ORIGINAL ARTICLES

Dietary and Social Characteristics of Children with Severe Tooth Decay

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Abstract

Background and Aims
Dental decay remains a major public health problem in Scottish children. The aim of this study was to investigate the relationship between diet, bowel habit, social class, and body mass index (BMI) in children with severe tooth decay.

Children and Methods
A cross sectional study of 165 children aged 3 -11 years attending Glasgow Dental Hospital for extraction of teeth under dental general anaesthesia (DGA), was undertaken. A structured questionnaire was used to obtain information from each child on diet, bowel habit, and social status of their parents. Fibre and sugar scores were calculated from the frequency of consumption of a range of relevant foods.

Results
The children (mean age 5.7 (SD1.8) years) had between 1 and 20 decayed, missing or filled primary teeth (dmft) with a mean dmft of 7.9 (SD 3.5). 37% ate a chocolate bar daily, and 29% regularly drank a sugary drink after brushing their teeth. An excess of children were from the most deprived parts of the city and they had the worst decay. Children with the worst decay were also significantly thinner. No relationship was found between tooth decay and bowel habit.

Conclusions
In this selected group of children with poor dental health, those from deprived families were over-represented and had significantly more decay. Severe dental decay was also associated with underweight.

Introduction

Poor health in children, as in adults, is linked to lower social class and poor diet.[1] This association is manifest from birth: babies in lower social classes are less likely to be breast fed, and bottle fed babies tend to have a higher prevalence of dental caries, which may be related to the use of reservoir feeders and comforters containing sugary drinks.[2] Dietary surveys of preschool children, adolescents and adults in Scotland have shown that poor diet is established at an early age in response to psychosocial and domestic influences[3] and that unhealthy eating habits in childhood persist into adult life.[1] The pattern then continues to the next generation as parents give their children what they themselves ate as children. [4]

Poor diet has a number of known adverse health effects including poor dental health, overweight and underweight, and constipation. Children with a diet low in fibre are prone to disordered bowel habit[5] with functional constipation accounting for 3% of paediatric outpatient appointments.[6] Diets differ across socio-economic groups [7,8,9] with low-income groups consuming less fresh fruit, vegetables and high fibre foods, and instead consuming cheaper foods rich in energy, especially sugar.[1] In Scotland 59% children have dental decay by five years, the care index in 5 year olds is less that 10%,[10] and 48% have had a tooth removed by the age of nine years. Children from lower socio-economic classes have worse dental health and higher levels of caries in their primary dentition.[10,11]

The Scottish Health Boards have reported a progressive increase in decay with increasing deprivation in five year olds, with a mean decayed, missing or filled teeth (dfmt) of 1.3 in the least compared to 4.3 in the most deprived areas.[10] Children who lack teeth or who have had teeth removed are at risk of developing malnutrition,[12,13] and those who had teeth removed may be lighter and shorter than control children.[14] The aim of this project was to investigate the relationship between diet, bowel habit, social class, and body mass index (BMI) in children with severe tooth decay.

Methods

We performed a cross sectional study of a sample of children aged 3–11 years attending Glasgow Dental Hospital for teeth extraction under a dental general anaesthetic (DGA). Parents were invited to participate and given consent forms to read and sign before their children entered the study. Children with chronic nutritional, gastrointestinal, or other systemic disease were excluded. Ethical approval for this study was obtained from the Glasgow Dental Hospital ethics committee.

Data were gathered using a structured interview prior to DGA that included questions on the child's diet, bowel habit, number of previous dental extractions, and social status of the parents. The information on diet was

obtained using a food frequency questionnaire for selected foods high in fibre or sugar.[15] Height and weight were measured by nursing staff (clothed, with shoes on). The case notes with dental charting of dentine caries and the history of previous extractions were used to establish the number of dmft for each child.

