

# Effect of Hydration Education on College Athlete's Hydration Status and KAP

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**Abstract:** Proper hydration is essential for both mental and physical performance. The purpose of this study was to determine if hydration education would improve hydration status in collegiate athletes. A total of 120 college athletes, 60 each male and female, 30 each served as the control group (C) and as the intervention (I) group. A pretested questionnaire was used to evaluate the hydration knowledge, attitude and practice (KAP) of the athletes. Changes in percent body weight change (%BWC) and Urine colour (UC) were specifically used to determine hydration status. After baseline testing, intervention group attended education program on hydration. A significant difference in hydration KAP and hydration status was observed between both male and female control and intervention group. The women athletes scored significantly higher in hydration knowledge and total KAP scores, Male athletes improved significantly better in hydration status than female athletes. It is concluded that hydration education positively affected fluid intake habits, hydration knowledge, attitude and thereby the hydration status of both male and female college athletes.

**Keywords:** KAP, hydration status, percent body weight change, Urine colour, College athletes

## 1. Introduction

Water is the vital performance enhancing nutrient when exercise and heat stress are combined. (Jéquier and Constant, 2010). Maintaining water and electrolyte balance is critical to the health and sports performance of athletes. Athletes need adequate fluid intake before, during, and after exercise to prevent dehydration and to maintain the physical demands of their sport (Cheuvront et al., 2003). During a state of dehydration, the excessive loss of water and electrolytes and lack of their replacement can impair exercise performance and thermoregulation. Ignorance of the importance of hydration; availability of fluids before, during, and after participation, and belief in misinformation about hydration are possible reasons for the lack of proper hydration (Nichols et al., 2005).

Athletes competing in team sports require them to switch intermittently between maximal-effort and low-intensity exercise, potentially causing large losses of body water, therefore, hydration is an important but often overlooked aspect of proper training. Nichols et al., 2005, examined the knowledge and behaviors of hydration and fluid replacement in collegiate athletes and determined that they were not properly educated about appropriate hydration for practice and competition. Educating athletes on hydration is essential in keeping athletes healthy and performing well.

## 2. Review of Literature

Kavouras et al., 2012. evaluated whether an intervention program emphasizing in increased fluid intake can improve exercise performance in children exercising in the heat. The samples for the study were ninety-two young athletes (age:  $13.8 \pm 0.4$  years, weight:  $54.9 \pm 1.5$  kg). Thirty-one (boys: 13, girls: 18) children served as the control group (CON) and 61 (boys: 30, girls: 31) as the intervention (INT). It was observed that the hydration status was improved

significantly in the INT [USG: pre= $1.031 \pm 0.09$ , post= $1.023 \pm 0.012$ ,  $P < 0.05$ ; urine osmolality (mOsm/kg water): pre= $941 \pm 30$ , post= $782 \pm 34$ ,  $P < 0.05$ ], while no statistically significant changes were found in the CON [USG: pre= $1.033 \pm 0.011$ , post= $1.032 \pm 0.013$ ,  $P > 0.05$ ; urine osmolality (mOsm/kg water)  $970 \pm 38$  vs  $961 \pm 38$ ,  $P > 0.05$ ]. A significant improvement in performance of INT group was found. (time for 600 m: pre= $189 \pm 5$  s, post= $167 \pm 4$  s,  $P < 0.05$ ). The findings showed an improved hydration status by ad libitum consumption of water and enhanced performance in young children exercising in the heat.

Educating athletes on aspects of hydration is an important part of being an allied health care professional. Only about 20% of athletes consume sports drinks while training and 40% of athletes consume alcohol on competition day. Only 22% of collegiate athletes knew that sports drinks were a better fluid choice than water; which shows that some athletes lack a complete understanding of hydration. They concluded that by monitoring their weight, urine volume and urine concentration after activity athletes have solid guidelines to follow to ensure hydration (Nichols et al., 2005).

A study to assess the current knowledge, attitudes and practices regarding hydration of student handball players was carried out by Nigan et al., . using a survey questionnaire from 211 students including 74 handball players (HB) and 137 non-athletes (NA) of the Ouémé-Plateau region, i.e. the South-eastern region of the Republic of Benin. It was found that 63% of them had a good level of hydration practices, but worse levels of hydration knowledge and attitudes. The handball players found to have higher levels of hydration knowledge and practices than their non-sporting peers ( $p < 0.05$ ), in the HB group, good hydration practices are not inevitably associated with a good level of knowledge related to water. The trainers' advice to the players for dehydration prevention had

certainly a positive impact on their hydration practices. New learning strategies are needed for the young students in Benin to improve their hydration knowledge, attitudes and practices at a time.

