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Hydration status and its association with fatigue, concentartion, self reported dry skin among post-graduation pursuing females in Hyderabad

Thirumala Jahnavi[1*], P Ashlesha[2]
[1] Department of Food and Nutrition, Veeranari Chakali Ilamma Women's University, Koti, Hyderabad, Telangana, India
[2] Head, Department of Food and Nutrition, Veeranari Chakali Ilamma Women's University, Koti, Hyderabad, Telangana, India
Corresponding Author: Thirumala Jahnavi
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Abstract
Hydration status can be influenced by lifestyle factors and varied intake habits, yet research linking these parameters is limited. This cross-sectional study was aimed to assess the hydration status and its association with fatigue, concentration, and dry skin, among post-graduation pursuing females in Hyderabad. A multi factorial structured questionnaire was used to a sample of 100 young female adults. Data were analyzed using descriptive and Spearman's rank correlation analysis using JASP. The findings of the study revealed weak correlation between the hydration status score and fatigue severity score ($r = -0.068$, $p = 0.500$) and concentration scores ($r = -0.146$, $p = 0.149$), while a very weak negative correlation was observed between hydration status score and the self-reported dry skin score ($r = -0.023$, $p = 0.821$). However, none of the observed correlations were statistically significant ($p>0.05$). The limitation of the present study was small sample size and limited variations in hydration status measurement, which may have reduced the ability to detect strong correlation.

Keywords: Hydration status, fatigue, concentration, dry skin, cognitive failure, fatigue severity scale

Introduction

Water is essential for life and bodily functions. About 50-70% of the human body is water, varying with age, sex, and composition. Water maintains osmotic pressure and electrolyte balance, acts as a solvent, transports nutrients, aids absorption and waste removal, regulates body temperature, supports metabolic reactions, blood volume, cardiovascular stability, cellular communication, and homeostasis [10]. In addition to its physiological roles, drinking enough water helps muscles work well, keeps joints lubricated, and prevents stress from heat. When exposed to high temperatures and during physical activity, the body loses water through increased sweating. This raises the need for water intake to keep electrolyte balance and control body temperature. If the lost water is not replaced, it can cause fatigue, reduced exercise ability, and hindered recovery [14].

Fatigue is a multifactorial phenomenon characterized by chronic tiredness, low energy, and reduced capacity for work, physical, and mental activity. It includes physical fatigue affecting muscle performance and mental fatigue affecting attention and decision-making. Sleep quality, stress, nutrition, and health affect fatigue levels [6]. Individuals with inadequate hydration often report higher levels of tiredness, irritability, fatigue, and reduced motivation. These effects can have a direct impact on daily functioning, mainly in academic and occupational places where there is a need for continuous attention and performance [11].

Water is vital for cognitive health. The brain relies on water balance and is sensitive to hydration changes affecting neurotransmission and cerebral blood flow. Good hydration improves attention, alertness, and mental health, whereas poor hydration affects mood and productivity [4]. Cognitive functions include attention, reasoning, problem-solving, and memory. Among these processes, concentration is sensitive to hydration status. The brain depends on adequate water supply to maintain neurological activity, synaptic transmission, and overall cognitive efficiency [9]. Research shows that even mild dehydration can affect cognitive outcomes. Young adults, especially students, are at a higher risk due to irregular hydration habits and high cognitive demand. Studies suggest that rehydration can reverse cognitive performance, showing the reversible nature of these effects and the importance of maintaining adequate hydration levels [12].

Skin hydration is an important aspect of overall health. It is influenced by both external and internal factors, such as moisturizer application, environment, and hydration status. Water plays an important role in maintaining skin elasticity, barrier function, and overall appearance. Adequate hydration supports stratum corneum integrity, preventing irritation and dryness [1]. Dehydration can lead to decreased skin hydration, resulting in dryness, reduced elasticity, and roughness. This occurs due to reduced water levels in the skin layers. This reduces skin barrier function and increases trans epidermal water loss. Such changes can make the skin more susceptible to environmental damage and aging [13].

As water plays many important roles in the body, even small deviations in hydration status can negatively affect normal body functions and impair health outcomes [10]. This shows the importance of maintaining adequate hydration not only for physical health outcomes but also for psychological outcomes, such as proper cognitive functioning [4].

Regardless of the large amount of evidence on the importance of hydration status on cognitive and physical

health, limited research has examined the association with fatigue, concentration, and dry skin among post-graduation female students. Early signs of dehydration are often overlooked, allowing dehydration to affect their psychological and physiological functions. Therefore, the present study is aimed to assess the association between hydration status fatigue, concentration, and self-reported dry skin, among post-graduation female students in Hyderabad.

