Community Dental Health (2020) **37,** 223–228
Received 6 November 2019; Accepted 5 February 2020

doi:10.1922/CDH_00040Mafla06

Maternal Oral Health and Early Childhood Caries amongst Low-Income Families

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Objective: To determine the association between maternal oral health and Early Childhood Caries (ECC) and discover the role of maternal and child behaviours in explaining this association. ***Basic research design***: A cross-sectional analytic study. ***Clinical setting***: Public Healthcare Services in Pasto, Colombia. ***Participants***: 384 mothers and their 2-5-year-old children. ***Methods***: Mothers completed a questionnaire to provide information on sociodemographic and behavioural factors and were examined for caries experience (DMFS index) and periodontal status (Community Periodontal Index, CPI). Children were examined for dental caries (dmfs index). The association between maternal dental indicators and child dmfs was assessed in negative binomial regression adjusting for confounders. ***Results***: About 96% and 33% of mothers had caries experience and periodontal disease, respectively. The mean dmfs was 7.4 (SD: 9.5, range: 0-71). Maternal DMFS, but not CPI, was positively associated with children's dmfs (Rate Ratio: 2.51, 95%CI: 1.59-3.97) after adjustments for sociodemographic and behavioural factors. ***Conclusions***: Maternal caries experience, but not periodontal status, was positively associated with ECC in their children. Maternal and child behaviours explained little of this association.

Keywords: *Mothers, dental caries, child, periodontal pocket, pre-school*

Introduction

Mothers play a pivotal role in the development of their children. They care for their offspring and support their well-being. When children are unwell, mothers may develop activities that improve their health (Al-Ayed, 2010). Appropriate assistance may consist of medical check-ups and emotional support. The relationship between maternal and child health may be influenced by multiple factors, such as physical health (including genetic factors shared by the mother and their children), mental health (Nolvi *et al*., 2019) and family socioeconomic circumstances.

Maternal influences on early childhood caries (ECC) have been studied extensively (Tinanoff *et al*., 2019; Harris *et al*., 2004), which has led to the development of conceptual frameworks to understand this common childhood condition (Kim Seow, 2012). Such frameworks suggest that mothers are the primary source of bacterial acquisition/colonisation (vertical transmission) and socialization for their children (role modelling). Mothers will foster the acquisition of healthy behaviours (regular toothbrushing and low intake of free sugars), early familiarisation with dental services (age at first visit to the dentist and regular dental attendance) and coping with life stressors (particularly associated with living in poor socioeconomic circumstances) (Tinanoff *et al*., 2019; Kim Seow, 2012).

Even though parents' oral health is a good reflection of their attitudes and beliefs, which can subsequently affect their dietary choices and use of dental services, only a few previous studies have explored the association between mothers' oral health status and dental caries presence in their children (Hooley *et al*., 2012). Dye et al. (2011) found that mothers with high levels of untreated decay (6+ surfaces affected) and tooth loss (5+ teeth missing due to caries or periodontitis) were more likely to have 2-to-6-year-old children with greater caries experience than those without those conditions. Pinto et al. (2017) found that mothers' caries experience (DMFT>0) was associated with the dmfs score of their 24-to-42-month-olds but that maternal gingival bleeding was not associated with child dmfs. A positive association between maternal and child caries experience was also observed amongst 11-12 year-old children (Nourijelyani *et al*., 2014), even with maternal reports of any active decay in the past year (Laniado *et al*., 2019). The literature on this relationship is scarce and other maternal oral health indicators require investigation. Therefore, this study aimed to determine the association between maternal oral health and early childhood caries amongst low-income families in Colombia; and to evaluate the role of maternal and child behaviours in explaining this association. The 2013-2014 national oral health survey in Colombia showed that 83% of 3-year-olds and 89% of 5-year-olds had caries experience ($d_{2\text{-}6\ ICDAS}$-m-f), with a prevalence of untreated dental caries ($d_{2\text{-}6\ ICDAS}$) of 78% in 3 year-olds and 82% in 5-year-olds (MINSALUD, 2017).