Trammell, 2007 assessed the hydration knowledge, attitude, behaviors and fluid replacement effectiveness of collegiate athletes. A total of 74 athletes were surveyed and 59 were also allowed to monitor their hydration status using weight charts. Significant differences in knowledge scores were found between sophomores and seniors and between some of the demographic variables for the behavior scores. Both the men's soccer team and the women's soccer team scored significantly higher on the behavior section than did the men's cross country team) and the women's cross country team. A strong relationship between knowledge and practice related to hydration was observed and concluded that allied health care professionals continue to need to monitor athletes and how they maintain their hydration status

**Problem Statement:** Hydration at summer sports camp is a major concern and special efforts need to be made to help athletes develop hydration strategies. To date, little research has been done to study the effect of hydration education on the hydration status and level of hydration knowledge, attitude and practice of college athletes at summer sports camps.

**Objectives:** To investigate and compare the effect of hydration education on hydration knowledge, attitude, practice and hydration status of male and female college athletes at summer sports camp.

### 3. Methodology

#### 3.1. Sample

Data collection occurred in a NSO (National Sports Organization) summer training camp at Anna University, Chennai. A total of 120 (60 male and 60 female) athletes in team sports participated in the study. 60 athletes (male: 30, female: 30) served as the control group (C) and 60 athletes (male: 30, female: 30) served as the intervention group (I). All volunteers and their coaches were informed about the nature of the study and gave informed written consent.

#### 3.2. Tools used

The daily program in the camp consisted of an early morning training, a mid day rest and an evening training. During the first week (non-intervention), baseline measures such as height, weight, BMI, body composition were measured using digital weighing balance, stadiometer and TANITA body composition analyzer respectively. Fluid intake was recorded for 3 days using diary method. The average fluid intake of every individual was calculated. Using a reconstructed tested hydration knowledge attitude and practice questionnaire, the hydration KAP was assessed. The hydration status was assessed by two methods, viz percent body mass change and urine colour. The percent body weight change was calculated using the following formula.

$$\% \text{ Body weight change} = \frac{\text{Pre-exercise body weight} - \text{Postexercise body weight}}{\text{Post exercise body weight}} \times 100$$

To monitor their urine colour, Urine color chart (Armstrong et al., 1998) was given to each athlete and instructed to monitor their first urine colour, before training and immediately after training without any fluid intake and were asked to tick the urine colour in the given urine chart continuously for five days.

The average percent body mass change and the urine colour values were compared with NATA, 2000 hydration index.

#### 3.3: Intervention

Thirty boys and girls each were selected as control and intervention group. The hydration education program on topics such as importance of fluids and its benefits, dehydration, symptoms and its ill effects, simple measures to monitor hydration status, importance of sports drinks, electrolytes, natural sports drinks and simple methods to prepare sports drinks. A one hour hydration education programme was conducted continuously for 7 days after their evening training, and it was imparted through lecture cum leaflet, power point presentation, demonstrations and exhibition. The intervention group was requested not to disclose the hydration education details to their control counterparts.

In the third week of the summer camp, all the study participants (both control and intervention group) were required to complete a hydration KAP questionnaire and their hydration status were assessed.

#### 3.4 Statistical Analysis

SPSS version 16 was used for statistical analysis. Frequencies, Mean, standard deviation for male, female control and intervention group was determined. Independent sample t test and Pearson correlation coefficient tests were applied to study the effect of hydration education.

### 4. Results and Discussion

#### 4.1. Demographic Details

Majority of the athletes (86.7%) were in the age group of 18 – 19 years, where the mean age of male and female athletes were  $19.33 \pm 1.26$  and  $18 \pm 1.21$  years respectively. Majority of respondents were in their second year of study. Sports in which male athletes participated in were 23.3 % hockey, 18.3 % volley ball, 16.7 % kabadi and 21.7 % in cricket. Majority of the female athletes (26.7 %) participated in volleyball followed by kho-kho (23.3%), kabadi (20%), basketball and throw ball each 15%. About 88.3% (N- 53) of male athletes were playing at University level and 11.7% (N-7) at state level, where 47 female athletes (78%) were playing at University level, 20% at State level (N-12) and 4 of them at National level (2%).

