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RELATIONSHIP BETWEEN EARLY CHILDHOOD CARIES AND ADVERSE BIRTH OUTCOMES

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Keywords: preterm birth, low birth weight, early childhood caries, premature infants, small for gestational age, adverse birth outcomes, perinatal complications, dental caries.

Summary

Purpose: The aim of this review was to assess the relationship between adverse birth outcomes and early childhood caries.

Methods: Two reviewers searched different databases from February 2020.

Results: 1376 articles were shown after the initial electronic databases search. The authors identified 10 studies investigating the incidence of dental caries among children with primary dentition, covering 79284 children, with their age ranging from 0,5 to 6 years. The studies were published from 2010 to 2020 and included retrospective, cohort, case control and cross-sectional studies.

Conclusion: The found scientific evidence demonstrated that children with adverse birth outcomes are more likely to experience caries than healthy children.

Introduction

According to the World Health Organization, there are an estimated 15 million babies that are born preterm each year. That means that even more than 1 out of 10 babies are born before 37 weeks of gestation [1]. The numbers are even bigger when babies with other adverse birth outcomes, such as new-borns that are small for gestational age and new-borns with low birth weight are also included [2]. Due to these complications, when exposed to extrauterine life foetuses are not fully developed and this increases the risks of both physical and mental disorders such as cerebral palsy, seizure disorders, severe mental retardation, psychosocial and behavioural disorders, hearing loss, visual impairment, and lower respiratory tract infections [3, 4]. All the previously mentioned perinatal complications can also have a direct or indirect negative impact upon new-born's oral health. Besides oral abnormalities, such as palatal defects caused by oral intubation and long-term mechanical ventilation, developmental defects of enamel, reduced dental dimensions, delayed eruption of primary and permanent dentition are reported more frequently among prematurely born children than full-term born infants [5, 6]. When enamel and dentin developmental disorders occur, the teeth become more vulnerable and the likelihood of being damaged by cariogenic microorganisms increases [7, 8].

The purpose of this review was to assess the relationship between adverse birth outcomes and early childhood caries.

Methodology

A systematic review was based on the PRISMA guidelines. The protocol for the systematic review was registered in the PROSPERO (International prospective register of systematic reviews) database. Registration number: CRD42020200414. The following focused question was developed with reference to the PICOS model: Do children born with adverse birth outcomes display higher dental caries incidence in primary dentition compared to those who were born healthy? Do children born with adverse birth outcomes display higher dental caries incidence in primary dentition compared to those who were born healthy? On 17 February 2020, a systematic search in the medical literature was carried out to identify all peer-reviewed articles, reported from 2010 to 2020, investigating the incidence of dental caries among children with primary dentition (or up to 6 years old). Combinations of keywords "preterm birth", "low birth weight", "early childhood caries", "premature infants", "small for gestational age", "adverse birth outcomes", "perinatal complications", "dental caries" were used in the following electronic bibliographic databases: MEDLINE (searched via PubMed), EMBASE (searched via ScienceDirect), System for Information on Grey Literature in Europe, The Cochrane

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Library (Cochrane Central Register of Controlled Trials) and LILACS. Additionally, the search was expanded by checking for potential articles in the references of the included articles. No language restrictions were applied if an English summary was provided. Two independent authors (K.J. and A.V.) conducted an electronic search and selected studies that seemed to have eligible titles and abstracts for the review and met the criteria. Final selection was made after assessing full-text studies. If there were any discrepancies, the third reviewer - research advisor (As.V.) - would have tried to resolve the conflict. Inclusion criteria were: retrospective studies, cohort studies, case control studies, cross-sectional studies; children with primary dentition (up to 6 years old); children with adverse birth outcomes compared with born healthy; clinical diagnosis of dental caries using caries evaluation indexes verified by World Health Organization; articles published less than 10 years ago. Exclusion criteria were: systematic reviews, meta-analyses, case series, case reports; letters to the editor, case reports, in vitro studies, animal studies, experimental studies, reviews, conference abstracts, guidelines; children with permanent dentition (older than 6 years old); studies in which the diagnosis for dental caries was not performed through a clinical examination; articles older than 10 years old. A narrative summary of included studies was made. The generated data presenting their study design, characteristics of participants, diagnostic criteria, interventions, and outcome points was put into a table.

Results

1376 articles were shown after the initial electronic database search. Removing duplicates in turn returned 1283 articles, then after screening titles for their relevance, 56 articles were chosen in this stage. 34 articles were excluded having read their abstract. After applying all the filters and reading full-text articles, 10 articles fit our inclusion criteria and were included in this systematic review. [8-17] The final sample consisted of 5 cross-sectional [8, 9, 12, 13, 17], 4 cohort [14, 10, 15, 16], 1 case control [11] studies. Characteristics of all 10 publications included in the review are presented in Table 1 and Table 2. The articles were published between the year 2010 and 2020. Number of patients varied from 128 to 74748 (a total of 79284 patients in 10 studies) with patients age ranging from 0,5 to 6 years. All 10 studies evaluated caries with verified indexes: 3 studies dmft [9, 11, 13], 2 – dmfs [10, 12], 3- ECC [8, 16, 17], 1- dde [14]and 1- deft [15]. 8 out of 10 studies examined children that were born preterm [8-11, 14-16, 17], 2 out of 10 studies examined children that were born small for gestational age [10, 15] and in all the studies except one [16] low birth weight children were included. In all of the chosen studies preterm birth (PB) was defined as a birth at less than 37 weeks gestation, low birth weight (LBW) as birthweight less than 2500 g and small-for-gestational-age (SGA) as birthweight less than 10th percentile of expected weight for gestational age.

