International Journal of Paediatric Dentistry 2004; **14:** 251–259

The effects of diet, breast-feeding and weaning on caries risk for pre-term and low birth weight children

E. S. DAVENPORT, C. LITENAS, P. BARBAYIANNIS & C. E. S. WILLIAMS

Oral Growth and Development, Barts and the London Queen Mary's School of Medicine and Dentistry, Turner Street, London, UK

Summary. *Objectives.* The aims of this study were to determine the prevalence of dental disease in 3–4-year-old children born pre-term and low birth weight (PLBW) in East London, UK, to make comparisons with normal birth weight children (NBW), and to investigate the impact of dietary habits on the development of dental caries in primary teeth.

Design. This was a cross-sectional study.

Subjects and methods. The subjects were 100 children (54 boys and 46 girls) with a mean age (± SD) of 41·70 ± 5·11 months. The children were resident within walking distance of the dental hospital and were invited to attend with their parents. Demographic data and information about feeding practices from infancy to the present were ascertained by structured questionnaire. Dental caries status was determined, and height, weight and head circumference were also measured.

Results. Sixty children had experienced dental caries with a mean (± SD) dmft of 2·98 ± 3·93, 25 of whom had a dmft greater than 5. Normal birth weight children (3·00 ± 4·18) and boys (3·55 ± 4·48) had a significantly increased dmft over PLBW children (2·95 ± 3·35) and girls (2·29 ± 3·04). The PLBW children were more likely to have used a bottle from birth and one in four children were still using a bottle at the time of the dental examination. The PLBW children were significantly more likely to eat sugar than NBW children, scoring 5·53 ± 2·10 and 4·61 ± 1·94, respectively.

Conclusions. A clear relationship exists between poor diet and PLBW in a group of children resident in the East End of London. Targeted infant feeding programmes, education and support for families with regard to dental care is of importance to avoid an unnecessary amount of dental disease in young children.

Introduction

According to 1998 Mortality Statistics, 8% of all deliveries in the UK are premature [1]. Pre-term and low birth weight (PLBW) babies are often admitted to baby special care units because of their prematurity and immature organs. Post-delivery, PLBW infants often have a higher rate of medical intervention. This time in hospital may cause a marked change in the lifestyle of the family in the first few months of the infant's life. Pre-term and low birth weight infants adapt surprising well to extra uterine life, although there may be problems with immature body systems such as the respiratory, central nervous and excretory systems, and these children are more prone to infections [2].

Complications arising as a result of prematurity may affect the infant's development and feeding patterns. Hypoxia, jaundice, apnoeic episodes, anaemia,

Correspondence: Professor E. S. Davenport, Oral Growth and Development, Barts and the London Queen Mary's School of Medicine and Dentistry, Turner Street, London E1 2AD, UK. E-mail: e.s.davenport@qmul.ac.uk

rickets, haemorrhage and temperature instability being the most common. Of those very low birth weight (< 1500 g) or very pre-term (< 25 weeks) children who survive the perinatal period, half may have a disability [3]. Despite this, the prognosis of PLBW infants has improved over recent years, although very low birth weights still have a poor survival rate. Dental developmental defects as a consequence of premature birth may also be associated with other disturbances during pregnancy such as maternal infection, metabolic disorders (e.g. hypoxia, nutritional deficiencies, low serum calcium deficiencies) [4,5], and immediate post delivery or delivery problems [6].

Initial feeding patterns are difficult to establish, especially if a child is born PLBW, and thus, establishing breast-feeding may prove to be particularly difficult. It is recommended that all children should be breast-fed until at least 4 months of age, and weaned between 4 and 6 months of age [7,8]. Breast-feeding has many advantages: it provides optimal infant nutrition, immunological protection and minimizes the economic impact to the family. Despite good practice, there is conflicting evidence regarding breast-feeding in terms of dental health. Prolonged breast-feeding apparently carries a risk of developing dental caries or nursing caries, although milk is generally not considered to be cariogenic [9]. There may be good reasons for infants not to be breast-fed, such as inborn errors of metabolism or maternal lactation failure [26], or as a matter of choice. Hence, alternatives such as milk-based substitutes are used, many of which include sugar as part of a special preparation [10].

Making a decision about when to wean a PLBW infant is not straightforward. Many infants and young children continue to use a bottle once weaned, in some instances for prolonged periods of up to 3 years [11]. This is often associated with dental caries, especially if sugar is added, and the bottle is used frequently throughout the day and night [12].