#### 4.2. Anthropometric and Hydration status

The mean weight, height, of male and female athletes were  $56.8 \pm 11.04$ ,  $47.04 \pm 11.19$  Kg,  $166 \pm 8.67$ ,  $159.1 \pm 2.17$  cm respectively. A significant difference in bodyweight and height were found between male and female college athletes. The body fat percentage and percent total body water were found to be normal for both (body fat  $10.58 \pm 2.69$ ,  $15.49 \pm 4.733$  g% and total body water  $57.59 \pm 8.5$ ,  $55.99 \pm 4.37$  g%). The data on body fat showed a statistical significance between boys and girls, whereas total body water percent showed a non statistical difference (Table-I). The hydration status based on % bodyweight change and urine colour showed a high incidence of dehydration among male and female athletes during the summer camp. Kavouras et al., 2012, McDermott, 2009).

**Table 1:** Anthropometric details and Hydration Status of college athletes

Details	Male athletes (N=60) Mean $\pm$ SD	Female athletes (N=60) Mean $\pm$ SD	t- value
Weight (Kg)	$56.81 \pm 11.04$	$47.04 \pm 11.19$	3.054**
Height (cm)	$166 \pm 8.67$	$158.06 \pm 2.17$	6.847**
Body fat (g %)	$10.58 \pm 2.69$	$15.49 \pm 4.733$	8.893**
Total body water (g%)	$57.59 \pm 8.5$	$55.99 \pm 4.37$	1.293*
Percent body weight change	$2.75 \pm 1.06$	$2.85 \pm 0.98$	0.539 NS
Urine Colour	$3.016 \pm 1.04$	$3.33 \pm 1.32$	1.403*

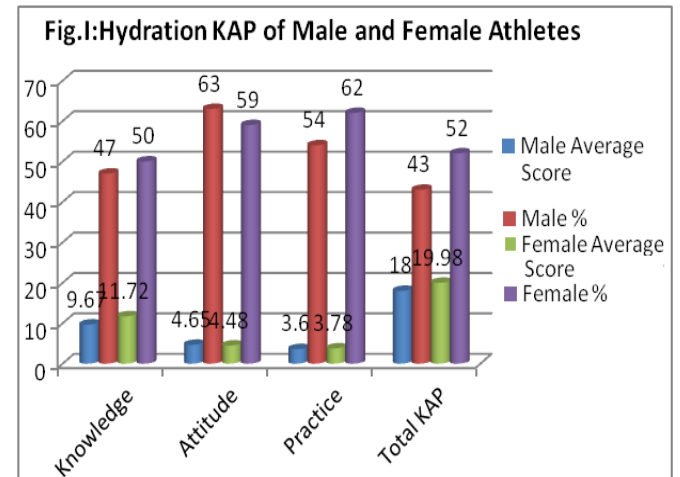
\*\* Significant at 1% level, \*: Significant at 5% level of significance, NS: Not Significant

As shown in Fig.1, the female athletes scored better in hydration knowledge (50%) and practice aspects (62%), compared to male counterparts (50 & 54%)

respectively). Compared to female athletes (59%), 63% of male athletes showed positive attitude towards hydration.

#### 4.3 Impact of Hydration Education Programme

As a response to the hydration education, the intervention group showed significant improvement in hydration knowledge, attitude, practice and overall KAP as well as in their hydration status.



**Figure 1:** Hydration KAP of Male and Female College Athletes

The percentage of male athletes who were classified as dehydrated in the intervention group decreased to 52.1%, while there was no significant difference in the control group (Table II). Stover et al., 2006 concluded that hydration lectures resulted in a significant decline in the percentage of dehydrated children in the intervention group.

**Table 2:** Hydration Knowledge, Attitude and Practice (KAP) and Hydration Status of Male Athletes

Variables	Control group (N=30)			Intervention group (N=30)		
	Before HE	After HE	t-value	Before HE	After HE	t-value
Knowledge Score	$11 \pm 1.145$	$11.37 \pm 2.327$	1.009*	$8.33 \pm 1.124$	$14 \pm 1.576$	19.607**
Attitude Score	$4.63 \pm 1.129$	$5.23 \pm 1.135$	4.267**	$4.67 \pm 1.124$	$7.9 \pm 1.094$	16.037**
Practice Score	$3.47 \pm 1.137$	$4.1 \pm 1.029$	5.188**	$3.73 \pm 1.112$	$7.83 \pm 1.234$	25.382**
Total KAP score	$19.2 \pm 2.325$	$21.3 \pm 2.654$	7.073**	$17 \pm 2.519$	$28.67 \pm 3.497$	20.764**
Body weight change (%)	$2.67 \pm 1.06$	$2.73 \pm 0.87$	0.403NS	$2.83 \pm 1.09$	$1.03 \pm 0.18$	9.56**
Urine colour	$2.93 \pm 1.02$	$3.2 \pm 1.06$	1.49*	$3.1 \pm 1.09$	$1.77 \pm 0.86$	7.35**

HE: Hydration Education \*\* Significant at 1% level, \*\* Significant at 5% level, NS: Not Significant

Table –III presents the hydration KAP score and status of female athletes. A significant improvement was observed in the scores of intervention group before and after

intervention. No significant difference was found in control group.