Method

Participants

A cross-sectional analytic study was carried out between September 2017 and June 2019 in Pasto, Colombia. A minimum sample size of 344 dyads was needed to

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detect a 0.35 standardised difference in dmfs between children of mothers with (exposed) and without dental caries (unexposed), assuming an exposed-to-unexposed ratio of 3, a standard deviation for the dmfs of 1 in both groups, 80% statistical power and 95% significance level. A consecutive sample of mothers and children was recruited from the Red Pública Municipal de Prestación de Servicios de Salud (RPMPSS) that includes 2 local hospitals and 18 clinical centres. They provide free or subsidised healthcare to low-income families. The study was conducted in two institutions that concentrate the largest number of patients, were open full-time and had a dental chair within the premises. We included children aged 24 to 71 months, who were registered in the RPMPSS and attending for child's growth and development checks. Children and mothers with psychological or medical condition that prevented a clinical examination and edentulous mothers (*n*=2) were excluded.

The University Bioethics Subcommittee approved the study protocol (Act No. 02-2016, 28/04/16). Mothers provided signed informed consent before participation. Children and mothers diagnosed with an oral disease were referred for treatment in the same institution or were given counselling for addressing their dental problem.

Data collection

Data were collected through questionnaires completed by mothers and clinical examinations for mothers and children. The questionnaire enquired about maternal demographic (age and marital status), socioeconomic (education and family socioeconomic status) and behavioural factors (sugars intake) as well as child demographic (gender and age) and behavioural factors (sugars intake and reason for last dental visit). Socioeconomic status (SES) was measured using the government's classification of households (strata 1=very low and strata 2=low), which is based on multiple housing quality indicators (access roads, house size, presence of sidewalk, garage and driveway, and material of walls and roof). The mothers were contacted and interviewed in the waiting room of the child's growth and development medical office. After this procedure, they and their children were examined in the dental office. Children were examined first unless the child was anxious about the dental examination. For children, the order of the examination was dental caries and oral hygiene (to avoid any remnant of plaque disclosing drops staining the teeth). For mothers, the order for the examination was dental caries, periodontal disease and oral hygiene.

Dental caries was evaluated according to the International Caries Detection and Assessment System (ICDAS II) diagnostic criteria (ICDAS, 2005). Teeth were isolated with cotton rolls and then the crowns of the teeth were examined individually for the presence of dental caries using sterile dental mirror Marthe® No 5 and a dental explorer No. 23 Marthe®. Suspected teeth with early lesions were further dried with a dental triple syringe. We used ICDAS codes to obtain the number of decayed, missing and filled surfaces (dmfs) for children, in accordance with the definition of American Academy of Pediatric Dentistry (2008) for ECC that includes both non-cavitated and cavitated lesions; and the decayed, missing and filled surfaces (DMFS) for mothers. One trained and calibrated examiner conducted all dental examinations. To measure examiner reliability, 5% of the sample (20 children and 20 mothers) were re-examined a few days later. The Kappa values for intra-examiner reliability were 0.80 for children and 0.74 for mothers, at the surface level.

Periodontal status was recorded according to the World Health Organization (WHO) criteria with the Community Periodontal Index (CPI) (code 0= absence, code 1= pocket 4-5mm and code 2= pocket 6mm or more). We used a dental mirror Marthe® No. 5 and a periodontal probe WHO Surgical Excel® 83-2560. The highest CPI score was recorded for each mother. The Kappa score for intra-examiner reliability was 0.87 (20 mothers with repeated examinations). We used disclosing solution Ditonos® to assess children's and mothers' oral hygiene. They were asked to spread the solution around the mouth and all over the teeth. We helped children in this activity because some of them could not follow the request. Oral hygiene was assessed using the debris index of the Simplified Oral Hygiene Index (OHI-S) (Green and Vermillion, 1964) classified as good (0-0.6), fair (0.7-1.8) and poor (1.9-3.0) (Green, 1967). The Kappa score for intra-examiner reliability was 0.76 for children and 0.85 for mothers.

Statistical analysis

We first compared the dmfs index according to maternal (age, education, SES, sugar-sweetened beverage (SSB) intake and debris index) and child factors (sex, age, reason for last dental visit, debris index and SSB intake). The dmfs index was modelled using negative binomial regression as the outcome was a count variable with over dispersion (variance higher than the mean). The association between maternal and child caries experience was assessed in crude and adjusted models (Models 1 and 2, respectively). Model 2 included adjustments for maternal age, education, SES and child sex, age, reason for last dental visit, debris index and intake of SSB). To explore the role of maternal dental behaviours (debris index and SSB intake) on the association between maternal and child caries experience, these variables were added to a subsequent regression model (Model 3). A similar strategy was followed for the association between maternal periodontal status and child caries experience.

