*International Journal of Paediatric Dentistry* 2004; **14:** 267–271

# Fluid for thought: availability of drinks in primary and secondary schools in Cardiff, UK

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**Summary.** *Objective.* While adequate hydration is undoubtedly essential for health, well-being, performance and learning, it is important to recognize that drinks may also have significant detrimental effects on both general and dental health. Since, on weekdays, at least half of a child's recommended daily fluid intake must be imbibed at school, this study sought to examine the provision of drinks in that setting.
*Subjects and methods.* A self-administered postal questionnaire study was sent to the head teachers of all 107 state primary and all 20 state secondary schools in Cardiff, South Wales, UK.
*Results.* A response rate of 81·9% was achieved. Children had access to fresh drinking water from at least one drinking fountain in 69 (66·4%) of the 104 schools who responded to the questionnaire. Milk was available in 69 (80·2%) of the 86 responding primary schools. Sixteen (88·9%) of the 18 responding secondary schools had drink vending machines selling a variety of drinks.
*Conclusions.* While primary schools appear largely to restrict the availability of drinks to those conducive to the maintenance of good general and dental health, secondary schools appear to foster the use of vending machines. Guidelines should be developed on the use and content of vending machines in schools in order to both meet school objectives and promote healthy choices.

## Introduction

The ingestion of fluid is essential for life. In the long term, dehydration gives rise to a number of health problems ranging from constipation and continence problems to kidney and urinary tract infections, kidney stones, and some cancers [1–3].

A recent publication [2] has recommended a total fluid requirement of 1·5 mL/kcal expended. The standard recommendation is that at least six to eight glasses (1·5–2 L) of fluid should be drunk regularly throughout the day, with at least three to four glasses being imbibed while at school. Additional fluid is required during warm weather and in association with exercise.

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Thirst is a good indicator of fluid needs, provided that children have the opportunity to respond to it. While schools are legally required to supply water that is fit for drinking [4], the regulations are not specific. For example, they do not indicate how the water should be made available, or what constitute appropriate locations or facilities for delivery, how often the water should be accessible to the children, or the type and number of facilities per pupil. Importantly, ready availability of soft drinks has the potential to displace healthier choices if the latter are not available. This has clear implications for both general and dental health in this age-group.

The objectives of this study, which was set in state primary and secondary schools in Cardiff, UK, were to examine the availability of fresh drinking water delivered by means of drinking fountains and also to examine the provision of drinks other than water.

1. Is your school a primary or secondary school? 1° / 2°

2. How many pupils are on your school roll? ------

3. Do your pupils have access to a drinking fountain? Y / N

If yes, how many drinking fountains does your school have? ------

4. Do your pupils have access to a milk bar / school milk? Y / N

5. Do your pupils have access to a drinks vending machine? Y / N

If yes, how many drinks vending machines does your school have? ------

If yes, what drinks are sold from these machines?

| | |
|---|---|
| Carbonated soft drinks | |
| Still soft drinks | |
| Mineral water | |
| Milk | |
| Hot drinks | |

6. Excluding those drinks brought with packed lunches, do you allow your pupils to bring drinks from home? Y / N

7. Do you allow your pupils to leave a class to take a drink? Y / N

8. Do you encourage your pupils to drink immediately following participation in sports? Y / N

9. Do you consider that your pupils have adequate access to drinks during the school day? Y / N

If no, what do you consider to be the barriers to improving access? Please use the space below to comment, continuing overleaf if necessary.

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**Fig. 1.** Self-administered postal questionnaire.

## Methods

Prior to commencement of the study, all state primary and secondary schools within the City of Cardiff were identified via the Cardiff County Council website. Permission to approach head teachers was sought from, and granted by, the Chief Schools Officer. A self-administered questionnaire (Fig. 1), primarily comprised of closed questions, was developed in consultation with the Healthy Schools Co-ordinator, and this was mailed to each head-teacher with an individually addressed covering letter and a stamped addressed envelope for its return. The anonymized responses were analysed using the Microsoft Excel 97 computer program.

