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Dental caries and children's weights

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SUMMARY The weights of 1105 children who needed the extraction of deciduous teeth under general anaesthesia were significantly lighter than the weights of 527 children who did not have dental extractions. Dietary analysis was made for 204 children after extraction and 131 children of the non-extraction group. Children who require mutiple extractions before the age of 6 may be suffering an undetected malnutrition.

There have been many studies of the effect of diet on dental tissues. Schour and Massler[1] reviewed the effects of dietary deficiencies on oral structures. Bibby and Mundorff[2] considered demineralisation of enamel by snack foods and Rugg-Gunn *et al*[3] studied the effect of eating some British snacks on the acidity of human dental plaque. There is thus evidence that the presence of carbohydrate-type foods around teeth is associated with dental caries. Currier and Glinka[4] reviewed the prevalence of one type of severe dietary caries which occurs early in life and is sometimes known as 'baby feeding bottle' syndrome. Nilson and Rolling[5] studied the prevalence of caries in 'high-risk' patients aged between 3 and 5 who received dental treatment under general anaesthesia.

Because the prevalence of dental caries has been correlated with carbohydrate around the teeth, and the prevalence of obesity has been associated with high calorie intake which probably implies a high carbohydrate intake, most dental workers have consequently tended to presume that dental caries would be associated with overweight children. A study of the literature has failed to reveal any evidence of this. An observation by Miller[6] that two young children who presented in the Child Dental Health Clinic at the Cardiff Dental Teaching Hospital with severe 'feeding bottle caries' were underweight led to a comparison of the weights of children who required different forms of dental treatment. Children with severe dental caries usually require the extraction of several and, on occasion, of all deciduous teeth before the age of 5. It was therefore decided to compare the weights of children who attended for extraction under general anaesthesia with those of children who attended for routine dental care without extraction.

Methods

The first part of the study was a retrospective comparison of records available in the clinic since June 1975. All children attending for dental extraction under general anaesthesia were examined beforehand. They were weighed fully clothed with shoes on, with outdoor coats or jackets removed. We included in this study children who had at least two deciduous teeth removed under general anaesthesia (GA group). As a contrast we also studied children attending for routine dental care (DC group) whose height and weight measurements were normally recorded without heavy outdoor clothing or shoes. Each individual was plotted on Tanner's growth and development charts[7] according to age and weight and assigned to Tanner's percentile groups.

A second study compared the diet histories of patients attending either for general anaesthesia or for routine dental care. From July to December 1980, diet history forms were given to the parents of the GA group at the time the child was assessed for general anaesthesia. The parent was asked to record for two weekdays and one weekend day everything the child ate and drank. The completed forms were returned at the child's next visit and an appointment was then made to see the dietician. Some patients attended for extraction on the same day as the assessment and for these a recall appointment was made two weeks later for inspection of the healing sockets and also to return the completed diet history and to discuss the diet with the dietician. Diet histories of children in the DC group were obtained as part of normal care; the form was completed by a parent between visits and handed back for assessment by the dietician at the next attendance at the clinic. The history sheets tried to assess the frequency of eating, the adequacy of the diet in relation to carbohydrate, fat, and protein, and whether the child had a satisfactory breakfast. The following factors were included:

1. Age
2. Weight
3. Sex
4. Frequency of eating
5. Quality of breakfast
6. Protein consumption
7. Milk consumption
8. Fat consumption
9. Solid refined carbohydrate between meals
10. Solid refined carbohydrate at meal times
11. Refined carbohydrate liquids between meals
12. Refined carbohydrate liquids at meal times
13. Unrefined carbohydrates

If breakfast was taken the protein intake was classified as poor or satisfactory. The fat consumption was classified as reasonable or high.

Results

WEIGHTS

Weight records were available for 1105 children who had teeth extracted under general anaesthesia (GA group) with a mean age of 5·94 (SD 2·23) and for 527 children who received dental care but had no extractions (DC group) with a mean age of 6·51 (SD 2·17). The percentage distribution of weights by Tanner's age-adjusted percentiles is shown in Table 1. The children in the GA group were lighter than those in the DC group and this was true for both boys and girls ($p < 0·001$). In the GA group, 31·3% were below the 25th percentile compared with only 17·1% in the DC group; 57·7% of the GA group but only 39·5% of the DC group were below Tanner's median.