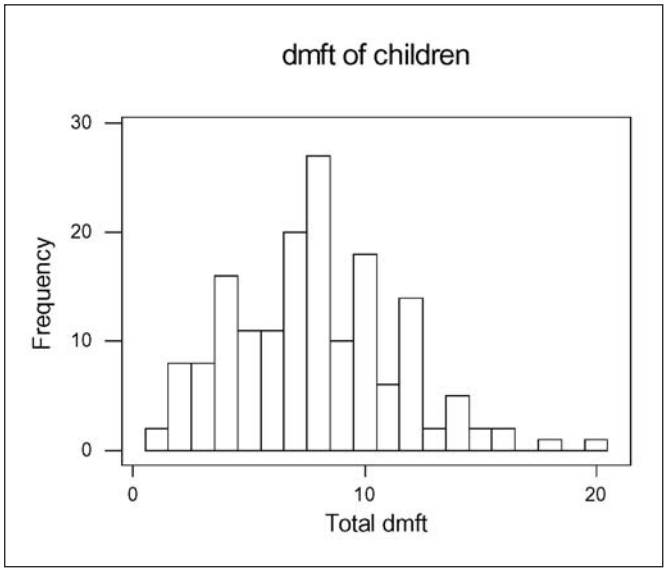
To compare the amount of fibre and sugar the children consumed, a score was calculated based on the frequency they were eaten, scored from 0 = never to 4 = more than twice a day, after which scores for all sugar and all fibre foods were added together. Height (cm), weight (kg), and body mass index (BMI weight (kg)/height $(m)^2$) were expressed as standard deviation scores compared to the UK 1990 growth reference to adjust for the age and gender.

The 1991 Scottish Health Board Carstairs score was used as an index of social deprivation, which classifies an individual by the level of deprivation of their postcode sector, using 1991 census information. Areas with a high score are more deprived than areas with a lower score[16] Regression analysis was used to identify relationships between dependent variables such as dmft and independent variables such as sugar. Two sample student T tests were used to calculate differences between those in high and low deprivation or dmft categories.

Results

Data were collected during January, February and March 2003. Of 189 children and their parents invited to participate in the study, 165 were successfully interviewed. The children interviewed were aged between 3-11 (Table 1) and included approximately equal numbers of girls (52%) and boys (48%). Their dmft ranged from 1 to 20. (Fig 1)

Fig 1 Distribution of dmft scores



The children had mean weight and height SD scores close to the average for their age. (Table I) From all but two children Carstairs scores were obtained and 71% children

Table I General characteristics of group of children studied

	Number of children	Mean	Standard Deviation	Minimum
Age (yr)	165	5.7	1.8	3.0
Dmft	165	7.9	3.5	1
Height SD	132	0.25	1.8	-3.7
Weight SD	162	-0.001	1.2	-4.4
Sugar frequency	161	31.5	5.4	6
Fibre frequency	165	36.4	4.6	23
Bowels opening (/d)	160	2.2	0.7	1

Table II Effect of social class on dmft, age and BMI

Carstairs Score	1-2	3-4	5-7
Number of children	10 (6%)	37 (23%)	116 (71%)
Population of children in Greater Glasgow *	24,252 (18%)	28,235 (21%)	78,907 (60%)
Mean Dmft	5.70	7.32	8.16
Mean BMI	-0.44	0.25	-0.23
Mean Age	5.6	6.2	5.8

*** data from Greater Glasgow Health Board, unpublished 2002, www.show.scot.nhs.uk/gghb/**

Table III Relationship of dmft to height, BMI and age

dmft	1-7	8-20	P value
Height SD	0.47	0.065	0.22
BMI SD	0.18	-0.42	0.019
Age (years)	5.9	5.7	0.6

dmft was divided into low dmft (1-7) and high dmft (8-20) using the median. Height and BMI are measured in standard deviations and the value given is the mean for the children in each group. dmft was then compared to the mean values for height, BMI and age with significance determined using a two sample t test.

Table IV Sugar and fibre scores by severity of decay and level of deprivation

	Number of children	Mean fibre score	SD	P	Mean sugar score	SD	P
High DMF	89	37.2	5.1	P=0.056	30.9	4.8	P=0.21
Low DMF	75	35.8	4.2		32.0	5.9	
Bowels open				P=0.86			P=0.73
>2 per day	15	35.8	4.5		31.0	4.5	
Daily	107	36.6	4.5		31.8	5.4	
1 /2 days	26	36.0	4.9		32.5	4.4	
2+ days	12	37.1	6.1		30.1	4.6	
Carstairs score				P=0.58			P=0.13
1,2&3	26	35.5	4.2		31.9	4.2	
4	21	35.7	3.8		31.8	4.9	
5	32	36.4	5.5		29.3	5.6	
6	36	36.9	4.9		32.4	5.8	
7	48	37.1	4.7		32.2	5.7	

were in DEPCATs 5-7. (Table II) The results for bowel frequency (Table I) show that children opened their bowels on average at least once a day. Fibre and sugar score mean values are shown in Table I.

