

ORIGINAL ARTICLE

The Awareness of Athletes on Hydration and Dehydration in Qom, Iran

Mohammad Hozoori¹, Mohaddeseh Asafari^{2*}

1. Department of Family and Community Medicine, Qom University of Medical Sciences, Qom, Iran

2. Food Safety and Hygiene Section, Department of Food Science and Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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ABSTRACT

Background: Water is an essential ingredient for athletic performance and has an undeniable role in the success of athletes. However, according to studies, the level of awareness and use of water and fluids among athletes has been insufficient. This study intended to assess the level of awareness of fluid consumption among athletes in Qom, Iran.

Methods: In a cross-sectional study, 18 sports clubs in Qom were randomly selected and 270 researcher-made questionnaires were distributed among the athletes. The questionnaire contained demographic questions and also included 14 questions about personal awareness on water and hydration such as consumption of fluids and sport drinks during exercise, thirst and body water reserves. The validity and reliability of the questionnaire were determined by assessment experts and Cronbach's alpha ($N=24$, $\alpha=0.83$).

Results: People under the age of 25 years had more awareness, while 48% of them considered thirst as the best criterion for drinking water during exercise. Thirty-four percent considered appropriate drinking water until quenching their thirst, and only 30% reported consumption of sports drinks useful during an exercise. Also, the level of awareness was lower with university education.

Conclusion: The lack of awareness of athletes about the importance of water and beverage consumption can lead to inappropriate behaviors, irrational attitudes and unscientific steps. Low scores and non-scientific resources to get information about hydration and drinking water among athletes can be a major challenge in the area.

*Corresponding author:

Mohaddeseh Asafari, PhD candidate,
Food Safety and Hygiene Section,
Department of Food Science and
Technology, Shahid Beheshti University
of Medical Sciences, Tehran, Iran.

Tel: +98-9183699248

Email: m.asafari@sbmu.ac.ir

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Introduction

After oxygen element, water is the most important one for survival and its consumption is considered an urgent nutritional need for the body. Water, as one of the main constituents of the human body, accounts for approximately 60 to 70% of body weight (1). The human body needs water to maintain balance and stay alive, to build muscles, hydrate various tissues

and organs, regulate body temperature and normal kidney function, and excrete waste products and toxins. Water is absorbed through the drinks and consumed food and is excreted through the kidneys, skin, lungs and feces (1, 2). During sports activities and energy consumption, athletes gradually become dehydrated (2). Dehydration occurs when the body loses its water by as much as 2% of body weight, which

is characterized by thirst, weakness, weight loss, dry skin, increased heart rate, and vertigo. If dehydration is not treated, vital organs would lose their ability to perform their function, and if dehydration continues to increase, it would lead to anesthesia and death (1, 3). In these conditions, athletes experience increased heart rate, increased body temperature, anxiety and fatigue, declined cardiac output, decreased athletic performance, reduction in memory and alertness, and a decrease in muscle function (4-6). On the other hand, the imbalance in the body's electrolytes also exacerbates these factors (5). The balance of water and electrolytes is very important in people, especially among athletes.

Many studies have been done on the effects of water on the human body and how hydration affects athletic performance, and several studies have shown that dehydration during exercise reduces athletic performances (5-7). Edward Adolf was one of the first to study the effect of water consumption on heat and performance (8). He also coined the term dehydration when sweating occurs rapidly, a person does not consume enough fluids to retain water, and when the body needs lots of water, and it is not a sign of feeling thirst (2). In recent years, there has been an awareness that even mild hydration (less than 2% of body weight) can impair exercise performance and increase the likelihood of heat stress (2, 9). Therefore, adequate awareness of the importance of fluids and meeting the need for it in athletes is one of the basic principles in sports nutrition. However, the available evidence indicates that athletes are not well aware about water needs, hydration status, and its effects on sport performance. In a study that examined the awareness and behavior of American athletes toward hydration, half of the participants had moderate levels of awareness (10). Due to the fact that increasing the awareness of people about hydration is necessary and also the existence of few studies on athletes' awareness on water consumption before, during and after exercise, this study aimed at evaluating athletes' knowledge about hydration.

Materials and Methods

In a cross-sectional study, using a table of random numbers, 18 sport clubs from Qom city, Iran were enrolled and 270 questionnaires were distributed among athletes of selected clubs in different disciplines (15 questionnaires for each club), while 223 of them were completed (response rate of 83%). This study was approved by the Ethics Committee of Qom University of Medical Sciences, Qom, Iran (IR.MUQ.REC.1394.37). This study was designed using a questionnaire (18 questions) to assess demographic characteristics (including weight,

height, age, history of sports activities, etc.) and assess the awareness of athletes on hydration by the research team as an option bank. Then, during the panel of experts, its face and content validity was examined with the approval of faculty members who were specialized in instrument construction and were familiar with the subject of research. Moreover, each part was evaluated with the help of 24 athletes other than the main sample; but with the same characteristics using internal consistency coefficient (validity) and Cronbach's alpha test (reliability). Cronbach's alpha was confirmed by 83% of the tests in each part of the reliability.