Dental caries remains the principal dental disease affecting children. The mean dmft for 5-year-old children is 1·57 in the UK, but in East London and the City, this increases to 2·41 [13]. Approximately 25% of 3–5-year-old children are registered with a dentist and receive dental care [14] in East London. This community is culturally diverse and several markers of social deprivation exist, such as a mixed ethnic minority population, homelessness and refugee status.

The aims of this study were to determine the prevalence of dental caries in 3–4-year-old children born PLBW in East London, and to investigate the impact of dietary habits on the development of dental caries in primary teeth in 3–4-year-old children born PLBW in East London.

Subjects and methods

Study design

The study was conducted at Barts and the London NHS Trust Dental Institute after approval was obtained from the East London City Health Authority ethics committee. One hundred 3–4-year-old children whose mothers had previously been investigated in a case control study to determine the relationship between periodontal disease and the delivery of PLBW [15] were invited to join the study. Between January and July 2001, two of the authors (C.L. and P.B.) consecutively selected 100 children from those who lived within walking distance of the Dental Institute in the East End of London.

The study comprised three parts:

(1) A structured questionnaire to ascertain the children's demographic details, gestation weight, gender, initial and current feeding patterns, and previous dental health was conducted by P.B. and C.L. A 24-h dietary recall of current feeding habits was used for ease of application knowing the limitations of such a tool, especially those associated with recall bias. Further questions ascertained whether the children were breast- or bottle-fed, or both, and when these types of feeding were stopped. Data regarding the number and types of snacks, the amount and type of sugar intake, and the types of drink consumed each day were also collected.

(2) A clinical examination was carried out to determine the prevalence of dental caries and enamel opacities using British Association for the Study of Community Dentistry criteria [16]. The examination took place in a dental surgery with the subject in a supine position, examined from behind using a mirror and dental light. The teeth were not cleaned prior to examination; however, where visibility was obscured, debris and moisture were removed from individual sites. Radiographs were not taken.

(3) Height, weight and head circumference were measured using a Leicester Height Measure [17], a portable balance (Model Tanita 1632 W 'Solar') and a reusable Lasso-o™ (Child Growth Foundation, London, UK), respectively, for each child.

Statistical analysis

The data were entered onto standard clinical proforma. This and the structured questionnaire were coded and entered onto a database (SPSS for Windows & NT Version 10·1) prior to carrying out a descriptive analysis. The null hypothesis tested was: 'There is no difference in dental caries between normal, and pre-term and low birth weight children born at the Royal London Hospital.' The differences between the two groups of children were tested using chi-square tests and the Mann–Whitney *U*-test at a level of 5%.

Results

One hundred children were recruited into the study. Sixty-two were of normal birth weight (NBW) (35 boys and 27 girls) and 38 PLBW (19 boys and 19 girls), as shown in Table 1.

The demographic details of the study group are shown in Table 1. There were no differences detected between the PLBW and NBW children. The majority of the children were of Bengali origin (89%), representing the majority population in the Dental Hospital locality, and one-third were PLBW (38%).

Table 2 shows gestational age, birth weight, current weight, height and head circumference by PLBW (where PLBW ≤ 37 weeks and ≤ 2499 g) and normal-term delivery and weight (NBW > 37 weeks and > 2500 g). There was a significant difference between PLBW and NBW in all parameters (Table 2).

Table 3 represents the infant feeding patterns, including breast and bottle, and the length of either. Significantly more PLBW children were bottle-fed than of those who were NBW ($P = 0{\cdot}01$). Twenty-seven children were breast-fed beyond 6 months, five of whom were PLBW. The PLBW children used a bottle for significantly less time than those who were NBW ($P = 0{\cdot}001$). A significant number were still

Table 1. Demographic details including gender, age (months) and ethnicity by normal birth weight (NBW), and pre-term and low birth weight (PLBW).

Variable	All ($n = 100$)	NBW ($n = 62$)	PLBW ($n = 38$)	Significance
Gender:				
boys	55	35	19	$\chi^2 = 0{\cdot}62$, $P = 0{\cdot}43$
girls	45	27	19	
Age (months):				
mean	41·70	41·00	42·84	
SD	5·11	5·11	4·96	$t = 1{\cdot}77$, $P = 0{\cdot}08$
range	33–49	34–49	33–49	
Ethnicity:				
white	9	6	3	
Bengali	89	55	34	$\chi^2 = 0{\cdot}20$, $P = 0{\cdot}90$
other	2	1	1	

Table 2. Growth and development: measurements including birth weight (g), gestational age (weeks), current weight (kg), height (cm) and head circumference (cm) of normal birth weight (NBW), and pre-term and low birth weight children (PLBW).

