

The importance of human hydration: perceptions among healthcare professionals across Europe

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Summary

Attitudes of healthcare professionals to the importance of hydration for health, wellness and performance were evaluated in six European countries. These included general medical practitioners ($n = 600$), nurses ($n = 300$), pharmacists ($n = 550$), nutritionists ($n = 265$) and dietitians ($n = 265$), spread across France, Germany, Greece, Italy, Spain and the UK, who completed computer-aided web or telephone interviews. The interviews assessed attitudes to the importance of hydration, how commonly they assess the hydration status of patients, and knowledge about recommended water intakes, sources of water for consumption and contribution from different beverages. All responders considered hydration an important issue and there was little difference in opinion between different healthcare providers. Responders in Mediterranean countries (particularly Italy and Spain, but also Greece to some extent) rated hydration more importantly than those in Germany and the UK ($P < 0.001$) and this was reflected in the higher frequency with which they reported that they assess the hydration status of patients ($P < 0.001$) and provide advice on the subject ($P < 0.001$). It was also demonstrated by a greater percentage of responders citing the necessity of optimal hydration for physical performance in these countries, compared with Germany and those in the UK and France ($P < 0.001$). Whether this was caused by climatic or cultural differences was not addressed by the study. The contribution of an appropriate hydration status to mental health was relatively poorly recognised, with less than 50% of responders in all countries citing this as a benefit and less than 30% of those in France and Italy citing it as a reason to provide advice. Healthcare professionals were reasonably knowledgeable about European Food Safety Authority adequate intakes for water for men and women but overestimated the contribution from food and underestimated that from beverages. The data highlight opportunities for education and improved clinical practice, especially in respect to the effects of hydration status on mental wellbeing and performance and the contribution of foods and beverages to total water intake.

Keywords: health, healthcare professionals, human hydration, perceptions

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Introduction

The essentiality of water for life is beyond doubt. It is the main constituent of the human body, accounting for about 60% of body weight in adult males, 50–55% in

adult females and up to 75% in newborn infants. Prevention of dehydration is critical to survival and water balance is regulated by sensitive and precise homeostatic mechanisms that control both water intake and losses. These mechanisms are activated by deficits or excesses of just a few hundred millilitres and the body will correct even small losses of around 1% of body water within 24 hours (Jéquier & Constant 2010).

Dehydration affects health, wellbeing and performance, as well as contributing to morbidity in several chronic disease processes. Fluid losses of between 1% and 4% lead to progressive reductions in athletic performance, thermoregulation and appetite (Grandjean *et al.* 2003). Cognitive function and motor control can also be impaired, especially when dehydration is induced by exercise in hot conditions (Cian *et al.* 2000, 2001). Dehydration can impair short-term memory, visual perception and psychomotor ability, as well as altering mood and inducing fatigue, confusion and anger (Gopinathan *et al.* 1988; Cian *et al.* 2000, 2001; Shirreffs *et al.* 2004; D'Anci *et al.* 2009).

Greater water deficits are associated with more severe deterioration in performance and difficulty concentrating, headaches, irritability and sleepiness, and increases in body temperature and respiratory rates (Popkin *et al.* 2010). Delirium may develop in the elderly and very ill (Voyer *et al.* 2009). There are also effects on kidney function and the cardiovascular system (Manz & Wentz 2005). Death may ensue with losses in excess of 8% (Byard & Riches 2005).

Adequate water intake is a fundamental part of a balanced diet and in addition to its importance for physical performance and mental function, there is evidence that proper hydration status is associated with a number of health benefits. These include a lower risk of urolithiasis and urinary tract infections, and a reduction in hypertension, fatal coronary heart disease, thromboembolism and cerebral infarcts (Popkin *et al.* 2010). There is also evidence, albeit less strong, linking good hydration with reduced incidence of constipation, exercise-induced asthma and hyperglycaemia in diabetic ketoacidosis (Popkin *et al.* 2010).