Inclusion criteria indicated to absence of any sports injuries or complications that could interrupt sports activities and a willingness to participate in the study. Also, athletes who had a history of sport activity in the past 6 months and exercised an average of 6 hours per week were included in the study. Exclusion criteria were inability or unwillingness to complete the questionnaires. Prior to the study, the purpose of the study was briefly explained to the athletes in each club. With full and informed consent, 270 athletes answered the questionnaires. It was possible for people to discontinue the study at any time. Also, mentioning the names of the participants in the questionnaires was optional. The data were finally analyzed by SPSS statistical software (version 18 for Windows, Chicago, USA) by descriptive indicators and using Pearson correlation coefficient and, if necessary, by using ANOVA and post hoc tests as well as non-parametric tests. Chi-square and Mann-Whitney were analyzed at a significance level of less than 0.05.

Results

Totally, 223 athletes from 18 clubs in Qom, Iran were randomly selected and were given questionnaires to assess hydration awareness and water consumption. In the study, 127 (57%) of the participants were male and 96 (43%) were female. The mean and standard deviation (Mean±SD) of demographic characteristics of the participants were age (27±7), weight (74±10.5), height (171±15), sport history (46±59), and hours of training in a week (7±5.5). Figure 1 shows the 5 field of studied sports. Data on the source of athletes' information on hydration were demonstrated in Table 1, and coaches had a special effect on athletes' information, especially for men.

The study of athletes' awareness on hydration was shown in Table 2. No relationship was observed between the level of education and the level of awareness of the participants regarding knowledge on nutritional and hydration. However, there was a significant relationship between gender and source of information ($p < 0.05$).

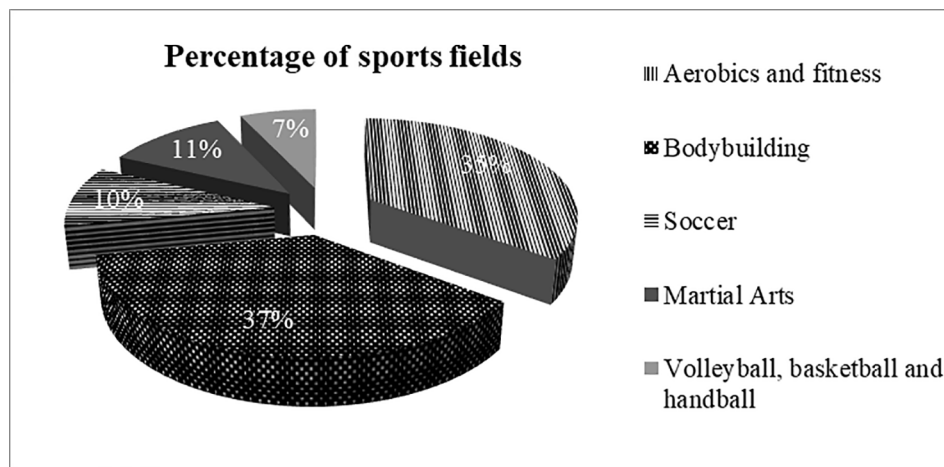


Figure 1: Number of people present from different sports fields

Table 1: Source of information regarding nutrition and water consumption among athletes.

Source of information	Number (Percentage)**		
	Female	Male	Total
Coach	24 (24.7%)	71 (56.3%)	95 (43%)
Nutritionist	35 (36.1%)	16 (12.7%)	51 (23%)
Physicians	13 (13.4%)	5 (4%)	18 (8%)
Friends	4 (4.1%)	10 (7.9%)	14 (6.3%)
Media	9 (9.3%)	3 (2.4%)	12 (5.4%)
Print media	4 (4.2%)	3 (2.4%)	7 (3.1%)

**Number (Percentage): Totally: 197, Male: 108, Female: 89.

The relationship between age groups and awareness was presented in Table 3. This Table reveals the results of Post-hoc analysis. Also, findings were divided into three age groups. Athletes in the age group older than 40 years reported less awareness on thirst for hydration than young people under 25 years and the difference was statistically significant ($p < 0.05$). Moreover, people aged 25 to 40 years (adults) had more awareness, but the difference was not statistically significant. Regarding the temperature of the drink consumed during exercise, young people had less awareness than adults and the difference was statistically significant ($p < 0.05$). The older athletes were more aware, but the difference was not statistically significant. Toward water intake after exercise, elderly athletes had less awareness than young people, while youth and adolescents reported less awareness on aging and the difference was not statistically significant. This study was also conducted in relation to the level of education of athletes, and no significant differences were observed in this section. However, the level of awareness in people with university education was lower than those without university educational level.

