

Full Length Research Paper

Current knowledge, attitudes and practices regarding hydration of student handball players in the South-eastern region (Oueme-plateau) of the Republic of Benin

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This cross-sectional study was carried out in order to check if the trainers’ counselling had been able to lead the Benin young handball players to acquire higher levels of hydration knowledge, attitudes and practices than their non-athlete peers. A survey using questionnaire was passed to 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. On the whole, 63% of the surveyed students had a good level of hydration practices, but worse levels of hydration knowledge and attitudes. The handball players had higher levels of hydration knowledge and practices than their nonsporting peers ($p < 0.05$), whereas no difference was noted between the two groups concerning their attitudes to water ($p > 0.05$). The percentages of HB players having a good level of knowledge related to water or a good level of hydration practices are more important than those of the NS group ($p < 0.001$), with respective Odds Ratio (OR) of 5.3 (IC_{95%} : 2.5 – 11.0) and 44.8 (IC_{95%} : 10.5 – 190.2). 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.

Keywords: Knowledge, attitudes, practices, survey, pupils, handball, hydration, Republic of Benin.

INTRODUCTION

Water is the most important component of the human body of which it accounts for approximately 60%. It is distributed in all the body and enters the constitution of all the cells of which it represents a large part (Jéquier and Constant, 2010; Lang and Waldegger, 1997). Unfortunately, this invaluable liquid is lost on several occasions throughout the day, particularly by breathing and sweating, in the faeces, urines, etc. (Bossingham,

2005; Casa et al., 2005). This water loss is accentuated in hot environment and/or when the body is submitted to an intense and prolonged physical effort. It can have negative effects on the physiological mechanisms and health (Popkin et al., 2010; Manz and Wentz, 2005). In exercising athletes, the hydric deficit is accompanied by a decrease in sports performance. A 2% reduction in body weight is sufficient to lower physical capacity (Cheuvront et al., 2003; Brooks, 2000; Sawka, 1992). It is also known that under a high thermal stress, sweating is increased and higher than water consumption, which is likely to bring about a relatively severe condition of dehydration

(Sawka et al., 1984; Harrisson et al., 1975). As a consequence, there is a reduction in plasma volume (Murray, 2007; Claremont et al., 1976) which exposes the athletes to the risk of exertion hyperthermia or heat wave (Banzet et al., 2012; Maughan, 2003; Sawka, 1992).

In Benin, three hours of Physical Education (PE) are scheduled every week in the students' time-table. Those who practise a sport in clubs are trained between 3 and 7 pm, and are thus more exposed to different risks associated with water loss through sweating. It is possible to largely compensate for this water loss by good hydration practices, prior to, during and after exercise (Koulmann et al., 2003; Montain, 1999). On the one hand, it is necessary for the students to know about the importance of water in the maintenance of body homeostasis, during exercise and rest time. On the other hand, they must be aware that their attitude related to water partly determines the way in which they are hydrated and that they must consume an important quantity of drinking water every day.

Most studies regarding hydration knowledge, attitudes and practices in youngsters and in adults have been carried out in the professional environment in Europe, not to say in Africa (Mwembo-Tambwe et al., 2012; Odunaiya et al., 2011; Hentgen et al., 2002). A few studies concerning students' knowledge, attitudes and practices related to food as well as life style on school premises are available (Odunaiya et al., 2011; Vivas et al., 2010). It is indeed well known that children and teenagers constitute the main target populations as far as the prevention of bad hydration practices is concerned. Before designing educational programmes and/or strategies for good hydration practices, one must identify the key elements which are likely to induce the expected changes in the students' behaviour.

The young Benin sport practitioners who play team sports like handball are more and more frequently encouraged by their trainers to hydrate themselves during and after training, and during competition. However the possible impact of this advice on the hydration practices of the handball players is unknown, since no investigation has been made on the issue.

In a word, this study was carried out to appreciate the impact of the trainers' counselling on the hydration knowledge, attitudes and practices of young handball players, compared to those of their nonsporting mates.

METHOD

Study sample

It was a cross-sectional study, carried out in May 2012, with 74 players (HB) from the eight junior teams which were qualified for the semi-finals of the school handball championship of the South-eastern Region of Benin (West Africa). Finally, six (three of male and three of

female players) out of the eight qualified teams were retained. The players of the other two teams were taking exams in their schools and could not take part in the study. A control group constituted with the 137 non-athlete voluntary students (NA) attending the same classes and schools as the selected handball players was used to carry out this knowledge, attitude and practice (KAP)-based survey. Information was collected from the surveyed subjects who were gathered on the handball playing grounds of the selected secondary schools.