A range of poor dietary habits was reported. 29% of children drank soft drinks everyday, 67% had a drink after brushing their teeth, and in 29% this contained sugars. Only 14% of children stated that they ever drank sugared diluting juice, while 62% drank sugar free or no added sugar diluting juice. Over a third (37%) ate a chocolate bar everyday, with 39% eating at least one plain biscuit a day. Almost 75% ate chewy sweets and 30% had a "sucky" lollipop every week.

Children with the worst teeth had significantly lower BMI, but were only slightly shorter (Table III). Regression analysis showed a statistically significant relationship between Carstairs index and dmft ($p=0.015$). However, there was no relationship between BMI and Carstairs categories. There was no significant relationship between the sugar score of the children and their dmft, nor between DEPCAT and sugar consumption (Table IV). There was no significant relationship between dmft and bowel habit. (Table IV)

Discussion

This study showed significant relationships between dmft and BMI and DEPCAT, but no relationships with sugar score or bowel habit. The sample included a relatively large sample of children with significant dental decay. The dental data were of high quality and reliable, collected immediately prior to extractions and the deprivation classification is a well-established method. The method of obtaining information about the foods the children ate was relatively simple[17] but gave only a crude indication of what they were eating. Parents are reliable reporters of what their children eat at home but not at school and this is likely to be compounded by the fact that some parents are aware of the link between sugar and caries and are reluctant to admit just how much sugar their child consumes. Poor parental memory, lack of understanding of what is being asked and food overestimation are further sources of inaccuracies.[18]

The children were wearing shoes when they were measured which explains why their heights were slightly above average. Reference data were used in the place of a local control population, making it possible that more subtle differences in diet and growth were not detected.

The mean dmft of the study group was very high at 7.9. This was not surprising because all the children interviewed were about to have teeth removed for dental decay. A recent audit of children who had teeth removed under DGA in secondary care in Scotland found that each had an average of 5.3 teeth extracted. [19]

A high mean dmft may be caused by many factors and in this study the children had high-risk dietary habits such as the daily consumption of soft drinks, which is associated with other high-risk behaviours.[20] Furthermore, 67% had a drink after brushing their teeth compared with 40% in the National Diet and Nutritional survey (NDNS).[21] We found no direct relationship between sugar intake score and dmft. The relationship between sugar consumption and dmft has long been established and supported by many studies, but the association is not always detectable in cross sectional studies, as for example in a detailed dietary study of middle school children.[22] Dental caries is a multi-factorial disease and other risk factors must also be taken into account, such as exposure to fluoride, oral hygiene practices, and genetic susceptibility.[23] In addition, it has been suggested that eating sugary foods between meals is a stronger risk factor than total sugar consumption. The present study was only able to address total sugar consumption.

The proportion of our study group opening their bowels once or twice a day, (76%) was similar to the percentage seen in a previous study of 'normal' children.[24] Bowel habit was found to be unrelated to severity of dental decay. However the lack of a relationship between fibre score and bowel habit could mean dietary reporting of fibre intake was unreliable or that the causes of constipation are more complex.[25]

As well as an excess of deprived children in the sample a significant relationship was found between dmft and deprivation. Social deprivation has been identified as a high risk factor for children developing caries.[22,26] Although the lower tenth of all socio-economic groups spend less on sweets, the foods they buy are often richer in energy and higher in fat and sugar.[1] Socially deprived groups may also be less likely to attend early for restorative and preventative dental treatment.[11]

Children who undergo DGA for dental extraction have previously been shown to be lighter than controls,[14] but in this case there was no obvious difference compared to the growth reference, but children with the most severe decay were relatively thin. Children with established dental

decay may be less able to chew and this can affect their food choice.[9]

Further research in this area should include comparison with a sample of children from the general population and a more sophisticated method of measuring food intake, to discover whether their diet, growth and bowel habit differs from those in the study group.

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