The relationship between gender and awareness was displayed in Table 4. In this table, based on the results of Mann-Whitney test, out of 14 questions related to awareness on hydration, women in

7 questions and men in the rest reported more awareness, which was significant only for 4 questions ($p < 0.05$). Moreover, regarding the field of sports, the average awareness of athletes for ball sports was higher than other ones, but the difference was not significant.

Discussion

The results of this study showed that only about half of the participants (50.75%) had proper and appropriate awareness, which is in line with the results of studies in American athletes and Portuguese athletes (3, 10). The highest source of information was the coach (53%), while 21% of the people used a nutritionist to obtain information, which is similar to the findings of other studies (11-13). In comparison of female and male athletes, women considered nutritionist and then the coach as the most reliable source of information, which is consistent with the study of Hozoori *et al.* (12). According to the findings of our study, in addition to parents, social media, other athletes and coaches were the most important sources of information about hydration. Due to the close relationship between coaches and athletes, coaches can have a significant influence on the physical and mental health of athletes (14-16). Therefore, it is very important that coaches have sufficient and accurate

Table 2: A survey of athletes' awareness on hydration.

Questions and answers	Number (Percent)		
	Women	Men	Total
Consuming water and fluids before exercise to replenish body water reserves is necessary.			
Agree	78 (80.5%)	91 (72%)	169 (76%)
Disagree	3 (3%)	17 (14%)	20 (9%)
I don't know	15 (15.5%)	18 (14.3%)	33 (14.8%)
Decreased water reserves during exercise can impair the function of exercise.			
Agree	79 (82%)	103 (82%)	182 (82%)
Disagree	11 (11%)	7 (6%)	18 (8%)
I don't know	7 (7.2%)	16 (12.7%)	23 (10.3%)
Thirst is the best way to determine when you need to drink during exercise.			
Agree	36 (57%)	52 (41%)	107 (48%)
Disagree	55 (28%)	54 (43%)	90 (40%)
I don't know	5 (5.2%)	17 (13.5%)	22 (9.9%)
Weight loss during exercise is the best indicator for dehydration.			
Agree	49 (38%)	58 (46%)	107 (48%)
Disagree	28 (29%)	39 (31%)	62 (28%)
I don't know	33 (23.7%)	50 (22.4%)	50 (22.4%)
Sport drinks that are consumed during exercise should have different vitamins in their ingredients.			
Agree	37 (37%)	24 (19%)	74 (33%)
Disagree	28 (29%)	73 (58%)	26 (12%)
I don't know	33 (34%)	28 (22.2%)	118 (52.9%)
Adding carbohydrates to a drink during exercise saves muscle glycogen.			
Agree	43 (43%)	31 (25%)	109 (49%)
Disagree	10 (10%)	16 (13%)	52 (23%)
I don't know	43 (44.3%)	75 (59.5%)	61 (27.4%)
The sweeter sport drinks have more positive effects on athletes' performance.			
Agree	27 (28%)	33 (26%)	60 (27%)
Disagree	29 (30%)	42 (33%)	71 (32%)
I don't know	35 (36%)	48 (38%)	83 (37%)
During prolonged exercise, drinking fluids and water should:			
Be started when feeling thirsty from the moment.	27 (28%)	33 (26%)	60 (27%)
Be started from the beginning at the sport.	29 (30%)	42 (33%)	71 (32%)
Be started about 20 minutes after the start of exercise.	35 (36%)	48 (38%)	83 (37%)
After exercise:			
Drinking water and fluids should be stopped.	14 (14%)	10 (8%)	24 (11%)
Drinking water and fluids should be continued until you don't feel thirsty.	47 (49%)	72 (57%)	119 (53%)
You should continue to drink water and fluids even after quenching your thirst.	36 (37%)	40 (32%)	76 (34%)
If a soccer loses one kilogram after a match, he should:			
Drink as much as one liter (four glasses) of water.			
Drink 1.5 liters (6 glasses) of water.	30 (31%)	31 (25%)	61 (27%)
If you drink water during exercise, you do not need to drink water or fluids after exercise.	23 (24%)	29 (23%)	52 (23%)
	30 (31%)	42 (33%)	72 (32%)

knowledge in this field and have sufficient skills to provide nutrition counseling to protect athletes.

