

IN BRIEF

- Describes the prevalence of dental sepsis and provides a measure of the impact of disease in a 5-year-old population.
- The data suggest that by not treating dental caries in deciduous teeth, particularly where many teeth are affected, the risk of occurrence of dental sepsis is increased.
- The findings do not support a policy of non-intervention for deciduous caries if oral sepsis is to be minimised.

An investigation of the relationship between untreated decayed teeth and dental sepsis in 5-year-old children

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Objectives To investigate the prevalence of dental sepsis in 5-year-old children in Scotland and the relationship between sepsis, treated and untreated decayed teeth, oral cleanliness (visible plaque on anterior teeth) and socio-economic deprivation.

Subjects and methods Six thousand, nine hundred and ninety-four children of mean age 5.3 years were examined as part of a survey conducted under the Scottish Health Board's Dental Epidemiological Programme. The presence of dental sepsis was recorded, in addition to caries status, and presence of plaque. Postal code information was used to obtain a measure of material deprivation. Relationships between sepsis and its possible contributory factors were explored using stepwise logistic regression.

Main results In the whole sample, 4.8% of children examined had dental sepsis, ranging from 2% in the most affluent areas to 11% in the most deprived. Children with sepsis had much higher caries experience (mean dmft 6.30) than those without sepsis (mean dmft 2.36). However, when these factors and the presence of plaque were entered into a logistic regression model to predict presence or absence of dental sepsis, the most important factor was not deprivation, but untreated decay.

Conclusions The proportion of children with sepsis increases markedly with caries experience. This disadvantage can be mitigated if more of the caries experience is treated. These findings would not support a policy of non-intervention for deciduous caries if oral sepsis is to be minimised.

INTRODUCTION

Untreated dental caries in children can cause both pain and infection. The prevalence of dental pain experienced by children is surprisingly high – in a survey of 8-year-olds in Harrow, 48% had experienced toothache and for 18% their worst experience of toothache had made them cry.¹ However, very little is known

about the prevalence of dental sepsis. Dental sepsis in children can be defined as dental abscesses presenting as localised swellings or draining sinuses adjacent to carious or traumatised teeth. The consequences of such an infection, in addition to pain and discomfort, are two-fold: firstly a chronic abscess can result in damage to developing permanent teeth;² secondly, acute abscesses related to deciduous teeth can lead to rare, although serious, sequelae such as orbital cellulitis,^{3,4} brain abscesses⁵ and 'unexplained' recurrent fever.⁶

In a population with a high prevalence of dental caries in children, it is likely that some dental sepsis exists. Although epidemiological surveys monitoring the prevalence of dental caries in 5-year-olds are regularly undertaken in the UK, none have reported the prevalence of dental sepsis in the population, nor investigated the relationship with treated and untreated teeth. Children in Scotland have been shown to have relatively high levels of disease when compared with other areas of the UK.⁷ Therefore, it was agreed to include an assessment recording the presence of dental sepsis in the survey undertaken as part of the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP) in 1999/2000.⁸ Analysis of these data allows an exploration of the association between the restoration of deciduous teeth and the presence of dental sepsis, providing further insight to the current debate in the UK^{9,10} relating to the merits of undertaking restoration of deciduous teeth.

METHODS

During the school year 1999/2000, 6,994 children of mean age 5.3 years were examined for the annual survey conducted within the Scottish Health Boards' Dental Epidemiological Programme (SHBDEP). The children comprised representative samples within each Health Board in Scotland of children in P1 (the first year of primary school). Children were examined in school with a visual assessment of dental caries experience at the dental level of involvement by standardised examiners.¹¹ The presence or absence of visible plaque on upper anterior teeth was recorded as a measure of oral cleanliness. Furthermore, in this examination the presence of 'dental abscesses' was recorded for the first time. The examiners were asked to look around the mouth and record dental abscess as present if they could see a localised area of dental sepsis. This could be presenting as an 'acute' abscess with localised swelling or as a 'chronic' draining