Despite the clear advantages offered by proper hydration status, people are generally unaware of how much water they should drink and the contribution of beverages and foods to daily water intake. Adequate water intakes for infants, children, adults and pregnant women were recently identified by the European Food Safety Authority (EFSA) (EFSA 2010). Adequate total daily water intakes for men and women were defined as 2.5 litres and 2.0 litres, respectively. It is normally

assumed that about 80% of intake is provided by drinking water and beverages and 20% contributed by water contained in food (Panel on Dietary Reference Intakes for Electrolytes and Water 2005; EFSA 2010).

Healthcare professionals (HCPs) are ideally placed to advise and educate on the benefits of proper hydration status and the best ways to achieve this. Attitudes to human hydration-related issues among HCPs have been studied in specific situations, notably in older adults (Abdallah *et al.* 2009) and in patients with dementia and terminally ill patients (Bryon *et al.* 2008; van der Riet *et al.* 2008). However, there has been no systematic investigation of more general awareness and knowledge about hydration issues among HCPs.

The purpose of the present study was to evaluate the opinion of HCPs about the importance of hydration for health, wellness and performance, to estimate how commonly they assess the hydration status of patients, and to explore whether they consider people to be optimally hydrated. The study also examined knowledge about daily water intake recommendations, sources of water, the contribution of beverages and food to total water intake, and the impact of beverages on hydration status.

Methods

Healthcare professionals from six European countries were randomly recruited by an independent agency. A sample frame was built based on a variety of different sources, including WorldOne's LeadPhysician panel, WorldOne's Health Care Professional database with non-panel members and a free-found sample from the public domain. Panel members were recruited from a large sample frame within the total group of relevant HCPs in each country using an opt-in method (people gave explicit consent to participate). They were invited to complete either a computer-aided web interview (France, Germany, Italy, Spain, UK) or a computer-aided telephone interview (Greece) with a series of closed questions (Table 1). Each interview lasted for approximately 10 minutes. A total of 1980 interviews were completed: 600 from general medical practitioners, 300 from nurses, 550 from pharmacists, 265 from nutritionists and 265 from dietitians.

The first five questions examined the importance of hydration in terms of the responder's own views, their practice and advice given to patients. The next two questions explored the notion of whether, in the responder's opinion, people are optimally hydrated. The final two questions investigated the impact of foods and different beverages on hydration status.

Table 1 Research questions and answer format

No	Question text	Answer format
1	To what extent do you agree with the statement 'Hydration is important for health, wellness and performance'?	Scale from 1 to 7, where 1 is 'Fully disagree' and 7 is 'Fully agree'
2	How often do you provide advice to patients about the importance of hydration to their health, wellness and performance?	Scale from 1 to 7, where 1 is 'Never' and 7 'Always'
3	When determining how frequently you inform your patients about hydration, what are the reasons for the answer given?	Select one or more from 'Hydration is important to me', 'Hydration is a key factor for mental health' and 'Hydration is a key factor for physical health'
4	When assessing a patient during a regular visit, do you normally evaluate the patient's hydration status?	Select from 'Yes, I always do', 'Sometimes' or 'No, I never do'
5	If answering 'Sometimes' to Question 4, in what percentage of patients do you evaluate hydration status?	Select from '>40%', '21 to 40%', or '1 to 20%'
6	According to the European Food Safety Authority (EFSA), what is the recommended adequate intake of total water (in litres per day)?	State variable for men and women
7	To what extent would you say that you agree with the statement 'Many people are not optimally hydrated'?	Scale from 1 to 7, where 1 is 'Fully disagree' and 7 is 'Fully agree'
8	In an average diet, what percentage of water would you normally expect to come from food and what percentage from beverages?	State variable for percentage of water from food and beverages
9	What would you say each of the following beverages contribute to achieving an optimal level of hydration?	Scale from 1 to 7, where 1 is 'Do not contribute at all to achieving an optimal hydration status' and 7 is 'Contribute a lot towards achieving an optimal hydration status'