Materials and methods

A cross-sectional observational study was conducted among 100 young female post-graduation students in Hyderabad. Participants were selected using convenience sampling from researcher's institution and other post-graduation students who voluntarily agreed to participant and met the inclusion criteria.

Data collection and assessment tools

Data was collected using structured questionnaire consisting of following sections:

Demographic details: Information on age, educational qualification was collected.

Hydration status: Hydration status was assessed using a, adapted, modified questionnaire based on previously validated questionnaire from a published study Laja Garcia et al. (2019) [8] The questionnaire includes items related to water, beverage intake and fruit, and vegetable consumption frequency, along with urinary habits and thirst levels, which were assessed for descriptive analysis only.

Fatigue severity scale: Fatigue symptoms were assessed by using a fatigue severity scale developed by Krupp et al. (1989) [7]. Which consists of 9 items scored on a 7-point Likert scale.

Cognitive failure questionnaire: Concentration-related symptoms were assessed by using a cognitive failure questionnaire developed by Broadbent et al. (1982) [3]. Which consists of 25 self-reported items assessing everyday cognitive failures related to attention and memory.

self-reported skin dryness questionnaire: skin dryness symptoms were assessed by using a self-reported skin dryness. Which consists of 10 self-reported items related to skin health.

Scoring

Hydration assessment section: water, beverage intake and fruit, vegetable consumption frequency was scored using 5-point frequency scale. For hydrating beverages, foods (water, natural coconut water) and reverse scoring for dehydrating beverages (high caffeinated drinks and sugary beverages). Total hydration status scores were calculated by summing Water and beverage intake, and fruit and vegetable consumption of each participant.

Fatigue severity scale: The symptoms were assessed using a 7-point Likert fatigue severity scale which consists of 9 items; ranging from disagree to agree. Scores were calculated by summing all scores; scores range from 9 to 63, higher scores indicating greater fatigue.

Cognitive failure questionnaire section: The symptoms were assessed by a 5-point ordinal frequency scale that is used for cognitive failure questionnaire ranging from: very often to never; Scores were calculated by summing all scores. Scores range from 0 to 100; with higher scores indicating poorer concentration.

self-reported skin dryness questionnaire section: The symptoms were assessed by a 4-point ordinal frequency scale that is used for cognitive failure questionnaire ranging from: never to always; Scores were calculated by summing all scores. Scores range from 0 to 30; with higher scores indicating dry skin.

Statistical analysis: Data was entered into Microsoft excel and analyzed using JASP. Descriptive statistics, including frequencies and percentages, were used to summarize the demographic characteristics, hydration status, fatigue, concentration, and self-reported dry skin of the participants. Spearman's rank correlation coefficient was used to determine the association between hydration status and fatigue, concentration, and self-reported dry skin. A p-value of <0.05 was considered statistically significant.

Ethical considerations: Participants were verbally informed about the purpose of the study before the data collection. Participation was voluntary, and verbal consent was obtained before filling out the questionnaire. Participants indicated their willingness to participate by completing and signing the questionnaire. Anonymity and Confidentiality were maintained throughout the study. The institution did not have an ethical committee for student research.

Results and discussion

Demographic and educational details

A total of 100 post-graduate female students aged 21-25 participated in this study. Most participants were a 21-22-year age group (58%). Regarding educational qualification, most participants were pursuing MSc nutrition and dietetics (45%), followed by MBA (35%).

Hydration status

The hydration status was assessed based on the frequency of water, beverage intake and fruit, vegetable consumption among participants were assessed. The frequency distribution of reported intake is presented in Table 1.

The frequency distribution of beverage consumption among young female adults are presented in table 1**.** The data shows that varying consumption patterns across the different beverages, with plain water being most frequently consumed, while sugary and packed beverages are comparatively less frequently consumed.

Table 1: Water and beverage intake, fruit, vegetable consumption among participants (n=100)