Results

A total of 384 child-mother dyads were evaluated. The characteristics of participating mothers and children are shown in Table 1. Most mothers were younger than 25 years (60.9%), had completed secondary education (54.9%) and lived in very low SES (80.5%). About 96% and 33% of mothers had caries experience (DMFS: 25.4 ± 21.2) and periodontal disease, respectively. In addition, 21.9% of mothers and 20.8% of children drank SSB once or more a day, whereas 36.7% of mothers and 40.6% of children had poor oral hygiene. The mean dmfs was 7.4 (SD: 9.5, range: 0 to 71), with only 29.2% of children being caries-free. The main component of the dmfs was decayed surfaces (mean: 3.4; SD: 5.4; range: 0-40).

Table 1. Characteristics of participating mother-child dyads (*n*=384)

Variables	%	Child caries experience (dmfs)			
		Mean	(SD)	RR[1]	[95% CI]
Mother's age					
≤24 years	60.9	7.62	(9.90)	1.00	[Reference]
25-34 years	27.6	7.17	(9.26)	0.94	[0.68-1.31]
≥35 years	11.5	6.57	(7.90)	0.86	[0.54-1.38]
Marital status					
Cohabiting	63.0	7.67	(10.12)	1.00	[Reference]
Not cohabiting	37.0	6.88	(8.33)	0.90	[0.66-1.21]
Mother's education					
Primary	31.0	8.99	(12.03)	1.00	[Reference]
Secondary	54.9	6.94	(7.94)	0.77	[0.56-1.06]
Higher	14.1	5.48	(8.38)	0.61	[0.38-0.97]*
Family SES					
Low	19.5	4.09	(6.76)	1.00	[Reference]
Very low	80.5	8.17	(9.90)	2.00	[1.38-2.88]***
Mother's SSB intake					
Never	23.7	7.05	(10.25)	1.00	[Reference]
<1/day	54.4	7.55	(9.59)	1.07	[0.75-1.53]
>1/day	21.9	7.29	(8.46)	1.03	[0.67-1.59]
Mother's debris index					
Good (DI: 0-0.6)	12.5	6.08	(11.06)	1.00	[Reference]
Fair (DI: 0.7-1.8)	50.8	7.63	(9.96)	1.25	[0.79-1.98]
Poor (DI: 1.9-3.0)	36.7	7.46	(8.22)	1.23	[0.76-1.97]
Child's gender					
Boy	49.0	6.55	(8.10)	1.00	[Reference]
Girl	51.0	8.16	(10.63)	1.24	[0.93-1.66]
Child's age					
2 years	27.6	5.56	(6.42)	1.00	[Reference]
3 years	23.4	6.51	(7.70)	1.17	[0.78-1.75]
4 years	27.1	6.98	(9.77)	1.26	[0.85-1.85]
5 years	21.9	11.07	(12.78)	1.99	[1.33-2.99]**
Child's reason for last dental visit					
Check-up	77.6	6.54	(9.39)	1.00	[Reference]
Trouble	22.4	10.24	(9.36)	1.57	[1.11-2.20]*
Child's debris index					
Good (DI: 0-0.6)	7.6	4.41	(6.17)	1.00	[Reference]
Fair (DI: 0.7-1.8)	51.8	6.79	(8.17)	1.54	[0.87-2.72]
Poor (DI: 1.9-3.0)	40.6	8.66	(11.27)	1.96	[1.10-3.50]*
Child's SSB intake					
Never	27.6	7.25	(11.43)	1.00	[Reference]
<1/day	51.6	6.95	(8.05)	0.96	[0.68-1.35]
>1/day	20.8	8.58	(10.03)	1.18	[0.78-1.79]

[1] Negative binomial regression was fitted and rate ratios (RR) reported.
* p<0.05; ** p<0.01; *** p<0.001

Family SES and the reason for the child's last dental visit and debris index were positively associated with child dmfs. Children of very low SES (RR: 2.00; 95%CI: 1.38-2.88). Those whose last dental visit was because of problems (RR: 1.57; 95%CI: 1.11-2.20) and those with poor oral hygiene (RR: 1.96; 95%CI: 1.10-3.50) had greater dmfs scores. Maternal education was negatively associated with child dmfs score. Children whose mothers completed had higher education had a 39% (RR: 0.61; 95%CI: 0.38-0.97) lower dmfs score than those whose mothers only had primary education. (Table 1).