Table 2 Distribution of responders by country and healthcare profession

	France	Germany	Greece	Italy	Spain	UK	Total	Response rate (%)
General practitioner	100	100	100	100	100	100	600	34
Nurse	50	50	50	50	50	50	300	23
Pharmacist	100	100	50	100	100	100	550	16
Nutritionist	50	50	30	35	50	50	265	21
Dietitian	50	50	30	35	50	50	265	27
Total	350	350	260	320	350	350	1980	
Response rate (%)	20	20	23	33	21	31		

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 17.0 (SPSS Inc., Chicago, IL, USA). Percentages were used to describe all the qualitative variables analysed in this study. Mean scores and standard deviation were calculated for quantitative variables (those requiring an answer on a 7-point scale or a numerical variable), for all responders and by country and target. In the cases of variables with a skewed distribution, the median, minimum and maximum is also reported. Comparisons among countries and/or target population were done using Chi-squared test for qualitative variables and analysis of variance and post-hoc Student's *t*-test comparisons for quantitative variables.

Results

Data were obtained from France, Germany, Greece, Italy, Spain and the UK (Table 2), with general practitioners (GPs) and pharmacists comprising 30% and 28% of the sample respectively, nurses 15% and nutritionists and dietitians 13% each. Response rates are also shown in Table 2. These range from 16% among pharmacists to 34% among GPs.

Hydration was regarded by HCPs as being important for health, wellness and performance, with a mean Pan-European score of 6.6/7. It was considered to be significantly more important by HCPs from all countries relative to those from Germany ($P < 0.001$). In addition,

Figure 1 To what extent do you agree with the statement 'Hydration is important for health, wellness and performance'? Data are reported as overall sample mean (Pan EU) and per country from a scale of 1 to 7, where 1 is 'Fully disagree' and 7 is 'Fully agree'. Analysis of variance, $P < 0.001$.

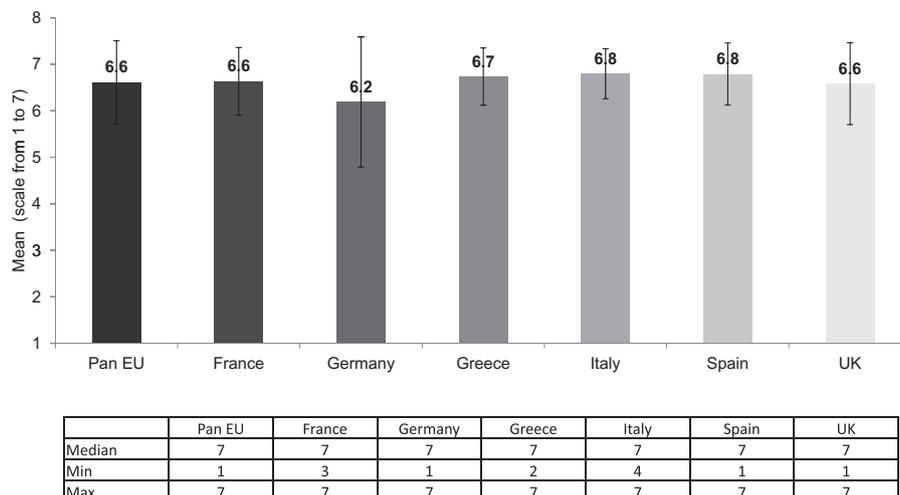
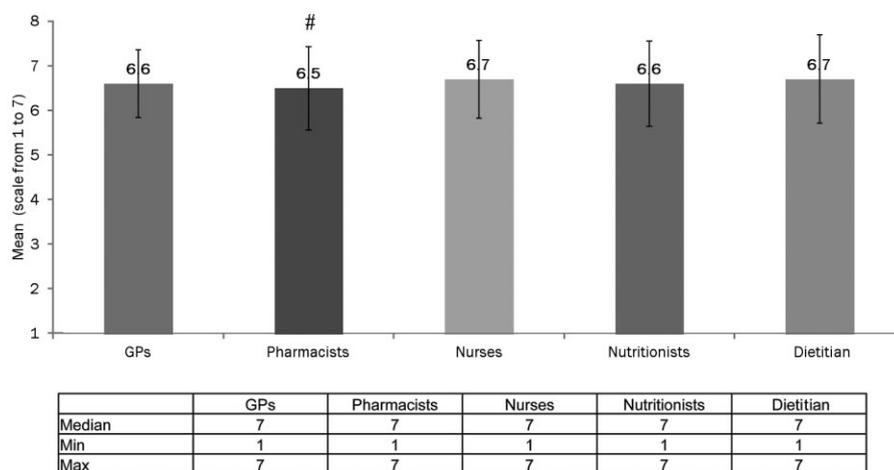