## Results

A total of 127 schools (107 primary and 20 secondary) were identified as lying within the City of Cardiff. Of these, 104 (86 primary schools and 18 secondary schools) returned completed or partially completed questionnaires, an overall response rate of 81·9%.

Fifty-seven primary schools (66·3% of those responding) and 12 secondary schools (66·7% of those responding) reported that their pupils had access

**Table 1.** Provision of drinking fountains by primary and secondary schools in Cardiff ($n = 64$).

| | Number of drinking fountains | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of school | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 14 | 16 |
| Primary | 5 | 19 | 5 | 10 | 2 | 4 | 1 | 1 | 2 | 2 | 1 |
| Secondary | 3 | 2 | 1 | 3 | 1 | 1 | – | 1 | – | – | – |

**Table 2.** Provision of drinks vending machines in secondary schools ($n = 15$).

| | Number of drinks vending machines | | | |
|---|---|---|---|---|
| | 2 | 3 | 4 | 6 |
| Number of schools | 7 | 3 | 4 | 1 |

**Table 3.** Types of drinks sold in drinks vending machines in secondary schools ($n = 16$).

| Type of drink | Number of schools |
|---|---|
| Carbonated soft drinks | 15 |
| Still soft drinks | 12 |
| Mineral water | 10 |
| Hot drinks | 10 |

to at least one drinking fountain. In answer to a subsidiary open question, 64 schools provided information as to the number of drinking fountains that they provided (Table 1). In 69 primary schools (80·2% of respondents) and one secondary school (5·6% of respondents), pupils had access to a milk bar or were provided with school milk. In addition, 19 schools (three primary and 16 secondary) had drink vending machines. In answer to a subsidiary open question, 15 secondary schools provided information as to the number of drink vending machines that they possessed (Table 2). Table 3 illustrates the nature of drinks sold in this way; it should be noted that no secondary school sold only water in its vending machines.

In 70 (81·4%) of the 86 responding primary schools and all the responding secondary schools, pupils were allowed to bring drinks from home to be consumed other than in association with a packed lunch. In addition, five primary schools had tuck shops selling both carbonated and still soft drinks.

In 58 primary schools (67·4% of respondents), pupils were allowed to leave a class to take a drink. Without exception, pupils in secondary schools were forbidden to do so, this stance being justified on the basis of lack of time and interference with lessons. Pupils were encouraged to take a drink immediately following participation in sports in 62 primary schools and 10 secondary schools (72·1% and 55·6% of respondents, respectively).

The head-teachers of 66 primary schools and eight secondary schools (76·7% and 44·4% of respondents, respectively) considered that their pupils had adequate access to drinks during the school day. In response to a subsidiary open question, the remaining 30 head teachers cited the following as barriers to improving access:

- the cost of installation of drinking fountains;
- misuse of facilities;
- vandalism; and
- health and safety concerns.

## Discussion

The results of this study suggest that there remains room for improvement in Cardiff schools with regard to ensuring that pupils (especially those in secondary schools) have access to water during lessons and following participation in sports.

It is important that teachers recognize that dehydration when exercising has adverse effects on mental and physical performance and temperature regulation, making the exercise feel harder and more tiring. Not only does a poorly hydrated child display a less positive attitude towards exercise, these adverse effects persist when a child returns to the classroom, resulting in poorer mental performance, lethargy and (perhaps most importantly) deterioration in mood [2,5]. Therefore, one would anticipate that it would be in a school's best interests to promote drinking water in association with exercise.

It is also important that teachers recognize the need to supervise children's drinking in association with exercise. Left to their own devices, children will not drink enough. A child of 30 kg can lose approximately half a litre of water during an hour of even moderate or intermittent exercise, this amount being increased in warm weather. Researchers advise that, in order to restore normal fluid balance after exercise, at least 1·5 times this amount should be imbibed, the key to avoiding dehydration lying in drinking before, and at regular intervals during and after exercise [6].