**Table 3:** Hydration Knowledge, Attitude and Practice (KAP) and Hydration Status of Female Athletes

Variables	Control Group (N=30)			Intervention group (N=30)		
	Before HE	After HE	t-Value	Before HE	After HE	t-value
Knowledge Score	$13 \pm 1.042$	$13.07 \pm 1.015$	0.403NS	$10.3 \pm 1.055$	$14.97 \pm 1.273$	21.58**
Attitude Score	$4.53 \pm 1.252$	$4.8 \pm 1.095$	1.682*	$4.43 \pm 1.223$	$7.8 \pm 1.27$	13.4**
Practice Score	$3.83 \pm 1.234$	$4.5 \pm 0.938$	4.817**	$3.73 \pm 1.081$	$8.03 \pm 1.189$	24.73**
Total KAP score	$21.5 \pm 2.345$	$22.47 \pm 1.776$	3.433**	$18.47 \pm 1.756$	$30.87 \pm 1.737$	37.49**
Body weight change (%)	$3.27 \pm 0.691$	$3.03 \pm 0.85$	1.366*	$3.87 \pm 0.97$	$2.23 \pm 0.73$	7.92**
Urine colour	$3.65 \pm 1.19$	$3.74 \pm 1.25$	2.72 **	$4.2 \pm 1.16$	$2.53 \pm 0.97$	8.118**

HE: Hydration Education

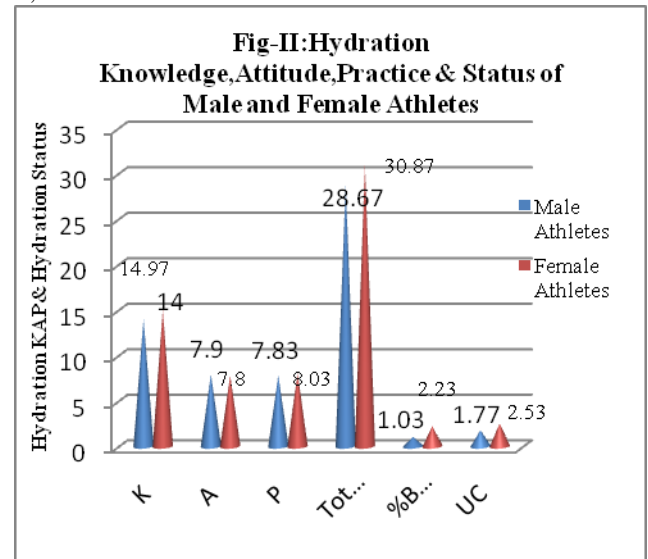
\*\* Significant at 1% level, \*\* Significant at 5% level, NS: Not Significant

The results comparing the effect of hydration education on hydration KAP and status between male and female athletes after intervention (Fig-II), reported that, female athletes were found to have better KAP score than male athletes. A significant difference was observed between male and female athletes.

After intervention, the percentage of the male subjects that were classified as dehydrated in the intervention group decreased to 62.1% ( $P=0.005$ ), and whereas in female athletes, it was 54%. The hydration status had improved better in male athletes than females after intervention, while there was no difference in the C group of both male (90.0%) and female athletes (93%). Similar findings was observed by Decher et al., 2008.

Pearson correlation analysis (Table-IV), revealed a significant positive correlation between hydration knowledge, attitude, practice and hydration status among college athletes post hydration education intervention. It showed that improving athletes hydration knowledge leads to significant improvement in practices and thereby hydration status of athletes which is in accordance with the

study done by Nicholas et al., 2005 and Kavouras et al., 2012.