Data collection

A pre-survey carried out in Porto-Novo with 18 junior handball players one week before the study, permitted the review of eight items in the questionnaire. The internal consistency of the three parts of the questionnaire was found acceptable, since the Cronbach's alpha ranges were ≥ 0.7 , with the smallest intra class correlation of 0.205 [CI: 0.89; 0.40]. The Bravais Pearson's correlations $r = 0.50$ to 0.78 found seven days apart with 30 students during the pilot study were significant ($p < 0.05$). Data were then collected during the survey, using the improved and reliable version of the questionnaire.

The survey was carried out by self-administration, i.e. each participant received a sample of the questionnaire and completed it by himself in the presence of the investigators. Socio-demographic data and three composite variables were assessed through the items which were proposed on the questionnaire. They were about: 1) students' knowledge related to water: it was measured through 14 questions related to the physicochemical properties of water, its distribution and its functions in the body, water consumption and loss; 2) attitudes of surveyed students to water, which were assessed using 10 questions about the precautions to take for water handling at school and at home, i.e. availability of water, cleanliness, protection and frequency of container cleaning; 3) hydration practices, which were measured through four questions related to the nature, quantity, quality and frequency of water intake.

For all the survey items, each good answer to a question was marked zero point and a bad response 1 point. All the students who gathered a score ranging from zero to six points were considered having a good level of knowledge related to water. Those who got seven to 14 points were regarded as having a bad level of knowledge related to water. So far as attitudes to water were concerned, students who obtained four or fewer than four points were considered as adopting good attitudes, and those having five to 10 points, were considered as adopting bad attitudes. Regarding hydration practices, were considered as having a good level, students obtaining 1 or less than 1 point and

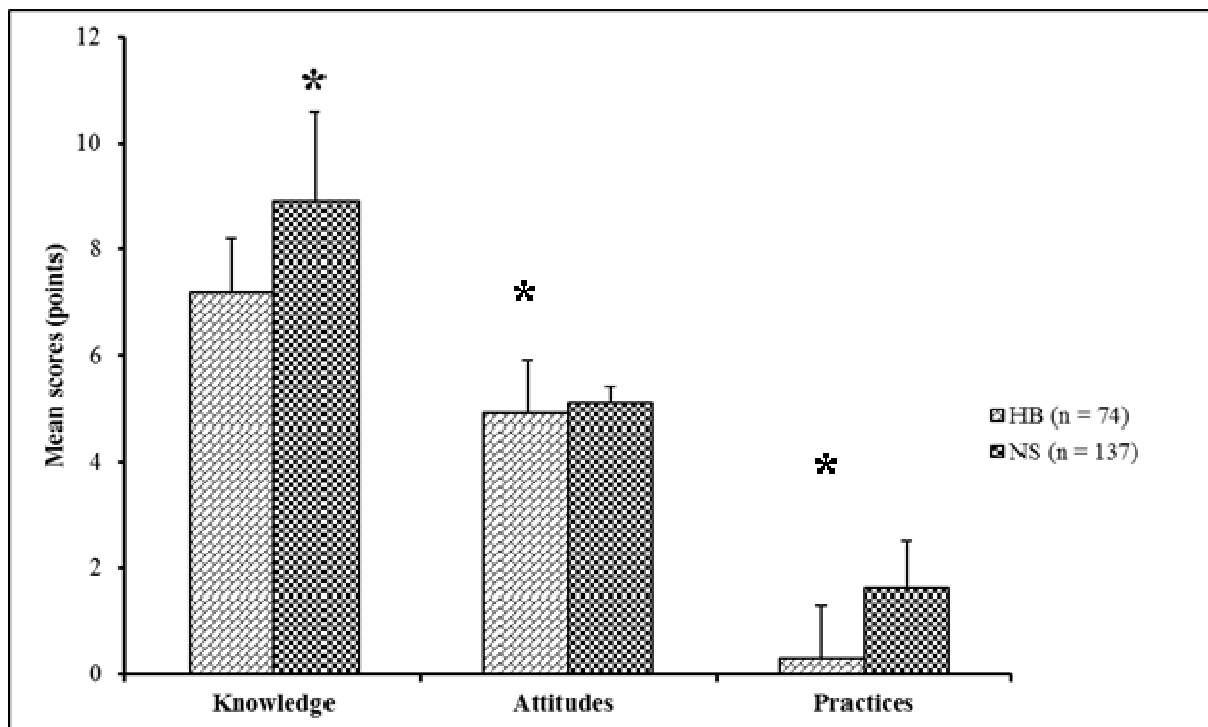


Figure 1: Comparison of hydration knowledge, attitudes and practices mean scores between handball players and non-sportsmen (n = 211).

