration status may affect the course of sleep, while short sleep duration may be associated with insufficient hydration. However, the direction of this relationship has not been clearly established.

5. The predominance of observational studies, the small number of interventional studies, and differences in methods used to assess hydration and sleep limit the ability to establish a causal relationship. Further prospective and experimental studies using objective hydration biomarkers and sleep assessment methods are needed.

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