Eight studies [8-11, 14-16, 17] have reported that preterm children have higher caries indexes than full term children, however the difference was statistically significant in only two of them [16, 17]. According to nine studies, LBW children had greater caries prevalence

Table 1. Characteristics of the included studies no.1

Author, year	Study design	Sample	Gender	Age	Dental caries evaluation index
Rajshekar, 2011	cross-sectional	Control group: 250 PTLBW group: 250	Control group: 137 male, 113 female children PTLBW group: 138 male, 112 female children	1-6 years	dmft
Nelson, 2013	cohort	Control group: 234 VLBW group: 234	Control group: 128 male, 106 female children VLBW group: 120 male, 114 female children	8-20 months	dde
Valdeci 2014	cross-sectional	320	-	43,2 months	ECC
Masumo, 2014	cross-sectional	Control group: 664 LBW group: 86	Control group: 338 male, 326 female children LBW group: 43 male, 43 female children	6-36 months	dmft
Nirunsittirat, 2016	cohort	544	273 male, 271 female children	3,7 years SD=0,4	dmfs
Bernabe, 2016	cross-sectional	1102	595 male ,507 female children	1-4 years	dmfs
Schüler, 2017	case control	Control group: 64, PT group: 64 (LBW 44, VLBW 9, ELBW 11)	Control group: 27 male, 37 female children PT group: 27 male, 37 female children	3-4 years	dmft
Sridevia, 2018	cross-sectional	690	385 male, 305 female children	3-6 years	ECC
Soares, 2019	cohort	74748	38271 male, 36477 female children	3 years	deft
Boustedt, 2020	cohort	208	105 male, 103 female children	5 years	ECC

than those with normal birth weight [8-15, 17]. In only four of those eight studies, however, statistically significant evidence was found to support a link between LBW children and caries prevalence [8, 11-13]. Regarding the birth weight and caries prevalence, there is statistically significant inverse proportion to each other: the lower the children's weight, the higher the caries prevalence in LBW group. Rajshekar et al. studied caries incidence in PTLBW and FTNBW children, which was 48% and 38,8% respectively, and this difference was statistically significant [9]. 2 studies have found that children who were born SGA had a higher caries incidence compared with those AGA [10, 16], however Nirunsittirat et al. did not demonstrate statistically significant difference [10].

Discussion

In this systematic review, we analysed the most recent literature in order to determine whether the relationship between adverse birth outcome (LBW, PTB, SGA) and caries experience in children with primary dentition exists. Previous systematic reviews, however, have not found anything that could confirm the link between adverse birth outcomes and development of caries.

All of the studies that were examining preterm infants in our present review showed that PT children have a higher caries incidence that FT children [8-11, 14-16, 17]. Moreover, 9 studies reported that LBW children are more prone to develop caries than NBW children [8-15, 17]. And lastly, children who were born SGA were reported to experience more caries than those AGA [10, 16]. However, despite the results showing positive relationship between adverse birth outcomes and caries in the recent studies, there might as well be some lack of evidence due to particular reasons. Firstly, several studies included children who were 3-year-old or even younger into the same statistics with 6-year-olds [9, 12, 17]. This in turn, leads to a distortion of the results, since sometimes 3-year-olds do not have a full set of primary dentitions, especially considering that a lot of preterm children have developmental issues. Moreover, older children were exposed to risk factors for a longer period of time and had a higher chance to develop more carious lesions. Secondly, a socioeconomic status plays a vital role in the prevalence of dental caries development [18]. A study in Brazil reported that children born in low-income families have a 57% higher caries incidence than those in higher income families [8]. Some of the studies, however, ignored it and blended the different groups of patients altogether [8-10, 13]. Also, background information, such as maternal health, oral hygiene habits, nutrition, sugar consumption, in most of the studies was collected through self-reported questionnaires [8-13, 15-17]. Therefore, the results should be interpreted with more caution. Furthermore, the studies involved in this systematic review would have shown more accurate results if the studies reported the children were subgrouped. In the present systematic review, it was difficult to combine data and perform a meta-analysis due to the heterogeneity of the studies and a limited number of studies which used the same outcome indexes.