Variable	All ($n = 100$)	NBW ($n = 62$)	PLBW ($n = 38$)	Significance
Birth weight (g):				
mean	2826·49	3310·42	2036·92	
SD	781·09	467·46	489·37	$P = 0{\cdot}0001$
range	894–4900	2510–4900	894–2425	
Gestational age (weeks):				
mean	37·41	39·34	34·62	
SD	3·24	1·47	2·85	$P = 0{\cdot}0001$
range	27–34	37–43	27–36	
Current weight (kg):				
mean	15·90	16·61	14·47	
SD	2·71	2·93	1·82	$P = 0{\cdot}001$
range	11·2–30·00	12·20–30·00	11·2–18·2	
Current height (cm):				
mean	98·65	99·53	97·21	
SD	4·51	4·16	4·74	$P = 0{\cdot}012$
range	89–111	91–111	89–107	
Head circumference (cm):				
mean	50·38	50·84	49·63	
SD	2·21	1·65	2·76	$P = 0{\cdot}007$
range	39–55	47–55	39–55	

Table 3. Infant feeding (breast and bottle, and length), number of meals, snacks consumed and sugar intakes of 62 normal birth weight (NBW), and 38 pre-term low birth weight (PLBW) children at the time of the interview.

Variable	All (n = 100)	NBW (n = 62)	PLBW (n = 38)	Significance
Initial feeding:				
breast	44	34	10	
bottle	25	11	14	$\chi^2 = 8{\cdot}46$, $P = 0{\cdot}01$
combination	31	17	14	
Length of breast-feeding (months):				
none	25	11	14	
0–2	20	11	9	$\chi^2 = 8{\cdot}81$, $P = 0{\cdot}07$
2–4	20	12	8	
4–6	8	6	2	
> 6	27	22	5	
Bottle-feeding stopped:				
yes	61	42	19	$\chi^2 = 3{\cdot}12$, $P = 0{\cdot}07$
no	39	21	18	
Bottle-feeding stopped (months):				
mean	33·94	34·35	33·26	
SD	12·16	12·34	11·84	$t = 2{\cdot}64$, $P = 0{\cdot}001$
range	1–49	1–48	1–49	
Number of meals per day:				
2	17	11	6	
3	66	40	26	$\chi^2 = 2{\cdot}08$, $P = 0{\cdot}55$
≥ 4	17	11	6	
Snacks:				
yes	92	56	36	$\chi^2 = 0{\cdot}62$, $P = 0{\cdot}43$
no	8	6	2	
Snacks per day:				
1	27	21	6	
2	50	27	23	$\chi^2 = 5{\cdot}26$, $P = 0{\cdot}15$
≥ 3	15	8	7	
Number of sugar intakes per day:				
mean	4·96	4·61	5·53	
SD	2·04	1·94	2·10	$t = 2{\cdot}21$, $P = 0{\cdot}02$
range	2–12	2–11	2–12	

using a bottle at the time of examination despite the mothers reporting that all the children had been weaned onto solids. The study children had juice at breakfast (47%) and with snacks (57%), water was drunk in preference at lunch (81%) and supper time (67%), and milk was taken at bedtime (97%).

All children had regular meals and snacks and there were no differences between the groups in this respect. Snacks (usually biscuits, cakes, crisps and fruit) were consumed at no particular time of the day. The frequency of sugar consumption ($P = 0{\cdot}02$) and snacking between meals ($P = 0{\cdot}15$) was most evident amongst the PLBW children (Table 3).

Only 40 children were caries free. Thirteen children had a dmft greater than 5. The overall mean dmft was 2·98 (SD = 3·93). There were no differences between the two groups in dental caries experience when considering gender, ethnicity or attendance at the dentist (Table 4). Thirty-six children (23 NBW and 13 NBW) had previously attended the dentist, but none had had restorations placed. Four children, however, had had one or more teeth extracted as a result of dental caries in their neonatal teeth before their fourth birthday, three of whom underwent a general anaesthetic. Twenty-five children had a dmft ≥ 5, 10 of them who were PLBW. Ten children (six PLBW and four NBW) displayed enamel defects, mainly opacities on the buccal surfaces of upper incisors.

Discussion

The children included in this study represent a particular socially deprived multiethnic community resident in the East End of London. One-third of the children in this study were born pre-term (< 37 weeks

Table 4. Dental caries experience (dmft) by birth weight, gender, ethnicity and attendance at a dentist: (NBW) normal birth weight; and (PLBW) pre-term and low birth weight.

