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RESEARCH ARTICLE

EVALUATION OF INTERRELATIONSHIP OF EARLY CHILDHOOD CARIES AND IRON DEFICIENCY ANEMIA

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ABSTRACT

Background: to evaluate the interrelationship of severe early childhood caries and iron deficiency anemia in young children.

Methods: A total of 102 children of age 2-6 years were screened by one of the pediatric dentists for the presence or absence of S-ECC according to the AAPD guidelines and were divided into 2 groups - study group (cases) and control group. Out of total 102 children screened, 60 children consented to participate in the study .The dental caries status, measurement of weight, and blood sample analysis were done for both groups. The blood sample collected was used for estimation of following parameters such as Hb, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and hematocrit packed cell volume (PCV) to diagnose anemia. The data collected were statistically analysed.

Results: A total of 60 out of 102 children were recruited 30 cases and 30 controls (59% response); forty two parents did not give consent for the study. There was no statistically significant difference between groups regarding age, male/female ratio between two groups. 43% children in study group suffered with Iron Deficiency Anemia. Data revealed that Hb, MCV, and PCV level differed significantly between the groups, but MCHC levels did not differ significantly between the groups.

Conclusion: Based on this, it can be suggested that pediatric dentists, pediatricians, and family physicians should recommend the assessment of anemia in S-ECC patients regardless of their clinical nutritional status.

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INTRODUCTION

Sir, William Osler, world acclaimed oral physician once very correctly said that "Oral Health is a mirror of general Health". Any factors affecting the general health also affect the oral health and vice-versa (Edalat *et al*., 2014). He referred oral cavity as the mirror in which the reflection of entire body can be seen.

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Though caries is a multi-factorial disease, the role played by diet in the causation of caries has been well documented (Sheiham and James, 2015; Guidelines on Caries Risk Assessment and Management for Infants). In some advanced countries, high consumption of carbohydrates along with frequent snacking habit were reported to be the reason of increasing of dental caries and resultant obesity (Edalat *et al*., 2014; Norberg *et al*., 2012; Macek and Mitola, 2006). Conversely, in some developing countries dental caries resulted in malnutrition and inability of consuming food (Edalat *et al*., 2014; Oliveira *et al*., 2008; Pourhashemi and Golestan, 2008).

1.Severe Early Childhood Caries is one of the conditions in children which generally presents with pain and affects the health and well-being of young children (Pourhashemi and Golestan, 2008; http://hd.handle.net/11295/64519). However, little is known about the influence of Severe Early Childhood Caries (S-ECC) on childhood nutritional status. The purpose of this study was to contrast ferritin and haemoglobin levels between children with S-ECC and caries-free controls.

MATERIALS AND METHODS

This cross-sectional study was conducted in the department of Pedodontics, Hazaribagh College of Dental sciences, Jharkhand, India. From July 2014 to June 2015, healthy children below the age of 6 years with S-ECC were recruited from the OPD of the Department of Pedodontics. Age- and sex-matched control subjects were enrolled from the OPD of the dental hospital. Exclusion criteria included unwilling patients and/or parents, serious, chronic medical problem, patients who were under medication affecting serum Hb levels. A total of 102 children of age 2-6 years were screened by one of the pediatric dentists for the presence or absence of S-ECC according to the AAPD guidelines (AAPD, 2012) and were divided into 2 groups - study group (cases) and control group. For inclusion in the study group, the child should have noncontributory medical and dental history. Children with S-ECC and having pulpal involvement of at least 2 teeth were eligible for inclusion in the study group. Comparison subjects having caries status equal to or below two as based upon clinical evaluation obtained from the same low socioeconomic status and matched to the S-ECC cases on the basis of age and gender formed the control group. Out of total 102 children screened, 60 children consented to participate in the study that were divided into 2 groups - 30 children-cases with S-ECC, 30 childrencontrol group. Written pre-informed consent was taken prior to the study from either the parent or the legal guardian. Institutional ethical clearance was sought prior.

The dental caries status, measurement of weight, and blood sample analysis were done for both groups. The blood sample collected was used for estimation of following parameters such as Hb, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and hematocrit packed cell volume (PCV) to diagnose anemia. Reference ranges for Hb, MCV, MCHC, and PCV were 12 g/dl; (Shaoul *et al*., 2012) 76-100 µm3 ; 33-37 g/dl; 39-49%, respectively (Cotran *et al*., 1999). In addition, IDA (having two out of three abnormal blood tests for Hb, ferritin, and/or MCV) was also determined (Brotanek *et al*., 2005). Weight measurements were taken for each child in light clothes and no shoes using the standard weighing machine after calibration. The weight of children of both groups was then compared with weight for girls and boys for age according to ICMR norms (ICMR, 2009).