K-Knowledge, A-Attitude, P-Practice, Tot-Total KAP, %BW- percent body weight change, UC- Urine colour

**Table 4:** Pearson Correlation Coefficients between Knowledge, Attitude, Practice Scores regarding Hydration and Hydration status of College Athletes after Intervention

Hydration KAP Variables	Hydration KAP				Hydration Status	
	Knowledge Score	Attitude Score	Practice Score	Total KAP Score	% BEC	U C
Knowledge Score	1	-0.035	0.225	0.278*	0.234	0.190
Attitude Score		1	0.340**	0.409**	0.031	0.155
Practice Score			1	0.253	0.097	0.009
Total KAP Score				1	0.335**	0.070
% Body weight Change					1	0.177

\*Correlation is significant at 0.05 level

\*\*Correlation is significant at 0.01 level

## 5. Conclusion

Hydration is an important but often forgotten aspect of nutrition. Hydration education can teach athletes the simple ways to improve their hydration, maintain health, reach peak performance, and recover properly post-event. In the present study, a short term hydration education helped in an improvement of hydration KAP on adequate fluid intake, fluid replacement, prevention and management of dehydration, which in turn showed an improvement in the hydration status of male and female college athletes. It is important to continue to educate collegiate athletes about hydration and to ensure that they have access to proper fluids to maintain hydration.

## 6. Future Scope

1. The similar study can be done with young athletes.
2. The effect of long term intervention on hydration status could be studied.
3. The effect can also be compared between endurance and non endurance athletes.

## References

- [1] Armstrong L. E, Soto J. A, Hacker F. T, Jr, Casa D.J, Kavouras S.A, Maresh, C.M. (1998), "Urinary indices during dehydration, exercise, and rehydration". Int J Sport Nutr, 8(4), pp 345–355.
- [2] Cheuvront SN, Carter R, Sawka, MN. (2003), "Fluid balance and endurance exercise performance". Curr Sports Med Rep, 2, pp 202-208.
- [3] Decher NR, Casa DJ, Yeargin SW, Ganio MS, Levreault ML, Dann CL, James CT, McCaffrey MA, Oconnor CB, Brown SW. (2008), "Hydration status, knowledge, and behavior in youths at summer sports camps". Int J Sports Physiol Perform. 2008;3, pp 262–278.
- [4] Douglas J, Lawrence E. Armstrong, Susan K. Hillman, Scott J. Montain, Ralph V. Reiff, Brent S.E. Rich, William O. Roberts, Jennifer A. Stone. (2000). "National Athletic Trainers' Association Position Statement (NATA): Fluid Replacement for Athletes". Journal of Athletic Training, 35(2), pp 212–224.
- [5] Godek, S. F., Godek, J. J., & Bartolozzi, A. R. (2005). "Hydration status in college football players during consecutive days of twice-a-day preseason practices". American Journal of Sports Medicine, 33(6), pp 843–851.



- [6] Jéquier E, Constant F (2010). "Water as an essential nutrient: the physiological basis of hydration". *Eur. J. Clin. Nutr.* 64,pp115–123.
- [7] Mansourou Arè mou Nigan(2013)."Current knowledge, attitudes and practices regarding hydration of student handball players in the Southeastern region (Oueme-plateau) of the Republic of Benin". *Herald Journal of Education and General Studies*, May Vol. 2 (2), pp72 – 76.
- [8] Maughan RJ(2003)."Impact of mild dehydration on wellness and on exercise performance". *Eur J Clin Nutr.* 2003;57((Suppl. 2) pp S19–S23.
- [9] McDermott BP, Casa DJ, Yeargin SW, Ganio MS, Lopez RM, Mooradian, EA. (2009). "Hydration status, sweat rates, and rehydration education of youth football campers". *J Sport Rehabil*,18, pp535-552.
- [10]Nichols, P. E., Jonnalagadda, S. S., Rosenbloom, C A., & Trinkaus, M. (2005). "Knowledge, attitudes, and behaviors regarding hydration and fluid replacement of collegiate athletes". *International Journal of Sport Nutrition and Exercise Metabolism*, 15, pp515-527.
- [11]Roberta F. Kumley, (2010)."Hydration and fluid replacement knowledge, attitudes, barriers, and behaviors of NCAA Division I Football players at a Mid Western University",Masters Theses submitted to Ball State University, Muncie, Indiana.
- [12]Kavouras S.A, Arnaoutis.G,Makrillos.M, Nikolaou.E,Chira.O,Ellinikaki.E,andSidossis..S(2012). "Educational intervention on water intake improves hydration status and enhances exercise performance in athletic youth". *Scand J Med Sci Sports*. Oct 22(5),pp 684–689.
- [13]Stover EA, Zachwieja J, Stofan J, Murray R, Horswill CA(2006)." Consistently high urine specific gravity in adolescent American football players and the impact of an acute drinking strategy". *Int J Sports Med*.27,pp330–335.
- [14]Volpe SL, Poule, K.A, Bland, EG. (2009)."Estimation of prepractice hydration status of National Collegiate Athletic Association Division I athletes", *J Athl Train*. Nov-Dec;44(6),pp 624-9.

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