Variable	Number of subjects	dmft	SD	Range	Significance
Subjects:					
all	100	2·98	3·93	0–15	
NBW	62	3·00	4·18	0–15	$t = 0·06$, $P = 0·94$
PLBW	38	2·95	3·53	0–12	
Gender:					
boys	55	3·55	4·48	0–14	$t = 1·60$, $P = 0·11$
girls	45	2·29	3·04	0–15	
Ethnicity:					
white	9	2·56	4·82	0–15	$t = 0·38$, $P = 0·70$
Bengali	89	3·09	3·88	0–14	
other	2				
Attendance at dentist:					
yes	36	4·08	4·72	0–15	$t = 2·4$, $P = 0·02$
no	64	2·36	3·29	0–12	

gestation) and low birth weight (≤ 2499 g), providing additional challenges to families and healthcare workers alike. Some of the children had visited the dentist, and more than half were found to have dental caries before they had reached their fourth birthday. Four of them had had teeth extracted and none had had any restorative treatment completed.

Children born before their time and or low birth weight are vulnerable, and even in the 21st century, mortality is still an issue [18]. If these infants survive the perinatal period, problems may arise, not least family dynamics, coping strategies, feeding problems [19], disability [3], and future disease such as coronary heart disease and diabetes [20]. Infants who are born very low birth weight and/or very early remain most at risk of developing a disability [3], which may compound feeding difficulties over and above the usual food preferences of infants and children at large. In this study, none of the children reviewed had a disability. Selection bias may be present because some parents did not respond to the invitation to participate in the study and no reason was given for non-attendance.

In general, the majority of the children had attained their expected height and weight, as assessed using standard measuring devises. All the PLBW children except six had caught up in growth by the time of examination [21]. These six were significantly below the ninth percentile for height and weight, and the second percentile for head circumference. This could be attributed to any one of the following factors: lack of growth, genetics, socio-economic, diet, illness and poor housing [22,23].

Feeding patterns are important for a child's well-being both in childhood and later life. Barker considered that the baby's nourishment before birth and during infancy, and its exposure to infection during early childhood, influences the disease she or he will develop in later life [20]. Hence, there is a need to influence proper balanced nutrition, especially in areas of social deprivation [24]. Breast-feeding until at least 4 months of age is preferred as an unequalled way of providing ideal food for the healthy growth and development of infants [25,26]. Breast-feeding may not always be possible, especially for those PLBW infants, where parenteral and nasogastric feeding is the only option until such time that the infant will feed normally [26]. The majority in this study group were breast-fed, which is of the same order as reported in the Infant Feeding Survey 2000 [27]. However, the PLBW infants were less likely to have been breast-fed, although 24 PLBW mothers had done so for at least 4 months, and half had continued beyond this period (Table 3). The remaining mothers preferred to use a bottle, possibly because of the difficulties associated with the child's admission to the special baby unit or adverse cultural norms. As in many parts of the world, the promotion of breast-feeding is ongoing in the UK; for example, 'Mother's Milk – the perfect take-away!' a slogan used recently by Sure Start to promote breast-feeding, especially for low-income families and younger mothers. The Sure Start Government-funded programme is designed to promote improvement in social and economic development, child health, children's ability to learn, and strengthening of families and communities [28]. In the East End of London, there are several schemes in place to promote ongoing best practice and improvement of living conditions to enhance healthcare for children from multiethnic and socially deprived backgrounds [29]. One of the benefits from such projects has been to improve family diets, leading to better general and oral health. Despite good intentions, breast-feeding has been implicated as a cause of early dental caries or nursing caries in infants and young children [30,31].

Weaning has a profound effect on the development of infants, and is influenced by biological (e.g. the health of child and mother), cultural (e.g. traditions, education and advertising) and economic (e.g. household and community) aspects. If family economics are challenged, then inappropriate practices result, something that is not unknown in the East End of London. In dental terms, weaning practice can have

a major influence on both immediate and future dental health, and good dietary practices from birth have the potential to secure a healthy dentition for life. In real terms, a weaning diet should reach the nutritional requirements for the growing child, and contain a variety of foods and drinks [32].

It has also been suggested that items containing high levels of non-milk extrinsic (NME) sugars are not a necessary part of the diet, although preschool children are known to satisfy their energy needs by consuming large quantities of 'juice-based' drinks [33]. Forty children in this study were still using a bottle at examination containing a variety of substances including NME sugars. The continuing prolonged bottle-feeding upwards of 3 years of age in this community persists and is evident in the study children [11].