HB : handball players; NS: non sportsmen; *: p < 0,001; knowledge: that is knowledge related to water hydration; attitudes: that is attitudes to water hydration; practices: that is hydration practices.

considered as having a bad level, those with two, three or four points.

Ethical considerations

Two weeks before the survey, school principals, Physical Education teachers and students of the selected schools were informed of the study objectives and design, and the future advantages for athletes. The participants were also reassured that all precautions had been taken to guarantee data anonymity and confidentiality, before they gave their informed written consent.

Statistical analysis

The collected data were processed with the Statistica (Stat Soft Inc., Version 5.5) and Epi-Info 2000 (version 3.5.3) software. For each study variable, the absolute frequencies and corresponding percentages were calculated. Association between the student's status (handball player or non-athletes) and each composite variable (knowledge, attitudes and practices) was determined by the chi² (X²) test. The measure of the association between the level of knowledge related to water and the hydration practices in the handball players

were also determined by the Odds Ratio (OR). The level of significance of the statistical tests was set at p < 0.05.

RESULTS

The students who took part in this study had an average age of 16.5 ± 0.9 years and took three hours of Physical Education (PE) per week. Among them, 74 (35%) had been involved in handball competitions for an average of 3 ± 1 years, with a two hours training session in the afternoon, twice a week.

The average records per item in students (HB and NA) are presented on figure 1. Regarding the levels determined, 19.9% of the 211 surveyed students had a good level of knowledge related to water, but only one (0.5%), had a good level of attitudes to water and 133 (63%) had a good level of hydration practices (table 1). This level of hydration practices was particularly good in HB, but with an elevated standard deviation, i.e. about 83% of the mean value (table 2). Table 2 also shows that the proportions of HB players with a good level of knowledge about water as well as those with a good level of hydration practices, are more important than those of NA (OR = 44.8; IC_{95%}: 10.5 – 190.2 versus 5.3; IC_{95%}: 2.5 – 11.0; p < 0.001). On the other hand, the level of attitudes to water did not differ significantly between HB

Table 1: Levels of hydration knowledge, attitudes and practices of the surveyed students (n = 211). n: sample size; values in the cases are absolute frequencies and the corresponding percentages.

	Absolute frequencies (%)	p
Level of knowledge related to water		
Good	42 (19.9)	0.0000
Bad	169 (80.1)	
Level of attitudes to water		
Good	1 (0.5)	0.0000
Bad	210 (99.5)	
Level of hydration practices		
Good	133 (63.0)	0.0003
Bad	78 (37.0)	

Table 2: Relations between surveyed students' status, their hydration knowledge, attitudes and practices levels.

	Status		OR	CI _{95%}	p
	HB (n = 74)	NS (n = 137)			
Level of Knowledge related to water					
Good	28 (66.7)	14 (33.3)	5.3	2.5 – 11.0	0.000*
Bad	46 (27.2)	123 (72.8)			
Level of attitude to water					
Good	1 (100.0)	00 (0.0)	Not defined	Not defined	0.173
Bad	73 (34.8)	137 (65.2)			
Level of hydration practices					
Good	72 (54.1)	61 (45.9)	44.8	10.5 – 190.2	0.000*
Bad	2 (2.6)	76 (97.4)			

HB: handball players; NS: non sportsmen; n: sample size; values in the cases are absolute frequencies and corresponding percentages; p: p value; *: association between the students' status and the independent variable, significant at $p < 0.001$; OR: Odds Ratio; CI: confidence interval.

and NA ($p = 0.173$). On the whole, 72 surveyed HB players out of the 74 (97.3%) had a good level of hydration practices. Of the 72 HB, the 38.9% who also had a good level of hydration knowledge did not differ significantly from the 61.1% who had a bad level of hydration knowledge ($p = 0.383$).