The National Healthy School Standard Guidance [7] should be an ideal platform on which to base any improvement in the provision of drinks in schools. However, it makes no reference to water facilities other than stipulating, as a basic requirement, that 'clean drinking water is provided'. Therefore, it is

encouraging to note that the introduction of fresh water dispensers in all schools is among the actions to be led by the Food Standards Agency Wales and the Welsh Assembly Government [8]. However, availability of water can be improved quite simply and without cost to the school by encouraging pupils to bring bottles of tap water from home.

This study's second objective was to examine the provision of drinks other than water in Cardiff schools. Here, a more worrying picture emerges. While primary schools appear largely to restrict the availability of drinks to those conducive to the maintenance of good general and dental health, secondary schools appear to foster the use of vending machines, many of the products of which cannot be considered to fall into this category.

Dietary habits established in childhood have implications for health in adult life.

With regard to general health, increased consumption of soft drinks may have a negative impact on children's and adolescents' overall nutrition by displacing foods with higher nutritional value [9]. Indeed, it has been demonstrated that, as teenagers have increased their consumption of soft drinks, their consumption of milk has decreased by 40%; this may contribute to a decrease in bone density, subsequent increase in fractures and future risk of osteoporosis [10]. Increased ingestion of soft drinks has also been linked to childhood obesity [11]. Worryingly, many soft drinks contain significant amounts of caffeine, which, as a diuretic, increases excretory fluid loss; regular consumption may also lead to increased, even habitual, use [12].

From a dental viewpoint, it is well recognized that the frequent consumption of sugars in any beverage, particularly between meals, can be a significant factor in the initiation and progression of dental caries [13]. Similarly, the frequent consumption of carbonated and other acidic drinks has repeatedly been related to tooth wear [14–17], the effects of which will persist for a lifetime.

Information provided by the British Soft Drinks Association (*www.britishsoftdrinks.com*) suggests that there are approximately 1600 soft-drink vending machines (about 4% of the total in the UK market place) located in secondary schools. However, these are only placed in schools with the approval of the head teacher and the school's governors. It is for each school to decide on the location of any soft-drink vending machine and the nature of the drinks to be sold in this way. Soft drinks companies do not generally supply units to primary schools, although some will consider doing so if approached by a head teacher or school governor.

The authors recognize that the profit gained from soft-drink vending machines is critical to many schools, funding many extra-curricular activities, such as sport and music. However, pupils may pay the price for what they drink, or do not drink, over a lifetime. There is no reason why schools cannot provide a range of drinks compatible with the promotion of good general and dental health. Medical and dental professionals, education officials, and parent and consumer groups should be involved in developing guidelines on the use and content of vending machines in schools which both meet school objectives and promote healthy choices.

**Acknowledgements**

The authors wish to express their thanks to Mark Lancett, Healthy Schools Co-ordinator for Cardiff, for his help in setting up the study, and also to the head teachers of the schools involved.

**Résumé.** *Objectif.* Une hydratation adéquate est sans aucun doute essentielle pour la santé, le bien-être, la performance et l'apprentissage. Les boisson peuvent également avoir des effets délétères significatifs sur la santé générale et dentaire. Puisque, en semaine, au moins la moitié de la prise quotidienne de lait recommandée pour un enfant doit être ingérée à l'école, cette étude a été menée pour étudier l'apport de boissons dans ce cadre.
*Protocole.* Etude par questionnaire postal.
*Echantillon.* Le questionnaire a été envoyé aux directeurs de toutes les 107 écoles primaires d'état et 20 écoles secondaires d'état de Cardiff, Pays de Galles du Sud.
*Résultats.* Un taux de réponse de 81,9% a été obtenu. Les enfants avaient accès à de l'eau potable fraîche à partir d'au moins une fontaine dans 69 (66,4%) des 104 écoles ayant répondu au questionnaire. Du lait était disponible dans 69 (80%) des 86 écoles primaires ayant répondu. Seize (88,9%) des 18 écoles secondaires ayant répondu possédaient des distributeurs payant proposant de nombreuses boissons.
*Conclusions.* Tandis que les écoles primaires apparaissent restreindre les boissons disponibles à celles compatibles avec le maintien d'une bonne santé générale et dentaire, les écoles secondaires apparaissent comme favorisant l'utilisation de distributeurs. Des recommandations devraient être émises sur l'utilisation