Figure 2 To what extent do you agree with the statement 'Hydration is important for health, wellness and performance'? Data are reported as mean per target from a scale of 1 to 7, where 1 is 'Fully disagree' and 7 is 'Fully agree'. (GPs, general medical practitioners). Analysis of variance, $P = 0.023$; # $P < 0.05$ t-test pharmacists vs. dietitians.



HCPs from Italy and Spain rated it to be of significantly higher importance than those in the UK (Fig. 1) ($P < 0.001$). The level of importance attached to hydration was similar across different HCPs (Fig. 2), except for a statistically significant difference between pharmacists (lowest values of importance) and dietitians (highest values) ($P = 0.023$).

The relatively higher regard for hydration by HCPs in Mediterranean countries was reflected in the fact that they more frequently reported that they provide advice to patients about the importance of hydration to their health, wellness and performance than those in France, Germany and the UK (Fig. 3) ($P < 0.001$). This was also reflected in the fact that responders in Mediterranean countries attached more importance to informing people about the benefits of being adequately hydrated.

The reasons for giving advice on hydration were examined in a supplementary question. On a Pan-

European basis, the fact that hydration is personally important and a key factor for physical health were rated as more common reasons than giving advice because hydration is a key factor for mental health. Impact on physical health was rated as the most common reason in all countries except France, where personal considerations were rated more highly (68% of French HCPs chose 'Hydration is an important issue for me') ($P < 0.001$). The role of hydration in maintaining physical health was cited as a reason for providing advice more frequently in the Mediterranean than in the other countries. Benefits of hydration with respect to mental health was the least frequently cited reason for providing advice recognised in all countries (Fig. 4).

Further analysis of attitudes to hydration among categories of HCPs indicated that nutritionists and dietitians more frequently provided advice about the importance of hydration (mean 6.1 and 6.3, respec-

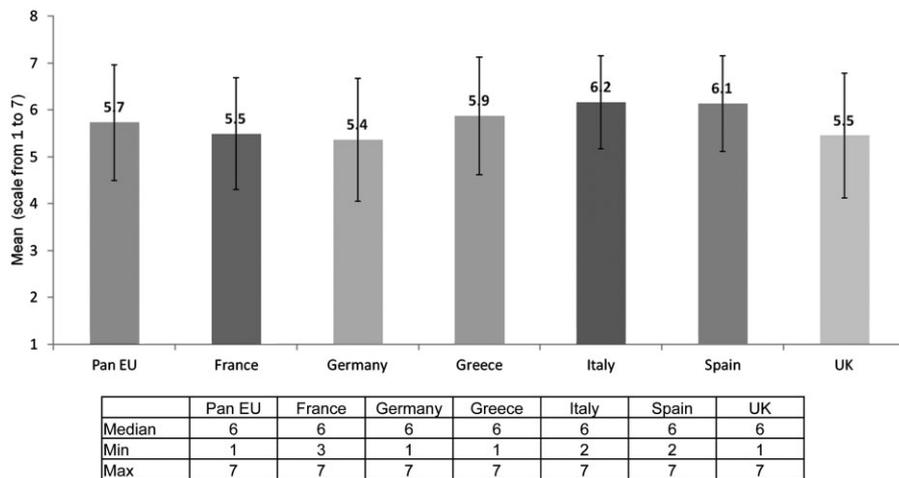


Figure 3 How often do you provide advice to patients about the importance of hydration to their health, wellness and performance? Data are reported as overall sample mean (Pan EU) and per country from a scale of 1 to 7, where 1 is 'Never' and 7 is 'Always'. Analysis of variance, $P < 0.001$.