The surveyed students usually had an average daily intake of 1.7 ± 0.5 litres of water, with extreme values [0.75 – 3.5 litres].

DISCUSSION

The objective of this work was to evaluate the level of hydration knowledge, attitudes and practices in school adolescent handball players from the Ouémé-Plateau area, i.e. the south-eastern region of Benin. The results of this work, the first one in the African context of Benin, could justify the necessity of drawing PE teachers'

attention to the importance of providing the young athletes - who are doubly exposed to the risk of dehydration - with hydration counselling. This risk of dehydration is all the higher as the young handball players are submitted to both thermal stress and high physical exertion associated with the practice of handball in the hot and humid environment of the Beninese Ouémé-Plateau region (Djogbéoua et al., 2010).

Although only one fifth of the surveyed students had a good level of hydration knowledge and only one among them had a good level of hydration attitudes, approximately two thirds of them seemed to have a good level of hydration practices. It is obvious that in comparison with the research hypothesis, these results present a paradox. It is quite normal to expect good hydration practices from people with good hydration knowledge and attitudes, rather than the opposite as indicated by the results of this survey. The former type of relations is the one that is reported by many studies

related to knowledge, attitudes and practices. For instance, while studying the factors that can justify the low level of water consumption observed in Irish schoolboys, Molloy et al. (2008) noticed that their teachers had poor knowledge on the importance of water, as well as bad attitudes towards water in class. Ke et al. (2008) had noted a significant improvement of knowledge, attitudes and practices related to artificial feeding and the -hydration of cancer terminal patients in 44 nurses from the Unit of Intensive Care at the hospital of Taipei (Taiwan), after a two-week specific training. Although their study was an interventional one, Ke et al. (2008) established a relationship between knowledge, attitudes and practices. As regards research specifically carried out on knowledge, attitudes and hydration practices, Authors have reported a relationship between knowledge related to water and hydration practices in sports classes. (P. Bacquaert & F. Maton, Institut Régional du Bien-être, de la Médecine et du Sport, Lille, France, personal communication, abstract, p.1). In the same line, Nichols et al. (2005) recorded a relation between hydration knowledge, attitudes and practices in 139 secondary school level athletes. Other KAP surveys reported results that are close to the ones in the current study and which had not established a relation between knowledge, attitudes and practices. In primary schools located in the Ethiopian rural area, Vivas et al. (2010) recorded an adequate knowledge related to hygiene in half (52%) of 669 surveyed schoolboys whereas only 14.8% of them admitted washing their hands after defecation. Mazerole et al. (2010) noted that 77.1% of the 498 high level athletics trainers questioned online declared that they know about the document related to the position statement of the athletics trainers' association on exertion heat wave and its treatment. However, less than one fifth of them (18.6%) used a thermometer to assess body temperature and only half of them (49.8%) used cold water immersion as a treatment for hyperthermia. In a study carried out in a delivery room with healthcare providers of which only 8.5% had a good knowledge, Mwembo-Tambwe et al. (2012) have noted a good level of attitude towards practices which contribute to the reduction of VIH transmission from mother to child. In Lithuania, an epidemiologic educational program that was implemented for increasing in nurses knowledge and attitudes regarding HIV-AIDS improved their level of knowledge, without changing their attitudes (Mockiene et al., 2011). Finally, among the women surveyed in Nigeria by Odunaiya et al. (2001), those who were well aware of the importance and advantages of exercise for a healthy life also had a positive attitude towards exercise, but a poor level of exercising practice.

Knowledge related to water

In reference to the Odds Ratios (OR), the handball

players were 5.3 times more likely to have a good level of knowledge related to water than their nonsporting peers. The young school handball players are supervised by PE teachers, who were well informed, during their training, of the importance of water, its relationship with health and sports performance. The teachers seize upon all the opportunities (break time during exercise, training assessment, etc.) to transmit their knowledge to the players in the form of counselling. The regular exertion of this educational activity on the young handball players, who want to improve their performances, could have positive effects on their knowledge. It could also make them more informed than their non-athlete mates, about the questions related to water and its relationship with health and sports performance.