Whilst considering PLBW infants, there are no directives regarding the weaning of PLBW infants, despite the availability of clear recommendations that all children should be weaned by 6 months of age [8]. King [19] has considered this dilemma, and concluded that digestive capacity and gastrointestinal maturity are adequate in the majority of cases and later weaning may lead to behavioural feeding problems, especially if sensitive periods for texture and taste are lost. Infants should, therefore, be weaned by 4–6 months of chronological age. The study children were all weaned by the time of the examination, and most had 'stopped' the bottle by their third birthday. However, at least one-quarter still had a bottle at night. Inappropriate weaning may be allied to the lack of availability of suitable foods (e.g. Halal), especially in the East End of London, where the population comprises a socially deprived multiethnic community [11].

Even though the children had at least two meals a day, most of them snacked two or three times in the same period, consuming biscuits, cake and crisps. The PLBW children had a significantly increased daily sugar intake, some as many as 12 sugar intakes a day (Table 3). Children from 3·5 to 4·5 years of age who drink juices with added NME sugars at night have sugar most days. Where household expenditure on confectionery exceeds £5 per day, they are more likely to experience dental decay, a situation that is further influenced by place of abode, and income support or family credit. Sugar intake increases with age, especially the consumption of soft drinks (e.g. ready-to-drink, carbonated and fruit juice), which is a cause for concern, especially where high levels are associated with increased prevalence of dental caries [12].

Sixty per cent of the study group had experienced dental caries with a mean dmft of 2·98, increasing with age. This dmft was increased over the locality dmft of 2·25 and 'd' represented approximately 90% [14]. This picture is similar to that reported for Scotland and Northern Ireland [34], and amongst other ethnic minority groups, especially those families who are non-English-speaking [35] and those who come from socially deprived areas where bottle-feeding using sweetened comforters is often seen beyond 2 years of age [36]. Burt and Pai have recently reported that there is no relationship between low birth weight and the development dental caries in a systematic review [37]. On the other hand, Seow reported that between 40% and 70% of pre-term children display generalized enamel hypoplasia, and delayed dental development and eruption. In our study group, 10 children displayed enamel defects, a level not dissimilar to the UK average [12]. No parents indicated that the children had delayed eruption of teeth.

Matee and colleagues have suggested that hypoplastic deciduous teeth are more likely to decay than those not affected [38]. It is unclear in this study group whether dental decay was preceded by enamel hypoplasia. We think this is unlikely to be the explanation, especially since there were no differences between the PLBW and NBW children's decay experience, and discriminators such as socio-economics (e.g. Infant Support and Family Credit), place of abode and household expenditure on confectionery could be more influential on the dental caries outcome.

The most recent literature discussing the effect of not restoring the primary dentition has raised many issues related to the continuing debate as to whether primary teeth should be restored or not. In the North-west of England, Tickle and colleagues found that there were no detectable differences in the number and type of tooth extracted with or without restorative procedures having being carried out [39]. They postulated that there is no added benefit in restoring carious primary teeth since natural exfoliation takes place without undue pain and sepsis [39,40]. This is in contrast to the recommendations/guidelines of the British Society of Paediatric Dentistry, in that restoring the primary dentition is paramount in ensuring pain-free, healthy mouths [41]. A more important issue is that caries in primary teeth is an important indicator for caries in permanent teeth [42]. The need to instil good habits and provide primary prevention at all times for all children,

especially those most at risk of developing dental caries, should be sustained.

The need for restoring the primary dentition has been challenged again, especially when intervention might be considered to be traumatic and 80% of the unrestored teeth remain symptomless until exfoliation [43]. However, preventive programmes are still considered to be essential despite the difficulties in targeting those populations most in need [40]. The population examined in our study was accessible and confined to the hospital's neighbourhood; therefore, in general terms, it should be easier to target preventive programmes, which include dietary measures and messages complimentary to other district programmes.

Where a relationship between poor diet, and pre-term and low birth weight exists, as in this group of children resident in the East End of London, it is important that consideration should be given to providing and/or enhancing programmes related to diet, such as infant feeding/breast-feeding, education and support for the parents with regard to dental care.