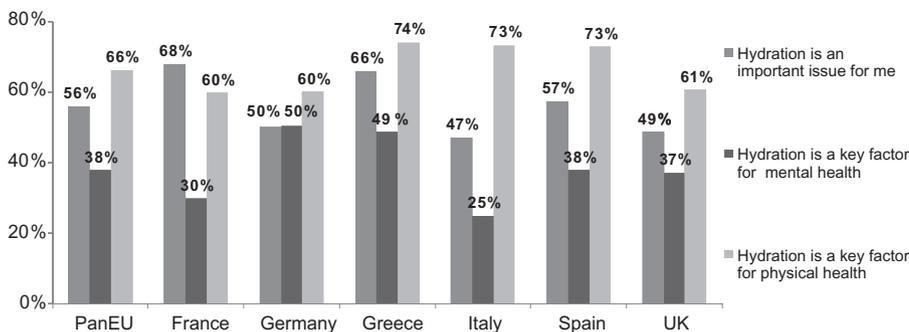


Figure 4 When determining how frequently you inform your patients about hydration, what are the reasons for the answer given? Data are reported as overall sample percentages (Pan EU) and per country. Multiple response. Chi-squared test, $P < 0.001$.

tively, on a scale of 1 to 7, where 1 is 'never' and 7 'always') and pharmacists the least frequently (5.2), with GPs and nurses having intermediate attitudes (5.7 and 5.9, respectively) ($P < 0.001$).

When asked about the statement 'many people are not optimally hydrated', there was good agreement between countries, with a mean Pan-European score of 5.7/7. There was only minor country-by-country variation in this response, with mean results from individual countries ranging from 5.3 to 5.9, with France and the UK rating the lowest agreement scores ($P < 0.001$) (Fig. 5).

There was a difference in the frequency with which HCPs evaluate patients' hydration status across Europe ($P < 0.001$). Between 50% and 59% of those in Greece, Italy and Spain answered that they always evaluate a patient's hydration status, whereas this was the response from only 28–36% of those in France, Germany and the UK (Fig. 6). Methods for assessing hydration status included asking questions about the patient's hydration status, undertaking a clinical interview or asking the patient to complete a questionnaire and performing a physical examination.

The importance placed on hydration by nutritionists and dietitians was reflected in the fact that they, along with nurses, more frequently reported that they evaluate the hydration status of their patients, always performing this in 66%, 72% and 50% of patients, respectively. Pharmacists reported that they evaluate hydration status relatively infrequently (always in 18% of patients), with GPs declaring that they always evaluate it in 38% of patients.

Country-by-country estimations of the EFSA recommendations for total daily adequate water intake ranged from 1.9 to 2.6 litres per day for men and 1.7–2.2 litres per day for women, with Pan-European means of 2.3 and 2.0 litres per day, respectively (Fig. 7). These compared with EFSA published values (EFSA 2010) for men and women of 2.5 and 2.0 litres per day, respectively. Knowledge of HCPs in Greece was closest to the EFSA values, with those from France being the most disparate.

When asked about the relative contribution of water from food and beverages, HCPs in all countries overestimated the amount coming from food and underestimated the amount from beverages (Fig. 8). Average Pan-European estimates of contribution from food and