Hydration practices

It appeared that the handball players are 44 times more likely to have a good level of hydration practices than non-athletes. Indeed, the very high water need in players is justified by the great water losses that are induced both by the hot weather in Benin (Djogbéoua et al., 2010) and by the four-hour handball practice every week. They are spontaneously driven to drink larger quantities of water because of the thirst induced by heavy sweating. This predisposition to drinking is reinforced by the attitude of most PE teachers who require that each player bring his bottle of water to the training session. This imposition, in addition to the important drinking need, could have a positive effect on the behaviour of the school handball players who bring their water bottles, not only to the training session but also to class. That is certainly not the case in non-athletes. The high standard deviation of the score related to the hydration practices recorded within the study sample, accounts for the great inter-individual differences in their behaviour regarding water consumption. This daily water consumption is just sufficient for female athletes, but very insufficient for male athletes, in comparison with the 1.8 litre and 2.6 litres recommended respectively for 13-18 years old girls and boys (Jéquier and Constant, 2010; Institute of Medicine, Food and Board Nutrition, 2004). The great difference in water consumption among the students composing the study sample does confirm the great inter-individual difference already noted about the level of hydration practices.

The absence of difference between the proportions of subjects adopting good attitudes towards water in the group of handball players and that of non-athletes can be associated with the precautions taken on both sides to ensure a good water quality, i.e. the hygiene of the containers, the conservation of water and the type of drinks consumed. On the whole 40% of the pupils who had a good level of knowledge related to water had also a good level of hydration practices. About two thirds of

those who had good hydration practices had also a poor level of knowledge related to water, without the difference between the two groups not being significant. One can deduce from this that the fact of having good hydration practices is not associated with good knowledge related to water. This result confirms the assumption about the obligation made by the PE teachers to the players, to bring water mixed with lemon juice for all the team.

Limits

The main limit of this study relates to the young age of the participants and the survey technique used. The information collected by the questionnaire is not always reliable, since the sincerity of the surveyed people can be questionable, all the more as the addressed children are 16 years old or younger. The results of this study permit to conclude that good hydration practices are not inevitably associated with a good level of knowledge related to water among the surveyed handball players.

CONCLUSION

In the current study, hydration knowledge, attitudes and practices in school handball players in the South-eastern region (Ouémé-Plateau) of the Republic of Benin were assessed with the hypothesis that higher levels will be recorded in athletes than in their non-athlete peers. It appeared that the majority of the surveyed players have a good level of hydration practices, but worse levels of knowledge and attitudes related to water. The handball players are 5.3 times more likely to have a good level of knowledge related to water and 44 times more likely to adopt good hydration practices than their non-athletes peers. In the group of surveyed handball players, good hydration practices are not inevitably associated with a good level of knowledge related to water. The results of this study do not prove that knowledge is necessary for adopting good hydration practices. It is then reasonable to think that the advice of the PE teachers to the players to prevent dehydration had certainly a positive impact on their hydration practices.

These data suggest the implementation of new learning strategies to improve at a time, hydration knowledge, attitudes and practices in the school handball players of the Republic of Benin.