Résumé. *Objectifs*. Cette étude a eu pour objectifs de déterminer la prévalence des problèmes dentaires chez les enfants de 3–4 ans dans East London nés avant terme et de petit poids à la naissance (PLBW), comparer avec les enfants nés à terme avec un poids normal (NBW) et d'étudier l'impact des habitudes diététiques sur le développement des caries des dents temporaires.
Protocole. Transversal.
Echantillon et méthodes. Cent enfants, 54 garçons et 46 filles, d'âge moyen 41,7 mois (e-t 5,11). Les enfants résidaient à proximité de l'hôpital dentaire et ont été invités à venir avec leur parents. Les données démographiques et les renseignements au sujet des habitudes diététiques depuis la naissance ont été obtenues par questionnaire structuré. L'état carieux a été évalué, de même que la taille, le poids et la circonférence de la tête.
Résultats. Soixante enfants avaient (eu) des caries avec un caod moyen de 2,98 (± 3,93), dont 25 avaient un caod supérieur à 5. L'indice caod des enfants NBW [3,00 (± 4,18)], et des garçons [3,55 ± 4,48)] était significativement augmenté par rapport à celui des enfants PLBW [2,95 (± 3,35)] et des filles [2,29 (± 3,04)]. Les enfants PLBW étaient plus à même d'avoir eu recours au biberon à partir de la naissance et un enfant sur quatre utilisait toujours un biberon au moment de l'enquête. Les enfants PLBW mangeaient significativement plus de sucre que les NBW: 5,53 ± 2,10 et 4,61 ± 1,94) respectivement.
Conclusions. Un lien clair existe entre une mauvaise alimentation et une naissance pré terme avec un faible poids de naissance, dans un groupe d'enfants habitant le East End of London. Des programmes ciblant l'alimentation des nourrissons, l'éducation et le soutien aux familles concernant les soins dentaires, sont importants afin d'éviter une quantité trop importante de troubles dentaires chez les jeunes enfants.

Zussamenfassung. *Ziele*. Ziele dieser Studie waren die Bestimmung der Prävalenz von Zahnerkrankungen bei 3–4 jährigen Kindern nach Früh- oder Mangelgeburt (F/MG) im Vergleich zu Kindern mit normalen Geburtsgewicht (NG) sowie der Einfluss von Ernährungsgewohnheiten auf die Kariesentstehung im Milchgebiss.
Design. Querschnittstudie.
Stichprobe und Methoden. Einhundert Kinder (54 Jungen und 46 Mädchen) mit einem mittleren Alter von 41.70 (+/– 5.11) Monaten. Die Kinder lebten in unmittelbarer Nähe der Zahnklinik und wurden mit ihren Eltern zur Teilnahme eingeladen. Mit einem strukturierten Fragebogen wurden wurden demographische Daten und Informationen zur Ernährung vom Babyalter bis zur Untersuchung gesammelt. Der Zahnstatus wurde erhoben und Körperlänge, Gewicht und Kopfumfang wurden gemessen.
Ergebnisse. Sechzig Kinder wiesen Karieserfahrung auf mit einem mittleren dmft von 2.98 (+/– 3.93), darunter waren 25 mit einem dmft größer als 5. Die Kinder aus der Kontrollgruppe hatten höhere dmft-Werte als Kinder der F/MG-Gruppe (2.95 +/– 3.35), Jungen höhere als Mädchen (3.55 +/– 4.48 sowie 2.29 +/– 3.04). Kinder der F/MG-Gruppe wiesen eine höhere Wahrscheinlichkeit auf, Zucker zu essen als Kinder der Kontrollgruppe.
Schlussfolgerungen. Es existiert eine Relation zwischen Ernährungsfehlern und Früh/Mangelgeburtlichkeit in einer Gruppe von Kindern wohnhaft im East End von London. Gezielte Programme zur Ernährungsberatung, Aufklärung und Unterstützung von Familien in der Zahnpflege sind wichtig um unnötige Zahnerkrankungen bei Kleinkindern zu vermeiden.

Resumen. *Objetivos*. Los objetivos de este estudio fueron determinar la prevalencia de la enfermedad dental en niños de 3 a 4 años nacidos pretérmino y de bajo peso (NPBP) en el Este de Londres para

comparar con niños nacidos con peso normal (NPN) e investigar el impacto de los hábitos dietéticos en el desarrollo de la caries dental en los dientes deciduos.

Diseño. Estudio transversal.

Muestra y métodos. Se utilizaron cien niños de los que 54 eran varones y 46 niñas, con una edad media de 41,70 (ds 5,11) meses. Los niños eran residentes a una distancia de la clínica dental alcanzable a pie e invitados a ser visitados con sus padres. Los datos demográficos y la información sobre las prácticas de alimentación desde la lactancia hasta la actualidad se adquirieron por un cuestionario estructurado. Se determinó la presencia de caries y también se midieron la altura, el peso y la circunferencia de la cabeza.

Resultados. Sesenta niños habían experimentado caries con un índice caod medio de 2,98 (ds 3,53), de los que 25 tenían un caod mayor de 5. Los niños NPN [3,00 (ds 4,18)], y las niñas [3,55 (ds 4,48)] habían aumentado de forma significativa el caod en relación con NPBP [2,95 (ds 3,35)] y las niñas [2,29 (ds 3,04)]. Los NPBP tenían más probabilidad de haber usado un biberón desde el nacimiento y uno de cada cuatro niños todavía estaban usando un biberón en el momento del examen odontológico. Los niños NPBP tenían de forma significativa más probabilidad de tomar azúcar que los NPN, 5,53 (ds 2,10) y 4,61 (ds 1,94) respectivamente.