An analysis by age-specific mean weights (Table 2) showed similar findings which were significantly different at ages 4–8 inclusive.

Table 1 *Percentage distribution of weights by Tanner's age-adjusted percentiles*

	BOYS		*GIRLS*		*CHILDREN*		
Tanner's weight percentiles	*DC group*	*GA group*	*DC group*	*GA group*	*DC group*	*GA group*	*ALL CHILDREN*
1– 3	1·9	4·0	0·8	6·3	1·3	5·2	3·9
4–10	4·2	8·0	5·3	10·1	4·8	9·1	7·7
11–25	8·3	16·4	13·7	17·7	11·0	17·0	15·1
26–50	24·1	28·4	20·6	24·5	22·4	26·4	25·1
51–75	24·5	23·6	23·7	19·3	24·1	21·4	22·3
Over 75	37·0	19·6	35·9	22·1	36·4	20·9	25·9
No.	265	550	262	555	527	1105	1623
χ^2 with 5 df:	37·3 p <0·001		33·8 p <0·001		67·2 p <0·001		

Table 2 *Age-specific mean weights by dental group and significance of the difference*

	GENERAL ANAESTHETIC GROUP			*DENTAL CARE GROUP*				
Age of child	*No.*	*Mean weight (kg)*	*SD*	*No.*	*Mean weight (kg)*	*SD*	*Difference in weight (kg): GA minus DC*	*Statistical significance*
2	32	13·53	1·73	6	13·48	1·46	− 0·05	NS
3	106	14·59	2·11	26	14·07	2·07	− 0·52	NS
4	185	16·39	2·08	60	17·36	2·03	+ 0·97	**
5	220	17·88	2·52	101	19·01	2·28	+ 1·13	***
6	162	20·44	3·16	87	21·51	2·81	+ 1·07	**
7	126	22·24	3·73	81	24·46	4·17	+ 2·22	***
8	99	25·56	5·11	60	27·63	4·31	+ 2·07	**
9	80	27·49	4·98	48	28·73	5·14	+ 1·24	NS
10	59	30·62	5·49	27	31·39	4·52	+ 0·77	NS
11	26	32·60	5·93	24	36·91	7·49	+ 4·31	*
12	7	33·93	4·37	4	39·05	6·33	+ 5·12	NS

NS not significant
* p <0·05
** p <0·01
*** p <0·001

DIET HISTORIES

An accurate and precise analysis of the diet sheets was not attempted since the study was interested in gross differences and an overall picture of the child's dietary habits. In general the diet sheets were well completed by mothers and omissions discussed by the dietician were of butter on bread or of milk on cereal rather than of sweet and biscuit intake. One hundred and thirty-one diet sheets were available for analysis from the routine DC group and 204 from the GA group.

Diet sheets were returned for children of all ages from the GA group and for children aged 3–12 from the DC group. A comparison of age-specific mean weights was made between these children and the larger more comprehensive main groups to establish whether those for whom the diet sheets were returned differed in mean weights from the larger group. The results were not significant ($p > 0{\cdot}05$) at any single year of age (Tables available on request).

The frequency of eating was higher in the GA group than in the DC group but this difference was not statistically significant. The difference was more marked in the boys: 28% of boys in the GA group were eating more than six times a day, compared with 16% in the DC group. There was little difference in the frequency of eating by the girls in the two groups.

More of the DC group ate breakfast and a higher proportion had a satisfactory source of protein (Table 3). There did not appear to be a sex difference between the two groups in relation to breakfasts. The DC group took animal protein more frequently than the GA group but this was not statistically significant. More milk was taken by the DC group (Table 4) and more by boys than girls, but conversely the GA group had a higher fat intake (Table 5). There was a significant difference between the groups in the intake of refined solid carbohydrate between meals (Table 6) with the GA group having more frequent snacks; the difference was more marked in girls than in boys.

There was no difference between the groups in the refined carbohydrate liquids taken between meals or those taken at meal times. The GA group had fewer intakes of unrefined carbohydrates, but this difference was not statistically significant.

Discussion

A problem in this survey was to obtain representative samples of the population. These children were selected either by the parents bringing them for dental care or by dental practitioners referring them. Both groups, therefore, were selected on the basis of perceived dental need. The DC group were older than the GA group and for this reason two methods of assessment were used. The comparison with the weight charts of Tanner showed the GA children to be significantly lighter. A comparison of the age-specific mean weights of the children in the two groups confirmed that the GA children were significantly lighter, thus reinforcing the comparison by percentiles of weight.