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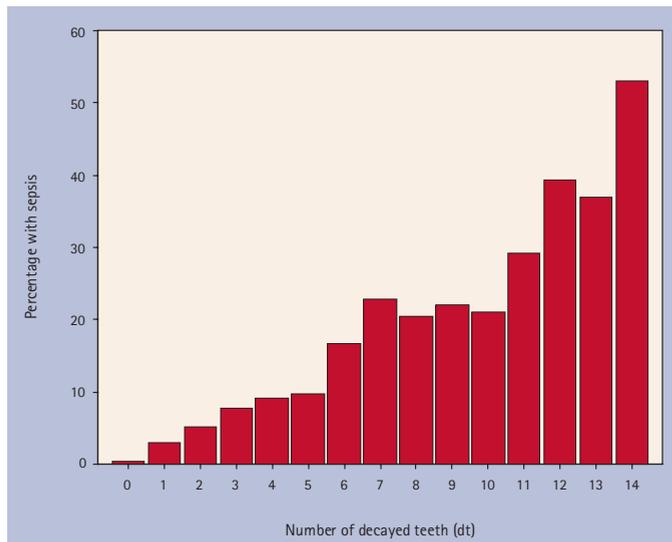


Fig. 1 Histogram of number of untreated decayed teeth and the prevalence of dental sepsis

Table 1 Prevalence of dental sepsis by area of deprivation

Deprivation category of area where child lives	Prevalence (No. children with dental sepsis)
1 (most affluent)	2% (11)
2	2% (18)
3	4% (58)
4	5% (72)
5	6% (50)
6	8% (51)
7 (most deprived)	11% (52)

Table 2 Mean caries experience of children with and without dental sepsis

	Mean (S.D.) of those with dental sepsis.	Mean (S.D.) of those with no dental sepsis.
dmft	6.30 (3.63)	2.36 (3.25)
dt	5.54 (3.63) – 88% of dmft	1.62 (2.47) – 68% of dmft
mt	0.37 (1.02) – 6% of dmft	0.51 (1.53) – 21% of dmft
ft	0.38 (0.84) – 6% of dmft	0.24 (0.74) – 10% of dmft

sinus. No attempt was made to assign which tooth had generated the septic response, whether single or multiple areas existed, or the reason for the pulpal damage.

STATISTICAL METHODS

The data were weighted by health board to give a representative sample for Scotland. The relationships between sepsis and its possible contributory factors were explored using stepwise logistic regression.

RESULTS

Six thousand, nine hundred and ninety-four children were examined in total. Thirty cases were excluded because of missing data on dental sepsis, leaving 6,964 cases included in the analysis for this paper. The prevalence of dental sepsis in Scottish 5-year-olds was found to be 4.8% (337). More children living in areas with the highest level of socio-economic deprivation were found to have dental sepsis (11% of those in DEPCAT 7, the highest deprivation category) compared to those from more affluent areas (2% of those examined in DEPCAT 1, the most affluent grouping, had dental sepsis) (Table 1).

Children with dental sepsis had a mean dmft of 6.30 (SD = 3.63) whereas those with no dental sepsis had a mean dmft of 2.36

(SD = 3.25). The biggest difference is in untreated decay (dt), with those with sepsis having three times as much as their counterparts without sepsis (Table 2). Those children with sepsis also have higher numbers of filled teeth, but when considered as a percentage of total caries experience, filled teeth contribute 6% of the caries experience of those with sepsis, compared to 10% of those without sepsis. Children with no sepsis also have a larger proportion of teeth with decay experience extracted (21% of dmft) than those with sepsis (6% of dmft).

Around one in 10 children with untreated decay (9.3% with dt>0) were found to have dental sepsis compared with only around 1 in 100 children with fillings and no untreated decay (0.9% with dt = 0 and ft>0; Table 3). Thirteen children in the sample were found to have sepsis but neither had untreated caries or any fillings and it is likely that the sepsis is related in these instances to traumatised incisors. Figure 1 illustrates the relationship between numbers of untreated decayed teeth and the percentage of children observed to have dental sepsis. The relationship between oral cleanliness (the presence of visible plaque on anterior teeth) and the presence of dental sepsis was also investigated. Of those children assessed to have no visible plaque on anterior teeth, 3.2% (142) had dental sepsis, compared to 7.8% (194) of those with some visible plaque.

