

## **Hydration and health**

- Increasing water intake has been shown to improve cognition and mood in children and adults; it has the potential to improve educational attainment and workplace performance.
- Low drinkers are at increased risk of kidney disease, obesity, and metabolic disease including type 2 diabetes and cardiovascular disease.
- Water is the healthiest drink and increased water consumption would result in improved health with associated cost benefits.

Historically interest, and therefore research, on hydration was focused on exercise and performance, and hydration in clinical situations. Now the focus has shifted to the importance of hydration in health in terms of the volume and types of fluids consumed (1). There is now increasing evidence to link adequate hydration with improved mental and physical health. The areas of health being researched include mental health, in terms of cognition and mood, kidney health, and metabolic health i.e., obesity, type 2 diabetes, and cardiovascular disease. The evidence base is now at the stage whereby public health policies are being implemented to encourage increased consumption of water and moderated consumption of fluid such as sugar sweetened beverages (SSB) to mitigate chronic diseases such as obesity (2). With significant numbers of European adults and children not drinking enough to meet the European Food Safety Authority (EFSA) recommendations (3–5) it is vital that any associated physical and mental health associated with hypohydration or underhydration are addressed by promoting increased water consumption.

### **Cognition**

Studies have shown that dehydration, as shown by urinary biomarkers, in children is associated with poor cognitive performance including poor memory performance and attention (6). Several interventions have shown that increasing water intake in school aged children improves cognitive

performance (7–9). This is especially important as several studies have shown that children are frequently dehydrated in the morning when they arrive at school (10,11). Given that children spend up to half of their waking hours at school it is disturbing that a recent study has shown that children consume only 14% of their total fluid intake at school (12). A toolkit developed by the European Commission (13) is available to help promote water consumption in schools however, while the toolkit offers clear guidance on interventions it is essential that this is supported and implemented throughout schools in Europe to optimise children's performance at school.

There is significantly more evidence of the negative effect of dehydration on cognition in adults with a recent meta-analysis showing poorer attention, executive function and motor coordination in dehydrated adults (14). Adequate hydration has also been shown to improve mood (15–17). Clearly it is important to optimise people's mental health for their own well-being but also in the workplace. Poor cognition will affect workplace performance (18) and may offset potential risks due to poor attention for example while operating machinery. The recent COVID pandemic has necessitated health workers wearing person protective equipment for long periods often sweating excessively and with limited opportunities to drink. Maintaining good hydration is essential to prevent decreased cognitive performance and tiredness in this essential part of the workforce (19).

### **Kidney health**

Chronic kidney disease (CKD) (20), renal stones (21) and urinary tract infections (22) represent significant burdens in terms of health and well-being and, financial costs. For example, the incidence and prevalence of kidney stones is increasing in Europe (21); this is accompanied by significant costs (23). There is clear evidence to show that increasing water intake inhibits the formation of stone forming crystals in the kidneys thereby preventing both primary and recurrent incidences of kidney stones (24–26). The European Association of Urology (27) now recommend increasing the volume of water drunk for the secondary prevention of kidney stones. The increase in obesity and type 2

diabetes in Europe is accompanied by an increase in the prevalence of CKD and kidney stones. While obesity is difficult to prevent and manage increasing water intake appears to be an easy and cost-effective way of ameliorating the associated kidney disease to an important degree. Cross sectional studies have shown high water/fluid intakes may reduce the risk of chronic kidney disease (CKD) by up to 50% (28). Similarly cohort studies showed that high water intake is protective of kidney function (29). Currently studies are being conducted to establish whether or not increasing water intake can prevent the progression of disease in patients with CKD (30). Urinary tract infections constitute over half of primary care consultations and are the most common health care acquired infection in Europe (22). Anecdotally health advice has always been to increase water intake by increasing water intake although until recently there was a paucity of evidence to support this. However, a recent randomised controlled trial has shown that increasing water intake significantly decreased the risk of a recurrent infection (31). It is important that health policies reflect the research to ensure that the public are aware of the benefits of drinking water to mitigate these kidney disorders and thereby reduce health costs.

### **Metabolic diseases**

Adults can maintain body water volume a wide range of intakes including low intakes. However, it has been suggested that low drinkers are underhydrated (32,33) with associated increases in vasopressin (AVP) (34–36); a hormone that is integral to water regulation in the body. High circulating AVP levels have been associated with an increased risk of metabolic disease including obesity, type 2 diabetes, and cardiovascular disease (32,37). In addition to these chronic disease an analysis of a large national sample recently showed that underhydration was a high mortality rate (38). Given that significant numbers of European adults and children do not drink enough to meet the recommended adequate intake levels it is likely that many will be low drinkers

and at risk of metabolic disease. This may be addition to those people with increased risk of metabolic disease due to regular consumption of SSB.

### **Types of fluids**

While all fluid intakes can be included in total daily intake water is the healthiest and usually the cheapest way to stay hydrated. For example, it has been shown that a water and milk-based drinking pattern is associated with better hydration compared with a pattern that has regular SSB and other drinks instead of water (39). As obesity prevalence increases it is important to consider the amount of energy in drinks including fruit juices and SSB. Adult surveys in seven European countries have shown that energy intake from drinks in each country exceeded the WHO recommendation of <10% energy from free sugars (3). The consumption of SSB is linked to an increased risk of obesity, type 2 diabetes and cardiovascular disease (40). Systematic reviews have shown a dose response of drinking SSB for coronary heart disease, type 2 diabetes and hypertension (41–43). With increasing obesity, and associated non communicable diseases, in Europe it is important to consider the role that healthy hydration may play in mitigating these health conditions. Water is both natural and calorie free; the promotion of increased water consumption would result in improved health with associated cost benefits

### **Summary**

Being well hydrated is clearly beneficial in terms of both mental and physical health. Encouraging good hydration and healthy drinking habits, with appropriate campaigns aimed at changing drinking behaviour, would undoubtedly result in health benefits and increased performance and safety at school and in the workplace. Increasing fluid intake in low drinkers, of which there are many in Europe, is likely to reduce metabolic disease and kidney disease. This would then reduce health costs for healthcare providers and improve health and quality of life in individuals. Indeed, it has been estimated

that if 100% of the population drank 2 litres of water a day it would save over 250 million Euros per year; if 25% were compliant the savings would still be substantial (44). It is a simple message to increase water intake but requires significant support from authorities and changes in policies to facilitate such behaviour.

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