There was evidence of an association between mother's DMFS and child dmfs (Table 2). In the adjusted model (model 3), children whose mothers were in the second, third and fourth DMFS quartile (highest), respectively, had 1.32 (95%CI: 0.88-1.98), 1.90 (95%CI: 1.26-2.86) and 2.51 (95%CI: 1.59-3.97) greater dmfs scores than children whose mothers were in the first quartile of the DMFS distribution (lowest). This association remained unchanged after further adjustment for maternal dental behaviours (debris index and SSB intake). Treating the mother's DMFS as a numerical variable (rather than in quartiles) yielded similar results. Table 3 summarises the analysis for maternal periodontal status and child dmfs score. No evidence of an association between these two variables was found, even when adjusting for confounders or using alternative indicators of periodontal status.

Discussion

In this study maternal dental caries experience, but not periodontal condition, was associated with child dental caries experience. This association was not explained by socioeconomic position (family SES and maternal education) or maternal and child dental behaviours (oral hygiene, sugar intake and child last dental visit).

Some limitations ought to be discussed before interpreting these results. First, the results were based on a convenience sample from an impoverished area. Therefore, the findings cannot be generalized beyond this group. Second, the periodontal examination for mothers was based on pocket depth at tooth level, which tends to underestimate disease prevalence and severity. However, it is the approach recommended by the WHO. Third, our assessment of sugars intake for mothers and children focused on consumption of SSBs. Other sources of free sugars are relevant to caries development but were not included in our dietary assessment for logistic reasons.

Our first finding was that mothers with better dental status had children with better dental status. There was evidence of a dose-response relationship in child dmfs according to maternal DMFS (either when treated as a categorical or numerical variable). The seemingly larger rate ratios observed when using quartiles rather than the numerical form of mother's DMFS can be explained by the larger intervals between adjacent values in the former than the latter. For instance, there was a difference of 42 units in the median DMFS between mothers in quartiles 1 and 4. When using the coefficient for numerical DMFS, the dmfs for children of mothers with a DMFS of 46 (median in 4th quartile) was ($e^{0.15*39}$=) 1.88 greater than the dmfs for children of mothers with a DMFS of 4 (median in 1st quartile). These differences were found after controlling for established risk factors for childhood caries, including family socioeconomic circumstances and child health behaviours. Our results agree with those reported amongst American children (Dye *et al*., 2011). Interestingly, the association between maternal and child oral health was condition-specific. While maternal caries was associated with childhood caries, maternal periodontal status was not. This interesting result might help untangle potential underlying mechanisms explaining how maternal oral health influences child oral health. Both caries and periodontal disease share some socioeconomic and behavioural influences. Maternal education and family SES (both through restriction and statistical adjustment) were our controls for confounding due to socioeconomic conditions. In terms of dental behaviours, good oral hygiene is important to prevent both oral diseases, and there is also new evidence showing that sugars intake, a well-known causal factor for caries development, is associated with periodontal disease (Chapple *et al*., 2017).

This argument brings us to our second finding. Maternal behavioural factors did not explain much of the association between maternal and child caries experience.

Table 2. Regression models for the association between maternal and child dental caries experience (*n*=384)

DMFS	*n*	*dmfs*		*Model 1*	*Model 2*	*Model 3*
		Mean	*(SD)*	*RR[1] [95% CI]*	*RR[1] [95% CI]*	*RR[1] [95% CI]*
Maternal DMFS in quartiles						
1st quartile (0-11)	93	5.27	(7.77)	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
2nd quartile (12-20)	94	5.87	(6.87)	1.11 [0.74-1.68]	1.31 [0.87-1.97]	1.32 [0.88-1.98]
3rd quartile (21-32)	100	8.64	(11.35)	1.64 [1.10-2.45]*	1.87 [1.24-2.80]**	1.90 [1.26-2.86]**
4th quartile (33-152)	97	9.54	(10.52)	1.81 [1.21-2.71]**	2.33 [1.50-3.62]***	2.51 [1.59-3.97]***
Maternal DMFS score						
Per additional surface	384	---	---	1.01 [1.00-1.02]*	1.01 [1.01-1.02]**	1.01 [1.01-1.02]**

[1] Negative binomial regression was fitted and rate ratios (RR) reported. Model 1 was unadjusted. Model 2 was adjusted for maternal age, marital status, education and SES as well as child sex, age, reason for last dental visit, debris index and intake of sugar-sweetened beverage. Model 3 was additionally adjusted for maternal debris index and intake of sugar-sweetened beverage. * p<0.05; ** p<0.01; *** p<0.001

Table 3. Regression models for the association between maternal periodontal status and child dental caries experience (n=384)