REFERENCES

- Banzet S, Koulmann N, Bourdon L (2012). Activité physique et hyperthermie. *Méd. & Armées*. 3: 207-216.
- Bossingham MJ, Carnell NS, Campbell WW (2005). Water balance, hydration status, and fat-free mass hydration in younger and older adults. *Am. J. Clin. Nutr.* 81: 1342-1350.
- Brooks GA (2000). *Exercise physiology: human bioenergetics and its applications*. 3rd ed. Mountain View, CA: Mayfield. 851 p
- Casa DJ, Clarkson PM, Roberts WO (2005). American College of Sports Medicine roundtable on hydration and physical activity: consensus statements. *Curr. Sports Med. Rep.* 4: 115-127.
- Cheuvront SN, Carter III R, Sawka MN (2003). Fluid balance and endurance exercise performance. *Curr. Sports Med. Rep.* 2: 202-208.
- Claremont A, Costill D, Fink W, Van Handel P (1976). Heat tolerance following diuretic induced dehydration. *Med. Sci. Sports*. 8: 239-243.
- Djogbéoua L, Pasteur N, Bio-Banganaa S, Baldeta T, Irish SR, Akogbeto M, Weill M, Chandre F. (2010). Malaria vectors in the Republic of Benin: Distribution of species and molecular forms of the *Anopheles gambiae* complex. *Acta Trop.* 114: 116-122.
- Harrison M, Edwards R, Fennessy P (1975). Effects of thermal stress and exercise on blood volume in humans. *Physiol. Rev.* 15: 164-167.
- Hentgen V, Jaureguiberry S, Ramiliarisoa A, Andrianantoandro V, Belec M (2002). Connaissances, attitudes et pratiques du personnel de santé en matière de VIH/sida à Tamatave (Madagascar). *Bull. Soc. Pathol. Exot.* 95:103-108.
- Institute of Medicine, Food and Nutrition Board (2004). *Dietary reference intakes for water, potassium, sodium, chloride, and sulfate*. National Academy Press. Washington DC. 1-18.
- Jéquier E, Constant F (2010). Water as an essential nutrient: the physiological basis of hydration. *Eur. J. Clin. Nutr.* 64: 115-123.
- Ke LS, Chiu TY, Hu WY, Lo SS (2008). Effects of educational intervention on nurses' knowledge, attitudes, behavioral intentions towards supplying artificial nutrition and hydration to terminal cancer patients. *Support Care Cancer*. 16: 1265-1272.
- Koulmann N, Banzet S, Bigard AX (2003). L'activité physique à la chaleur: de la chaleur aux recommandations d'apport hydrique. *Med. Trop.* 6: 617-626.
- Lang F, Waldegger S (1997). Regulating cell volume. *Am. Scientist*. 85: 456-463.
- Manz F, Wentz A (2005). The importance of good hydration for the prevention of chronic diseases. *Nutr. Rev.* 63: S2-S5.
- Maughan RJ (2003). Impact of mild dehydration on wellness and on exercise performance. *Eur. J. Clin. Nutr.* 57: S19-S23.
- Mazerolle MS, Scruggs IC, Casa DJ, Burton LJ, McDermott BP, Armstrong LE, Maresh CM (2010). Current knowledge, attitudes, and practices of certified athletic trainers regarding recognition and treatment of exertional heat stroke. *J. Athl. Train.* 2: 170-180.
- Mockiene V, Suominen T, Valimaki M et al. (2011). The impact of an education intervention to change nurses' VIH-related knowledge and attitudes in Lithuania: a randomized controlled trial. *Ass. Nurses AIDS Care*. 2: 140-149.
- Molloy CJ, Gandy J, Cunningham C, Slaterry G (2008). An exploration of factors that influence the regular consumption of water by Irish primary school children. *J. Hum. Nutr. Diet.* 5: 512-515.
- Montain SJ, Latzka WA, Sawka MN (1999). Fluid replacement recommendations for training in hot weather. *Mil. Med.* 164: 502-508.
- Murray B (2007). Hydration and physical performance. *J. Am. Coll. Nutr.* 5: 542S-548S.
- Mwembo-Tambwe N, Kalenga P, Donnen P, Chenge F, Humblet P, Dramaix M, Buekens P (2012). Connaissances, attitudes et pratiques des prestataires des soins de la salle d'accouchement sur la prévention de la transmission du VIH de la mère à l'enfant à Lubumbashi. *Med. Afr. Noire*. 59: 260-267.
- Nichols PE, Jonnalagadda SS, Rosenbloom CA, Trinkaus M (2005). Knowledge, attitudes and behaviors regarding hydration and fluid replacement of collegiate athletes. *Int. J. Sport. Nutr. Exerc. Metab.* 15: 515-527.
- Odunaiya O, Aderibigbe T, Oguntibeju O (2011). Physical exercise: Knowledge, attitudes and habits of literate women in Western Nigeria. *AJPHRD*. 17: 789-800.
- Popkin BM, D'Anci KE, Rosenberg IH (2010). Water, hydration and health. *Nutr. Rev.* 68: 439-458.
- Sawka M, Francesconi R, Young A, Pandolf F (1984). Influence of hydration level and body fluids on exercise performance in the heat. *J. Am. Med. Assoc.* 252: 1165-1169.
- Sawka MN (1992). Physiological consequences of hypohydration: exercise performance and thermoregulation. *Med. Sci. Sports Exerc.* 24: 657-670.
- Vivas A, Bizu G, Aboset N, Kumie A, Berhane Y, Williams MA (2010). Connaissances, attitudes et pratiques (CAP) de l'hygiène chez les enfants d'âge scolaire dans Angolela, Ethiopie. *J. Prev. Med. Hyg.* 2: 73-79.