de distributeurs dans les écoles afin de répondre aux objectifs des écoles et de promouvoir des choix sains.

**Zussamenfassung.** *Ziele*. Auch wenn adäquate Flüssigkeitszufuhr zweifelsfrei essentiell für Gesundheit, Wohlbefinden, Leistung und Lernen ist, muss doch erkannt werden, dass Getränke auch unerwünschte Effekte auf die Allgemeingesundheit und Zahngesundheit haben können. Da während Schultagen ein erheblicher Teil der Trinkmenge in der Schule getrunken werden muss, wurde in dieser Studie die Verfügbarkeit von Getränken dort untersucht.
*Design*. Selbst ausgefüllter postalischer Fragebogen. *Stichprobe*. Der Fragebogen wurde an die Direktoren aller 107 staatlichen Grundschulen und aller 20 weiterführender Schulen in Cardiff, Wales, versandt.
*Ergebnisse*. Eine Rücklaufquote von 81.9% wurde erreicht. Die Kinder hatten Zugang zu frischem Trinkwasser aus mindestens einem Trinkbrunnen bei 69 (66.4%) der antwortenden 104 Schulen. Milch war verfügbar an 69 (80.2%) der antwortenden 86 Grundschulen. Sechzehn (88.9%) der 18 antwortenden weiterführenden Schulen wiesen Getränkeautomaten auf.
*Schlussfolgerungen*. Während Grundschulen offenbar größtenteils die Verfügbarkeit von Getränken auf solche mit günstigen gesundheitlichem Effekt beschränken, sind die weiterführenden Schulen weitgehend mit Getränkeautomaten ausgestattet. Es sollten Richtlinien entwickelt werden, um den Gebrauch und die Inhalte von Verkaufsautomaten an Schulen dahingehend zu beeinflussen, dass Schulziele zu erreichen und gesunde Produkte zu fördern.

**Resumen.** *Objetivos*. Mientras la hidratación adecuada es indudablemente esencial para la salud, bienestar, comportamiento y aprendizaje, es importante reconocer que las bebidas pueden tener también efectos dañinos tanto en la salud general como dental. Puesto que en los días entre semana, al menos la mitad de la ingesta diaria recomendada de líquidos en un niño debe ser tomada en la escuela, este estudio debe examinar la provisión de bebidas en este lugar.
*Diseño*. Estudio cuestionario postal auto-administrado. *Muestra*. El cuestionario se envió a los profesores directores de las 107 escuelas primarias estatales 107 y 20 escuelas secundarias en Cardiff, Sur de Gales. *Resultados*. Se consiguió un porcentaje de respuesta del 81,9%. Los niños tenían acceso a agua fresca para beber de al menos una fuente potable en 69 (66,4%) de las 104 escuelas que respondieron al cuestionario. La leche estaba disponible en 69 (80,2%) de las escuelas primarias que respondieron. Dieciséis (88,9%) de las 18 escuelas secundarias que respondieron tenían máquinas de venta de bebidas variadas. *Conclusiones*. Mientras que las escuelas primarias parecen restringir ampliamente la disponibilidad de las bebidas en aras del mantenimiento de una buena salud general y dental, las escuelas secundarias parecen favorecer el uso de máquinas de venta. Deberían desarrollarse guías sobre el uso y contenido de máquinas de venta en escuelas tanto para coincidir con los objetivos de la escuela, como para facilitar una elección sana.

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