Conclusiones. Existe una relación clara entre la dieta pobre y el nacimiento pre-término y de bajo peso en un grupo de niños residentes en el East End de Londres. Para evitar unos niveles innecesarios de enfermedad dental en los niños pequeños, son importantes programas de alimentación dirigidos a lactantes, así como de educación y apoyo a las familias sobre cuidado dentales.

References

1 Office of Population Censuses and Surveys, Social Sciences Division. *1998 Mortality Statistics. Perinatal and Infant: Sociological and Biological Factors. England and Wales*. London: The Stationery Office, 1998.

2 Yuan W, Basso O, Sorensen HT, Olsen J. Indicators of fetal growth and infectious disease in childhood – a birth cohort with hospitalisation as an outcome. *European Journal of Epidemiology* 2001; **17**: 829–834.

3 Wood NS, Marlow N, Costeloe K, Gibson AT, Wilkinson AR. Neurologic and developmental disability after extremely preterm birth. *New England Journal of Medicine* 2000; **343**: 378–384.

4 Fearne JM, Bryan EM, Elliman AM, Brook AH, Williams DM. Enamel defects in the primary dentition of children born weighing less than 2000 g. *British Dental Journal* 1990; **168**: 433–437.

5 Mellander M, Noren JG, Freden H, Kjellmer I. Mineralization defects in deciduous teeth of low birth weight infants. *Acta Paediatrica Scandinavica* 1982; **71**: 727–733.

6 Seow KW, Brown JP, Tudehope DI, O'Callaghan M. Developmental defects in the primary dentition of low birth weight infants: adverse effects of laryngoscopy and prolonged endotracheal intubation. *Paediatric Dentistry* 1984; **6**: 28–31.

7 World Health Organization. *Indicators for Assessing Breast-Feeding Practices*. Geneva: Division of Diarrhoeal and Acute Respiratory Disease Control, World Health Organization, 1992.

8 Department of Health. *Weaning and the Weaning Diet*. Report on Health Social Subjects No. 45. London: HMSO, 1994.

9 Rugg Gunn AJ, Roberts GJ, Wright WG. Effect of human milk on plaque pH *in situ* and enamel dissolution *in vitro* compared with bovine milk, lactose, and sucrose. *Caries Research* 1985; **19**: 327–334.

10 Lawrence RA. *Breast Feeding: A Guide for the Medical Profession*. St Louis, MO: Mosby-Year Book, 1994.

11 Harris RJ, Armstrong D, Ali R, Lyones A. Nutritional survey of Bangladeshi children aged 5 years in the London Borough of Tower Hamlets. *Archives of Disease in Childhood* 1983; **58**: 428–432.

12 Hinds K, Gregory JR. *National Diet and Nutrition Survey: Children Aged $1^1/_2$ and $4^1/_2$ Years*, Vol. 2: *Report of the Dental Survey*. London: HMSO, 1995.

13 Pitts NB, Evans DJ, Nugent ZJ. The dental caries experience of 5-year-old children in Great Britain. Surveys coordinated by the British Association for the Study of Community Dentistry in 1999/2000. *Community Dental Health* 2001; **18**: 49–55.

14 Dental Practice Board NHS. *Dental Data Online – Registration Details*. [WWW document.] URL http://www.dpd.nhs.uk/ddpubs/reg_result.cfm

15 Davenport ES, Williams CECS, Sterne JA, Murad S, Sivapathasundram V, Curtis MA. Maternal periodontal disease and preterm low birthweight: case-control study. *Journal of Dental Research* 2002; **81**: 313–318.

16 Pine CM, Pitts NB, Nugent ZJ. British Association for the Study of Community Dentistry (BASCD) guidance on the statistical aspects of training and calibration of examiners for surveys of child dental health. A BASCD coordinated dental epidemiological programme quantity standard. *Community Dental Health* 1997; **14** (Suppl. 1): 18–29.

17 Voss LD, Bailey BJ. Equipping the community to measure children's height: the reliability of portable instruments. *Archives of Disease in Childhood* 1994; **70**: 469–471.