Lastly, we need to keep in mind that the relationship of caries and adverse birth outcomes has a lot of contributing factors. According to a study of Targino et al., preterm birth is linked to several

Table 2. Characteristics of the included studies no.2

Author, year	Caries index value in control group	Caries index value in adverse birth outcomes group	p-value
Rajshekar, 2011	Dmft: FTNBW 1.1 ± 2.2	Dmft: PTLBW 1.3 ± 1.8	0.30
Nelson, 2013	ECC: FTNBW 0.04 ± 0.37 (at 8 mos) FTNBW 0.40 ± 1.4 (at 18 mos)	ECC: PTVLBW 0.03 ± 0.23 (at 8 mos), PTVLBW 0.36 ± 1.2 (at 18 mos)	0.7 (at 8 mos) 0.78 (at 18 mos)
Valdeci 2014	ECC (%): NBW 9.9 FT 13.7	ECC (%): LBW 80.4 PT 82.8	< 0.01 0.149
Masumo, 2014	ECC (%): NBW 17.3	ECC (%): LBW 26.7	<0.05
Nirunsittirat, 2016	ECC (%): FT 89.7 NBW 88.6 AGA 87.9	ECC (%): PT 77.4 LBW 84.3 SGA 92.9	>0.05 >0.05 >0.05
Bernabe, 2016	Dmft: NBW 0.05 (at 12 mos), 0.66 (at 24 mos), 1.41 (at 36 mos), 3.45 (at 48 mos)	Dmft: LBW 0.02 (at 12 mos), 1.31 (at 24 mos), 1.85 (at 36 mos), 5.58 (at 48 mos)	>0.05 >0.05 >0.05 0.044
Schüler, 2017	Dmft (%): FT 11	Dmft (%): PT 7 LBW: 44	0.313 ≤0.001
Sridevia, 2018	ECC (%): FT 45.2 NBW 49.9	ECC: PT 58.9 LBW 50.6	0.001, 0.45
Soares, 2019	Deft (%): AGA 6 NBW 6	Deft: SGA 6 LBW 6	0.557, 0.209
Boustedt, 2020	ECC (%): FT 14.9, AGA 14,5	ECC (%): PT 61,5 SGA 33,3	<0.001 0.036

enamel defects, which lead to a development of caries [19]. Also, children with adverse birth outcomes tend to have a reduced immune response and an impaired immune competence [20]. This, in turn, might make them prone to an early acquisition of S.Mutans [21]. A study in Sweden by Brogardh-Roth et al. found that preterm children in their preschool years (3- to 5-year-olds) display a higher prevalence of Dental Behavioural Management Problems at dental examinations and treatments [22]. At the age of 6, however, no significant differences between the groups were found, which means that DBMP are temporary and possibly more common in younger, less mature children [22]. Furthermore, preterm children are said to receive nightly bottle feeding more frequently compared to the full-term children, so that they could weigh as healthy-born average babies [23, 24]. This kind of behaviour promotes the development of early childhood caries. Therefore, in order to single out adverse birth outcomes as a definite risk factor, a study should be designed, which would state as many confounding factors as possible, in order to reduce a risk of bias.

Conclusion

In conclusion, the found scientific evidence demonstrated that children with adverse birth outcomes such as being small for gestational age, preterm or low birth weight, are more likely to experience caries than healthy children. However, due to heterogeneity of the included studies a meta-analysis could not have been performed, therefore leaving the level of the evidence moderately lower. In addition, confounding factors such as weak immune system, bottle feeding at nighttime, enamel defects, etc. should be taken into consideration in future studies to increase reliability of the results.

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ANKSTYVOJO VAIKŲ DANTŲ ĖDUONIES IR NEPALANKIOS NĖŠTUMO BAIGTIES SĄSAJOS

A. Varoneckas, K. Jasinskaitė, A. Varašiūtė

Raktažodžiai: priešlaikinis gimimas, mažas gimimo svoris, ankstyvasis vaikų ėduonis, neišnešioti kūdikiai, mažas gestacinio amžiaus atžvilgiu, nepalankios nėštumo baigtys, perinatalinės komplikacijos, dantų ėduonis.

Santrauka

Tikslas − įvertinti nepalankios nėštumo baigties ryšį su ankstyvuoju vaikų dantų ėduonimi.

Metodai. Nuo 2020 m. vasario mėnesio du tyrėjai atliko internetinę paiešką skirtingose elektroninėse duomenų bazėse. ROBINS-I buvo naudojamas įvertinti straipsnių, įtrauktų į šią sisteminę apžvalgą, bendrą kokybę ir šališkumo riziką.

Rezultatai. Po pirminės paieškos, atliktos elektroninėse duomenų bazėse, atrinkti 1376 straipsniai. Autoriai atrinko 10 straipsnių, kuriuose aprašomi vaikų su pieniniu sąkandžiu, kurių amžius nuo 0,5 iki 6 metų, dantų ėduonies paplitimo tyrimai. Visi atrinkti retrospektyviniai, kohortiniai, atvejo ir kontrolės bei vienmomenčiai skerspjūvio tyrimai buvo publikuoti nuo 2010 iki 2020 metų.

Išvada. Rasti moksliniai duomenys parodė, jog dantų ėduonis dažniau pasireiškia gimusiems esant nepalankiai nėštumo baigčiai, nei sveikiems vaikams.

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