The GA group included a greater proportion of children below the Tanner 50th percentile than the control group and the tendency towards light body weight in the GA group would have been further emphasised if the weight of indoor clothing had been subtracted from the actual weight recorded, since Tanner's standards referred to children measured

Table 3 *Type of breakfast by dental group*

	DC group		*GA group*	
Breakfast	*No.*	*(%)*	*No.*	*(%)*
None	4	(3·1)	14	(6·9)
Poor protein	108	(82·4)	178	(87·7)
Satisfactory protein	19	(14·5)	11	(5·4)
All children	131	(100)	203	(100)

χ^2 (2 df) = 9·7 p <0·01

Table 4 *Daily milk intake by dental group*

	DC group		*GA group*	
Intake	*No.*	*(%)*	*No.*	*(%)*
< ¼ pint	12	(9·2)	39	(19·1)
¼–½ pint	39	(29·8)	61	(29·9)
½–1 pint	51	(38·9)	81	(39·7)
>1 pint	29	(22·1)	23	(11·3)
All children	131	(100)	204	(100)

χ^2 = 11·3 3 df p <0·02

Table 5 *Quality of fat intake by dental group*

	DC group		*GA group*	
Intake	*No.*	*(%)*	*No.*	*(%)*
Reasonable	119	(90·8)	168	(82·8)
High	12	(9·2)	35	(17·2)
All children	131	(100)	203	(100)

χ^2 = 3·7 1 df p <0·1 (NS)

Table 6 *Daily solid refined carbohydrate intakes by dental group*

	DC group		*GA group*	
No. of daily intakes	*No.*	*(%)*	*No.*	*(%)*
0	26	(19·8)	26	(13·1)
1	69	(52·7)	83	(41·7)
2	28	(21·4)	70	(35·2)
≥3	8	(6·1)	20	(10·0)
All children	131	(100)	199	(100)

χ^2 = 10·9 3 df p <0·02

nude. Furthermore, because the DC children were weighed shoeless, the weights of the GA group who were weighed with shoes are heavier than a strict comparison would justify. We therefore conclude that the difference in weight between the GA group and the control group was highly significant ($p < 0.001$) and that this difference was most marked in relation to the girls. Tanner[8] reported that girls are more sensitive in their growth response to the environment. Woods, 1980[9] in Australia found similar results in 65 children aged from 19 months to 5 years who required clinical sedation for dental treatment of early caries.

Diet histories had shown that some of the children who required extractions were still being fed solely by bottle at the age of 4. In some children, evidence had been found of pica in the form of excessive eating of paper or reports that a child had taken to gnawing the edge of the pram and had 'so broken his teeth'.

Our study of diet was an attempt to ascertain whether diet history could reveal any significant differences between these two groups. The diet histories can only be considered as very crude and perhaps geographically biased, because these histories were provided only by those parents who could return for the child to have the extraction sockets checked a fortnight after extraction. From the replies it appears that the DC group had breakfast more frequently and drank more milk. The analysis of fat intake, which was higher in the GA group, was at first surprising but it was associated with the fat on fried potatoes. The frequency of intake of solid refined carbohydrates taken between meals was significantly higher ($p < 0.05$) in the GA group. The latter had less refined carbohydrates at meal times than the control group and this was also a significant result.

These findings cannot be interpreted as proof in relation to dietary intakes, although the impression given does confirm presumptions made by previous observers and would reinforce the clinical impression that those children who had severe dental caries were suffering a form of malnutrition through having more 'empty calories' and not enough nutrients in their diet—perhaps a form of 'hyponutrition'. It does, however, suggest that the dental profession may be able to use their diagnostic skills for the possible identification of children who have slipped through the protective net of the maternity and child welfare clinics, but who have not yet reached the care of the school medical inspections, and who may therefore be children at risk. On the basis of these findings, we would advise any dental surgeon who sees the need for dental extractions under the age of 5 to relate the weight of the child to the ethnic norms and arrange advice appropriately to ensure that the child is not suffering from a form of malnutrition or failure to thrive. It is important also to check the weight after the age of 5, but it is before that age that such children are not protected by school medical inspection. We propose to test these findings by more extensive studies and to examine the possibility that dental disease other than dental caries may be a similar indicator of children at risk.

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