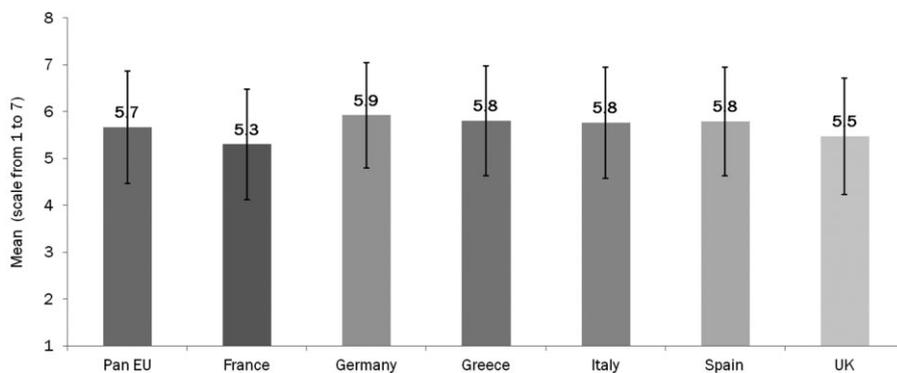


Figure 5 To what extent would you say that you agree with the statement 'Many people are not optimally hydrated'? Data are reported as overall sample mean (Pan EU) and per country from a scale of 1 to 7, where 1 is 'Fully disagree' and 7 is 'Fully agree'. Analysis of variance, $P < 0.001$.

	Pan EU	France	Germany	Greece	Italy	Spain	UK
Median	6	5	6	6	6	6	6
Min	1	3	1	2	1	1	2
Max	7	7	7	7	7	7	7

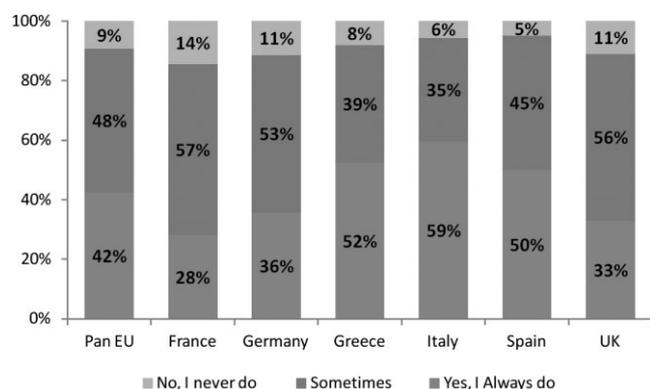


Figure 6 When assessing a patient during a regular visit, do you normally evaluate the patient's hydration status? Data are reported as overall sample percentages (Pan EU) and per country. Chi-squared test, $P < 0.001$.

beverages were 36% and 64%, respectively, compared with EFSA (2010) values of about 20% and 80%, respectively. The main source of hydration from beverages was considered to be water, from both tap and bottled (mineral) sources (Fig. 9). In contrast, alcoholic drinks were perceived as contributing the least amount to hydration status.

Discussion

In a recent review of water as an essential nutrient, Jéquier and Constant (2010) suggested that health professionals and nutritionists are sometimes confused about hydration matters and wonder about issues such as, how best to determine hydration status, how much individuals should drink and the need to drink fluids regularly. The purpose of this research was to examine these issues, most notably in respect of their opinions

about the importance of hydration for health, wellness and performance, their practice with regards to assessment of hydration status and knowledge about recommended water intakes and sources of water.

This research indicates that European HCPs, on the whole, regard the matter of hydration status as being of high importance. Benefits to health, wellness and performance were most strongly recognised in Mediterranean countries and this was reflected in the fact that HCPs in these countries attached more importance to giving advice, give it more frequently and measure hydration status more often.

Despite this, other data suggest that the perceived importance of proper hydration is not necessarily followed through by all HCPs in all countries with regard to their clinical practice, for example in evaluating the hydration status of patients. The results therefore help identify gaps in the knowledge and actions that, in turn, provide an opportunity for HCPs to make a significant difference to levels of health and wellness by improving the hydration status of their patients.

Pharmacists and GPs reported that they evaluate hydration status of their patients relatively infrequently compared to nurses, nutritionists and dietitians. This result seems logical for pharmacists, but suggests that GPs should perhaps be more targeted with education on the importance of proper hydration and the value of including the evaluation of hydration status in their clinical practice.