RESULTS

A total of 60 out of 72 children were recruited 30 cases and 30 controls (59% response); forty two parents did not give consent for the study. Data collected from a total of 60 children enrolled, were compiled and subjected to statistical analysis. There was no statistically significant difference between groups regarding age, male/female ratio between two groups. The mean age of cases was 4.9 ± 0.9 years and that of controls was 4.3 ± 1.4 years (Table 1).

Table 1. Sample distribution in study group and control group

Parameter	Study Group	Control Group	p Value
AGE (years)	4.9±0.9	4.3+1.4	0.698
GENDER	Male= 17 Female= 13	Male=16 Fenale=14	0.795
WEIGHT (kg)	15.4± 2.2	15.7±2.2	0.638
DEFT	9(5-16)	0(0-2)	<0.001

D: decayed; E: extracted due to caries; F: filled; T: teeth

The mean weight of children in S-ECC group was 15.4 ± 2.2 kg and in the control group was 15.7 ± 2.9 kg; did not differ between the two groups significantly (P = 0.638). The data on primary outcome and secondary outcomes were compared between the groups. The primary outcome was presence or absence of IDA in the participants of two groups. IDA has been defined as 2 of 3 abnormal blood tests: 1. Serum ferritin; 2. Hb; and 3. MCV (Clarke *et al*., 2006).Various blood variables; Hb, MCV, MCHC, and PCV, were the secondary outcomes of the study and the data of the same is presented in Table 2.

Table 2. Comparison of blood variables between study and control group

Secondary Outcomes	Study Group	Control Group	p Value
Hb(g/dl)	11.3±1.5	12.8±2.0	0.002
MCV(μm^3)	74.0±7.5	87.5±11.0	<0.001
PCV (%)	34.7±2.5	38.5±6.0	0.002
MCHC(g/dl)	32.8±2.6	33.2±1.7	0.415

On comparison of the percentage of children with IDA in two groups Table 3, out of a total of 30 cases of S-ECC children, 13 (43%) children had IDA as determined by below normal Hb and MCV values, whereas in controls, o Data on secondary outcome variables revealed that Hb, MCV, and PCV level differed significantly between the groups, but MCHC levels did not differ significantly between the groups (Table 2). Mean Hb levels differ nly 2 (7%) had IDA giving an OR of 10.7 (2.0, 104.9) (P = 0.001). significantly between the groups (11.3 ± 1.5 g/dl S-ECC vs. 12.80 ± 2.0 g/dl control, P = 0.002). Likewise, there is a significant difference in MCV levels between those with and without S-ECC (74.0 ± 7.5 µm3 in S-ECC vs. 87.52 ± 10.99 µm3 in control, P < 0.000). There was also statistically significant difference in the PCV levels in both groups (34.7% ± 2.5% in S-ECC vs. 38.5% ± 6.0% in control, P = 0.002). There is no significant difference in MCHC levels in children with and without S-ECC (32.8 ± 2.6 g/dl S-ECC vs. 33.2 ± 1.7 g/dl control, P = 0.415).

Table 3. Comparison of IDA between two groups study and control group

Primary Outcome(ida)	Study Group	Control Group	p Value	Or 95% CI
YES	13(43)	2(7)		
NO	17(57)	28(93)	0.001	10.77

DISCUSSION

Despite the epidemic nature of both dental caries and iron deficiency worldwide, there has been little research as to whether an association exists between the two conditions.