In this study, more than 80% of people were aware that sweating reduced body water reserves and dehydration increased the incidence of fatigue. About

70% knew that reduction in body water reserves significantly affected the athlete adaptation to the hot weather (women were more aware). Nearly half of the participants over 40 years (48%) considered thirst to be the best measure of hydration, and they behaved

Table 3: One-way analysis of variance and results of post hoc analysis to compare awareness on hydration and age among athletes.

Item	Age group	M	F	P	Group	Mean difference	P value
Thirst is the best way to determine when you need to drink water during exercise.	25>	3.28±1.17	3.207	0.042	Youth	-0.250	0.36
	25-40	3.03±1.39			Adults	-0.628	0.19
	40<	2.40±1.45			Youth	-0.878	0.04
Sport drinks consumed during exercise should be completely cold.	25>	2.60±1.07	3.136	0.045	Youth	-0.331	0.05
	25-40	2.27±0.96			Adults	-0.069	0.27
	40<	2.20±0.94			Youth	-0.400	0.28
If soccer loses one kilogram of weight after a match, how much water should he drink?	25>	2.23±0.87	3.349	0.037	Elderly	-0.321	0.31
	25-40	1.96±0.90			Youth	-0.275	0.13
	40<	2.56±0.88			Elderly	-0.596	0.30

M: male; F: female

Table 4: Results of Man-Whitney test to assess the difference for the level of awareness between the genders.

Item	Median	Man-Whitney	P value
Consuming water and fluids before exercise to replenish body water reserves.	5226		0.044
Female	121.12		
Male	104.98		
During exercise, the body's water reserves are reduced by sweating and transpiration.	4817		0.09
Female	122.29		
Male	101.54		
Exercise drinks that are consumed during exercise should contain different vitamins in their composition.	5040.5		0.02
Female	100.96		
Male	120.50		
Adding carbohydrates to a drink during exercise saves muscle glycogen.	4794		0.01
Female	120.56		
Male	100.80		

differently and unprincipled in performance. Today, thirst has been known as the first decision point to drinking water, but it cannot be an accurate criterion to evaluate of the water needs in all age groups.

Thirst occurs when that 2-3% of the body weight is decreased and athletes are dehydrated (17), and due to the fact that thirst is affected by environmental factors, it may not show the body's real need for water. Adams *et al.* in their study as well as others confirmed these findings (18, 19). According to the results of our study, 33.2% of the participants believed that adding carbohydrates to the consumed drink during exercise could save muscle glycogen, which is slightly different from the results of other researchers (20), but others have reported similar findings (21). In this relation, women were also more aware. Nevertheless, about half (49%) of people believed that presence of vitamins in sport drinks had a positive effect on physical activity (awareness was higher in men), but only if the person was deficient in nutrients, supplementation could be effective. An increased energy metabolism was shown to increase the need for many B vitamins, but there was no evidences to demonstrate that supplementation with these vitamins enhanced athletic performance (17, 22, 23). However, one study illustrated the positive

effect of magnesium on performance in male athletes (24). According to our findings, women (37%) less likely (58%) believed in supplementation during exercise when compared with men. One third of the participants (36%) reported that sweet sport drink had greater positive effect on performance of athletes. The finding is similar to a previous study (25).

Regarding water and fluid intake during exercise in our study, 65% of people were against the consumption of cold-water during exercise and most people in the age group under 25 years reported an agreement. The closer the water temperature was to the normal body temperature, it could shorten the time between drinking water and its absorption in the intestine (26). According to our results, there was no significant relationship between the level of education and awareness of individuals, but more awareness was found among younger people younger than 25 years of age. Despite that, people with a university educational level had less information about sport hydration when compared with other people. In our study, 31% of participants believed that drinking fluids was appropriate only during exercise; while the athletes should consume 500 to 600 mL of water or sport drinks, 2-3 hours before exercise and 200 to 300 mL, 20 minutes before exercise. This

process prevented the decrease of 2% of fluids lost through sweating and urine excretion (27). Other studies have reported similar findings too (5, 28).

Conclusion

Based on our findings, athletes did not know how to replace lost fluids or they were indifferent to the feeling of thirst. In consideration of the fact that dehydration causes a decrease in athletes' performance in terms of strength and speed and has negative effects on cognitive and physical performances as well as neuromuscular coordination, it should be planned to increase athletes' awareness. The role of hydration in athletes is very important and they need sufficient knowledge in this relation. A balanced diet and proper hydration are vital in prevention of injuries during exercise to improve the athletes' performance and to recover the fatigue. It is recommended to ensure a proper hydration before exercise, which requires the development of guidelines for fluid intake before, during and after exercise. In order to achieve this important goal and principle, sports complexes should hold training courses for coaches as well as athletes at the beginning of each sport course and to assign appropriate classes regarding the circumstances and the type of sport and the age.

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Conflict of Interest

None declared.

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