A stepwise logistic regression model was applied to the presence or absence of sepsis to identify which of these possible explanatory factors was most important. The possible predictors entered were DEPCAT, numbers of decayed, filled and extracted teeth (dt, ft and mt), and presence or absence of plaque. Due to missing postcode data 900 cases were excluded from this analysis. The first factor to enter the model was untreated decayed teeth (dt). The odds ratio for this factor shows that an increase of one additional untreated decayed tooth increases the odds of a child having dental sepsis by a factor of 1.37 (95% C.I. 1.33-1.42). On the next three steps, extracted teeth, DEPCAT, and filled teeth entered the model. The results of the regression are summarised in Table 4.

DISCUSSION

Epidemiological dental studies of 5-year-olds have been criticised because they focus on a normative assessment of need and provide little information on the impact of the disease.¹¹ This study does provide information on the impact of disease in terms of dental sepsis. Since the data are cross-sectional, the figures for the prevalence of dental sepsis may be an underestimate since the manifestation of dental abscesses can be episodic. The data also allow an investigation of the association between untreated decayed teeth and dental sepsis on a population basis rather than on a selected sample of children who regularly attend dental practices. While the cross-sectional nature of the study precludes drawing causal inferences between the two variables, it does provide data that contribute to the discussion generated by the findings of other observational studies concerning the merits of restoration of deciduous teeth.

Tickle *et al.*,¹² in a retrospective study based on case-notes of children with interproximal caries in primary molars who regularly attended the General Dental Service, found that there was no difference in the proportion of unrestored as opposed to restored teeth which prompted a course of antibiotics to be prescribed by the practitioner, and that unrestored teeth are no more likely to have been extracted because of pain than restored teeth. The authors suggest that this may indicate that there really is no advantage in restoring primary teeth if avoidance of pain or sepsis is the desired outcome.

The data from Scottish 5-year-olds do not confirm this approach. Even though the findings in this high caries population show that a significant proportion of disease remains untreated, and the proportion of children with sepsis increases markedly with

Table 3 Comparison of the prevalence of sepsis in children with untreated decay and children with filled teeth but no untreated decayed teeth

	% (No.) children with sepsis	% (No.) children without sepsis	Total % (No. children)
Children with untreated decayed teeth	9.3% (322)	90.7% (3143)	100 (3465)
Children with filled but no untreated decayed teeth	0.9% (2)	99.1% (224)	100 (226)
Children with no untreated decayed or filled teeth	0.4% (13)	99.6% (3260)	100 (3273)
Total % (No.)	4.8% (337)	95.2% (6627)	100 (6964)

Table 4 Stepwise logistic regression of possible explanatory factors on presence of dental sepsis

Step number	Variable entered	Regression coefficient	Odds ratio (C.I.)
1	Decayed teeth	0.31	1.37 (1.33 – 1.42)
2	Extracted teeth	-0.19	0.83 (0.75 – 0.92)
3	DEPCAT	0.34	1.40* (1.09 – 1.31)
4	Filled teeth	0.14	1.15 (1.00 – 1.31)

*Odds of those in DEPCAT 5-7 having sepsis are 1.40 times greater than odds of those in 1-4 having sepsis

caries experience, this disadvantage can be mitigated if more of their caries experience is treated. The reduced level of fillings and extractions in these children is a significant contributor to their oral sepsis. These relationships are independent of area of residence. These findings would not support a policy of non-intervention for deciduous caries if oral sepsis is to be minimised.

The evidence-base for the restoration of carious primary teeth is an important area where the evidence for the intervention must be weighed against the possible risks related to the intervention (in undertaking a potentially unpleasant procedure for the child) and possible risks of non-intervention (possible sequelae of pain and

sepsis and damage to the secondary successor). Tinanoff and Douglass¹³ put forward a case for a risk-based assessment of the need for care in the clinical decision making concerned with the caries management of primary teeth. The dentist is obliged to inform the parent about treatment options based on scientific evidence, risk assessment, expected outcomes and cost. The evidence base in this area needs to be strengthened to enable both practitioner and parents to make informed decisions. The Scottish data suggest that by not treating primary teeth, particularly where many teeth are affected by caries, the risk of the occurrence of dental sepsis is increased. Further work based on longitudinal studies is needed to provide more information on the risks of non-intervention for carious primary teeth.

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