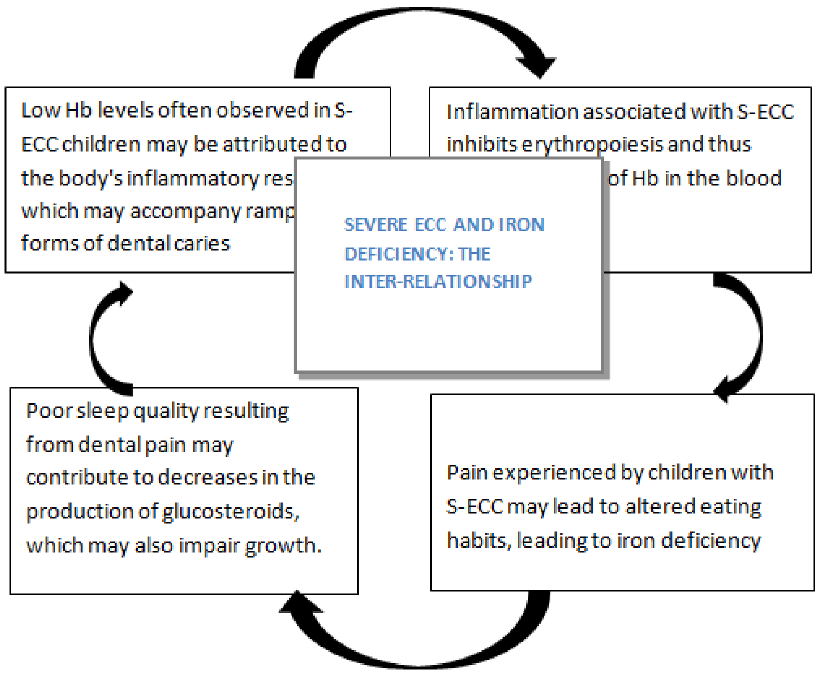

Figure 1. Association of severe early childhood caries and iron deficiency anemia

Severe Early Childhood Caries (S-ECC) is defined as the presence of any smooth surface caries for children under the age of 3 and the presence of one or more smooth surface lesions in any primary maxillary anterior teeth for those 3 to 5 years of age (or a dmft score of ≥ 4 (age 3), ≥ 5 (age 4), or ≥ 6 (age 5)) (Cotran *et al*., 1999). The implications of S-ECC can extend beyond the oral cavity as it can affect childhood health and well-being (Sheiham and James, 2015; Oliveira *et al*., 2008). Early Childhood Caries (ECC) is a broad definition of any decay in the primary dentition of children < 72 months of age. It can pose a significant threat to the oral health of young children and its prevalence has increased over the past two decades (Guidelines on Caries Risk Assessment and Management for Infants; Oliveira *et al*., 2008; Clarke *et al*., 2006).

According to WHO, affected eating pattern can rapidly manifest in younger children of 3-6 years of age and also definition of S-ECC describes the status of caries present in children younger than 6 years (Guidelines on Caries Risk Assessment and Management for Infants, ?; World Health Organ, 1995). Hence, this age group was selected for the study. Any child who had a chronic medical illness, which would affect normal growth, was excluded from the study. The mean weight of test group (15.38 ± 2.20 kg) is less than mean weight of control group (15.70 ± 2.93 kg) but this difference is not statistically significant (P = 0.636). However, the weight data revealed that 93% of the children in S-ECC group were underweight, whereas 70% of children in control group also had low weight as compared to standard ICMR norms; the difference between the groups being statistically significant (P < 0.05%) overall, 49 (81%) children in the entire sample were underweight. Approximately, 47% of India's below-five population is underweight (http://www.unicef.org/ india/ media3766.htm.) and further this study has been conducted in a rural area, constituted the sample children from low/moderate socioeconomic status background family.

Children with S-ECC have significantly lower mean Hb levels than controls (11.34 ± 1.45 g/dl S-ECC vs. 12.80 ± 2.03 g/dl control, P = 0.002. It has been found that 25% (n = 15/60) of the entire study sample have IDA. Clarke *et al*. in their study on S-ECC children reported a significant proportion of children with unacceptably low level of Hb and high prevalence of anemia (Clarke, 2006).

Data regarding MCV also suggest that there is a significant difference in MCV levels between those Low level of MCV serve as an indicator of microcytic anemia. (Thomas and Primosch, 2002) To determine IDA, Hb, and MCV values were taken into consideration. Among cases of S-ECC, 43% children had IDA, while among controls only 7% were found to have IDA. Association of severe early childhood caries and iron deficiency anemia has been shown in Figure 1.

Summary

Thus, this study shows that S-ECC and anemia are definitely interrelated, and S-ECC can be identified as a risk marker for under nutrition. Based on this, it can be suggested that pediatric dentists, pediatricians, and family physicians should recommend the assessment of anemia in S-ECC patients regardless of their clinical nutritional status.

Conclusion

The high proportion of cases with iron depletion, iron deficiency, or iron deficiency anemia in such a young population is of clinical concern because such disorders have the potential to cause impairment of body function. Research into the effects of iron deficiency has found that physical growth, behavioural development, and impaired brain development and function.

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