18 Department of Health. *Health and Personal Social Services Statistics. England. Section A: Public Health. Table A14. Fertility: Deliveries and Births*. [WWW document.] URL http://www.performance.doh.gov.uk/HPSSS/TBL_A14.HTM

19 King C. Weaning preterm infants on to solids: when, why and how. *Journal of Neonatal Nursing* 1998; **4**: 7–11.

20 Barker DJP. *Mothers, Babies and Health in Later Life*, 2nd edn. Edinburgh: Churchill Livingstone, 1998.

21 D'Souza SW, Vale J, Sims DG, Chiswick ML. Feeding, growth, and biochemical studies in very low birthwieght infants. *Archives of Disease in Childhood* 1985; **60**: 215–218.

22 Teranishi H, Nakagawa H, Marmot M. Social class difference in catch up growth in a national British cohort. *Archives of Disease in Childhood* 2001; **84**: 218–221.

23 Huttly SRA, Victora CG, Barros FC, Teixeira AMB, Vaughan JP. The timing of nutritional status determination: implications

for interventions and growth monitoring. *European Journal of Clinical Nutrition* 1991; **45**: 85–95.
24 Spencer N, Logan S. Risk factors for low birth weight are strongly influenced by the social environment. *Journal of Epidemiology and Community Health* 2002; **56**: 326–327.
25 World Health Organization/UNICEF. *Innocenti Declaration on the Protection, Promotion and Support of Breast Feeding*. Declaration presented at the WHO/UNICEF policy makers meeting on 'Breast Feeding in the 1990s: A Global Initiative', Florence, 1 August 1992.
26 Akre J. Infant feeding: the physiological basis. *Bulletin of the World Health Organization* 1989; **67** (Suppl.): 19.
27 Department of Health. *Infant Feeding Survey*. *National Statistics 2001*. [WWW document.] URL http://www.doh.gov.uk/public/infantpressaug01.htm
28 H.M. Government. *Sure Start*. [WWW document.] URL http://www.surestart.gov.uk
29 Ambrose P. *Tales from Two Cities – What Can We Learn About Housing, Health and Regeneration? Health and Regeneration Key Points*. London: King's Fund, 2001.
30 Ripa LW. Nursing habits and dental decay in infants: 'nursing bottle caries'. *Journal of Dentistry for Children* 1978; **45**: 274–275.
31 Matee MIN, Mikx FHM, Maselle SYM, van Palenstein Helderman WH. Mutans streptococci and lactobacilli and weaning habits in Tanzania infants. *Caries Research* 1992; **26**: 183–187.
32 Holt RD, Moyniham PJ. The weaning diet and dental health. *British Dental Journal* 1996; **181**: 254–258.
33 Petter LPM, Hourihane JO, Rolles CJ. Is water out of vogue? A survey of the drinking habits of 2–7 year olds. *Archives of Diseases in Childhood*, 1995; **72**: 137–140.
34 O'Brien M. *Children's Dental Health in the United Kingdom 1993*. London: Office of Population Censuses and Surveys, 1994.
35 Bedi R, Elton RA. Dental caries experience and oral cleanliness of Asian and white Caucasian children aged 5 and 6 years attending primary schools in Glasgow and Trafford, UK. *Community Dental Health* 1991; **8**: 17–23.
36 Holt RD, Winter GB, Downer MC, Bellis WJ, Hay IS. Caries in pre-school children in Camden 1993/94. *British Dental Journal* 1996; **181**: 405–410.
37 Burt BA, Pai S. Does low birthweight increase the risk of caries? A systematic review. *Journal of Dental Education* 2001; **65**: 102–1026.
38 Matee MIN, Mikx FHM, Masselle SYM, van Palenstein Helderman WH. Nursing caries, linear hypoplasia, and weaning habits in Tanzanian infants. *Community Dentistry and Oral Epidemiology* 1994; **22**: 289–293.
39 Tickle M, Milsom KM, King D, Kearney-Mitchell P, Blinkhorn AS. The fate of carious primary teeth of children who regularly attend the General Dental Service. *British Dental Journal* 2002; **192**: 219–223.
40 Milsom KM, Tickle M, Blinkhorn AS. Dental pain and dental treatment of young children attending the general dental service. *British Dental Journal* 2002; **192**: 280–284.
41 Fayle SA, Welbury RR, Roberts JF. British Society of Paediatric Dentistry: a policy document on management of caries in the primary dentition. *International Journal of Paediatric Dentistry* 2001; **11**: 153–157.
42 deLiefde B. Identification and preventive care of at risk children: a longitudinal study. *New Zealand Dental Journal* 1989; **85**: 112–116.
43 Levine RS, Pitts NB, Nugent ZJ. What happens to unrestored carious teeth? *British Dental Journal* 2002; **193**: 99–103.