Frequency and Percentage of Water and beverage intake, fruit, vegetable consumption						
Beverage (200-250 ml)	**Never/ rare**	**1-3times a week**	**4-6 times a week**	**Once daily**	**More than once daily**	**Total**
plain water	0(0%)	0 (0%)	0 (0%)	0 (0%)	100 (100%)	100 (100%)
Milk, milk-based drinks	37 (37%)	31 (31%)	8 (8%)	22 (22%)	2 (2%)	100 (100%)
Lemon water	54 (54%)	35 (35%)	5 (5%)	4 (4%)	2 (2%)	100 (100%)
Coconut water	49 (49%)	37 (37%)	10 (10%)	3 (3%)	1 (1%)	100 (100%)
Butter milk/lassi	39 (39%)	29 (29%)	10 (10%)	18 (18%)	4 (4%)	100 (100%)
Soups	75 (75%)	19 (19%)	3 (3%)	2 (2%)	1 (1%)	100 (100%)
Vegetables (gravy)	32 (32%)	29 (29%)	20 (20%)	12 (12%)	7 (7%)	100 (100%)
Fruits	13 (13%)	47 (47%)	15 (15%)	23 (23%)	2 (2%)	100 (100%)
Hot beverages (tea/coffee)	39 (39%)	18 (18%)	6 (6%)	33 (33%)	4 (4%)	100 (100%)
Sugarcane juice	63 (63%)	27 (27%)	5 (5%)	4 (4%)	1 (1%)	100 (100%)
Fresh Fruit juices	32 (32%)	42 (42%)	14 (14%)	11 (11%)	1 (1%)	100 (100%)
ORS/electrolyte drinks	80 (80%)	14 (14%)	2 (2%)	3 (3%)	1 (1%)	100 (100%)
Packed fruit juices	80 (80%)	13 (13%)	3 (3%)	4 (4%)	0 (0%)	100 (100%)

Urinary habits and thirst levels were also assessed as additional hydration-related indicators. The findings were analyzed descriptively using frequency and percentage. Most participants reported that urination frequency is 4-6 times/day (54%), urine color as light yellow (52%), while participants experience thirst often during the day (56%), sometimes without physical activity (47%).

Descriptive analysis for study outcomes

The frequency and percentages of Fatigue, cognitive failure as an indicator of concentration, and self-reported dry skin were assessed among participants. The distribution of participants is presented in Table 2.

The distribution of fatigue, cognitive failure, and self-reported dry skin among participants is presented in table 2. Among 100 participants, 43% were classified as having fatigue, while 57% reported no fatigue. Regarding cognitive failures, 10% of participants had low CFQ scores, 47% had moderate CFQ scores, and 43% had high. For self-reported dry skin, 47% of participants reported mild symptoms,50% moderate, while only 3% of participants showed Severe dry skin symptoms.

Table 2: Distribution of fatigue, concentration, self- reported Dry skin symptoms score among participants (n=100)

Study outcome	Category	Score ranges	Frequency	Percentage %
Fatigue (FSS)	Fatigue	>=36	43	43%
	No fatigue	<36	57	57%
	Total		100	100%
CFQ (concentration)	Low	<33	10	10%
	Moderate	34-66	47	47%
	High	>66	43	43%
	Total		100	100%
Self-reported dry skin	Mild	<10	47	47%
	Moderate	10-20	50	50%
	Severe	>20	3	3%
	Total		100	100%

Spearsman's rank correlational analysis between the variable

weak negative correlations were observed between the hydration status score and fatigue severity score (rho = -0.06816, p = 0.500), between hydration status scores and concentration scores (r = -0.1455, p = 0.149), and a very weak negative correlation was observed between the hydration status score and the self-reported dry skin score (r = -0.02289, p = 0.821). which indicates the inverse relationship between hydration status score and health outcomes- fatigue, concentration, and self-reported dry skin. However, none of the observations were statistically significant (p=0.05).

Variables	Spearmans rho value	p-value	Interpretation
Hydration status and Fatigue	-0.06816	0.500	Weak correlation (non-significant)
Hydration status and Concentration	-0.1455	.149	Weak correlation (non-significant)
Hydration status and Dry skin	-0.02289	.821	Weak correlation (non-significant)

This Statistically non-significant psychological (fatigue, concentration) and dry skin outcomes related to the findings of Benton et al., 2015 [2], akdeniz et al., 2018 [1], respectively. Jung et al., 2024 [5], shows that external skin care habits may mask direct internal hydration effects on skin. The non-significant may be due to lifestyle factors, such as sleep and stress, physical activity and environmental conditions which influence the level of fatigue, concentration, influence of confounding factors, such as external skin care and environmental conditions on dry skin symptoms and due to limited variations in hydration status assessment, such as environmental and seasonal changes.

Conclusion

The present study assessed hydration status and its association with fatigue, concentration, and self-reported

dry skin among post-graduation pursuing females in Hyderabad. Weak negative correlations were observed between hydration status and selected outcomes, suggesting that higher hydration scores were associated with lower levels of fatigue, cognitive failure, and dry skin. However, the associations observed were not statistically significant. Which can be due to confounding factors like lifestyle stress, physical activity, environmental conditions, and external skin care may have an impact on the selected outcomes.

Limitations of this present study includes as the study is cross-sectional and questionnaire based which can cause subjective bias and it is limited only to post-graduation pursuing females in Hyderabad. Further studies should be employed longitudinal studies with larger sample size and more diverse population along with objective clinical assessment of hydration status among participants may provide a more accurate relationship between hydration status and these health outcomes.

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