It was notable that certain countries, specifically France and Italy, under-recognised the importance of proper hydration for mental health. Even in those countries where the response was better, more than 50% of HCPs did not cite this as a reason to provide advice and guidance on adequate water intake. This may be caused

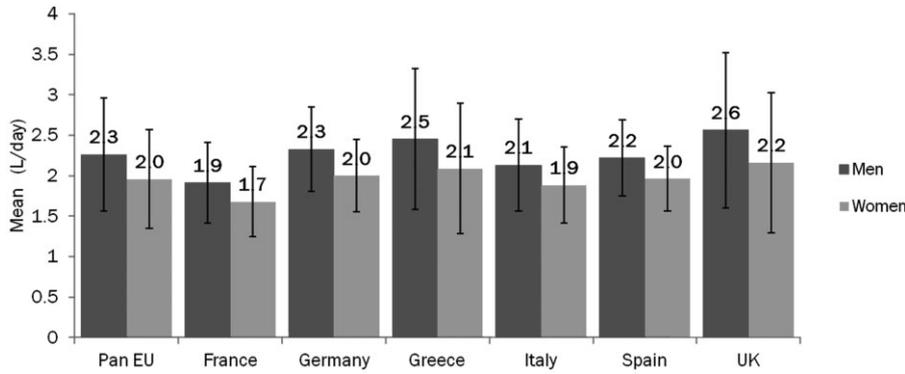


Figure 7 According to the European Food Safety Authority (EFSA 2010), what is the recommended adequate intake of total water (in litres per day)? Data are reported as overall sample mean (Pan EU) per gender and per country. Analysis of variance, $P < 0.001$, both for male and for female data.

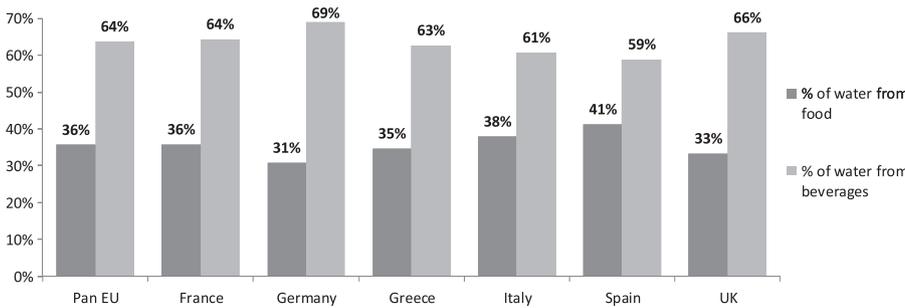


Figure 8 In an average diet, what percentage of water would you normally expect to come from food and what percentage from beverages? Data are reported as overall sample mean (Pan EU) of each percentage and per country. Analysis of variance, $P < 0.001$, both for food and beverages data.

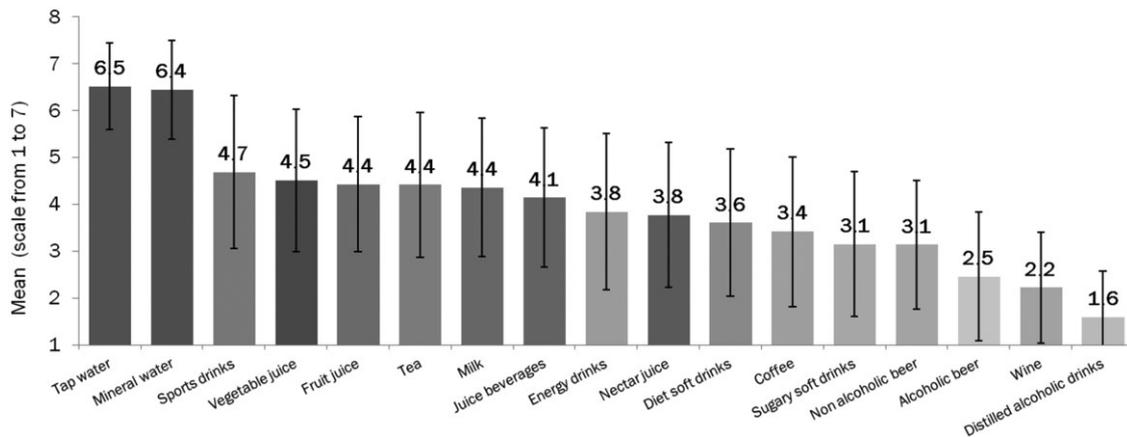


Figure 9 What would you say each of the following beverages contribute to achieving an optimal level of hydration? Data are reported as mean from a scale of 1 to 7, where 1 is 'do not contribute' and 7 is 'contribute a lot' for the overall sample.

by the fact that the evidence about the impact of hydration status on mental function and cognitive performance is not yet fully consistent. Further research is still needed on this matter.

There was a dichotomy in some of the data in that HCPs in Germany for instance, rated lowest in terms of their attitude to the importance of dehydration and frequency with which they provide guidance on the matter, but agreed most strongly with the belief that

people are not properly hydrated. This warrants further exploration as to its origins and actions to bridge the gap.

All countries overestimated just how much of total water intake is derived from food and conversely, underestimated the contribution from beverages in comparison to the EFSA (2010) recognised average values of about 20%. There is some country-specific research that does give higher values for contribution of water from

food (e.g. 25% in US adults, Heller *et al.* 1999) and in some countries, national recommendations are higher (e.g. French national recommendations for daily fluid intake encourage an intake of 1 litre of water ingested from food so that the total daily intake should be ~2.6 litres, Martin 2001) and this might account for some of the responses observed. However, the data from this study suggest that HCPs and the general public in turn, need to be more aware of the relatively minor contribution of water from food, as well as the importance of water and beverages in maintaining optimal hydration. There is also an opportunity to better understand and educate on the importance of a variety of food and beverage sources in providing hydration and the contribution of other regularly consumed beverages.

Many beverages, including sport drinks, juices, milk, coffee, tea and soft drinks contain more than 85% water and offering a variety of drinks has been shown to significantly increase water intake compared with offering water alone in a long-term exercise situation (López-Román *et al.* 2008). This may be caused by the pleasant taste or experience associated with these drinks providing an additional reason to drink.

Previous research on attitudes to hydration has concentrated on HCPs in specific clinical situations, such as older adults (Abdallah *et al.* 2009) and patients with dementia or terminally ill patients (Bryon *et al.* 2008; van der Riet *et al.* 2008). Importantly, this study identifies the potential to better understand the importance of hydration in situations where HCPs are dealing with the general population.

There were, however, several limitations to this study. The panel samples used were not equivalent to the total number of HCPs in each country/specialism and therefore there is no guarantee that they are fully representative of the population, even though the WorldOne panel is reputable both in terms of size and recruitment standards. The response rate, although in the common range of survey research, is not sufficient to be fully representative of the sample in question. In addition, responses to questions were based on opinions or perceptions, rather than actual practice. There is also a potential confounding effect from responders choosing to provide answers that might be more clinically or socially desirable than being a true measure of their attitude or actual behaviour. The study did not segment the HCPs (e.g. nurse, pharmacist, nutritionist, dietitian) according to the environment in which they were working (e.g. hospital, nursing home or the community). This may have had a bearing on attitudes and practices; for example, some of the differences observed

between the professions could have been as a result of the different environments in which the HCPs were predominantly practising, rather than true inter-professional differences. Therefore, it would be valuable to further examine this point in any future study.

Nevertheless, this research does provide valuable baseline data about the interest and knowledge of HCPs on the topic of human hydration, which can be used to tailor information to better address their needs.

Conflict of interest and sources of funding

In 2011, the European Hydration Institute, a non-profit foundation, received funds from the Coca-Cola Company – one of its four founding partners (along with the Nutrition Research Foundation of Spain, the Nutrition Foundation of Italy and the University of Las Palmas de Gran Canaria, Spain).

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