Community periodontal index (CPI)	*n*	*dmfs*		*Model 1*	*Model 2*	*Model 3*
		Mean	*(SD)*	*RR[1] [95% CI]*	*RR[1] [95% CI]*	*RR[1] [95% CI]*
Mother's periodontal status						
No sextant with CPI>0	255	7.03	(9.42)	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
1+ sextants with CPI>0	129	8.05	(9.65)	1.15 [0.84-1.56]	1.08 [0.8-1.46]	1.10 [0.79-1.52]
Maximum CPI score						
CPI=0	255	7.03	(9.42)	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
CPI=1	98	8.76	(10.35)	1.25 [0.89-1.74]	1.15 [0.82-1.6]	1.16 [0.81-1.65]
CPI=2	31	5.84	(6.69)	0.83 [0.48-1.43]	0.87 [0.52-1.48]	0.90 [0.52-1.55]
Sextants with CPI>0						
Per additional sextant	384	---	---	1.05 [0.95-1.16]	1.04 [0.94-1.14]	1.04 [0.94-1.16]

[1] Negative binomial regression was fitted and rate ratios (RR) reported. Model 1 was unadjusted. Model 2 was adjusted for maternal age, marital status, education and SES as well as child sex, age, reason for last dental visit, debris index and intake of sugar-sweetened beverage. Model 3 was additionally adjusted for maternal debris index and intake of sugar-sweetened beverage. * p<0.05; ** p<0.01; *** p<0.001

Model 3 in Table 2 found little change in the estimates for maternal DMFS when maternal SSB intake and oral hygiene were controlled for. Taken together, these findings imply that other factors might be more relevant to this association. Vertical transmission of bacteria from mother to child has been reported extensively in the literature (Childers *et al*., 2017). However, it is only bacteria, rather than the disease (dental caries) that is transmitted (Tinanoff *et al*., 2019). A recent Brazillian study suggested that maternal dental visits might be an intermediate variable between self-reported maternal and child caries experience (Cademartori *et al*., 2019). Maternal dental attendance could influence the child use of dental services and update preventive care. An alternative explanation is the role of nutritional deficiencies during pregnancy which could affect foetal tooth formation (DiOrio *et al*., 1973). Malnourishment has been linked to alterations in saliva and tooth development (Sheetal *et al*., 2013). Finally, there is also evidence for the role of genetic factors (Stanley *et al*., 2014) in caries development.

These findings have theoretical and practical implications. With the association between maternal and child caries amongst these low-income families, interventions targeting families with the mother as the core might provide fruitful to reduce early childhood caries levels. Incorporating a dental component during pregnancy and the first years of life might be an avenue for intervention. Controls during pregnancy and for child growth are a window of opportunity. New research would benefit from longitudinal designs and collecting information on maternal characteristics over multiple timepoints. The role of other potential mediators of the association between maternal and child oral health should be further investigated.

Conclusion

This study of mothers and children in low-income families of Colombia found maternal dental, but not periodontal status to be positively associated with early childhood caries over and above socioeconomic and child behavioural factors. Maternal health behaviours, here measured as SSBs intake and debris index, did not play a major role in explaining the association between maternal and child dental caries experience.

Acknowledgements

The authors would like to thank the following individuals Diana Bacca, Tatiana Díaz, Karime Criollo, Álvaro Dávila, Andrés Chamorro, Sebastián Rondón, Shavely Martínez, Nicolás Delgado, Rocío Portilla, Ángela Yamá, Katherine Cuastumal, Angélica Bermeo, Dayana Luna, Joanna Narváez, Paola Solarte, Erika Collazos, Gabriel Rosero, María Mafla, Nahary Solarte, and Juan Arciniegas for their assistance in data collection. This study was supported by the Comité Nacional para el Desarrollo de la Investigación (CONADI) of Universidad Cooperativa de Colombia (Code: INV1828).

Disclosure Statement

The authors declare that they have no competing interests.

References

AAPD, American Academic of Pediatric Dentistry. (2008): [*Definition of Early Childhood Caries (ECC)*]. Chicago, IL: AAPD. https://www.aapd.org/assets/1/7/d_ecc.pdf

Al-Ayed, I.H. (2010): Mothers' knowledge of child health matters: Are we doing enough?. *Journal of Family and Community Medicine* **17**, 22–28.

Cademartori, M.G., Custodio, N.B., Harter, A.L., and Goettems M.L. (2019): Maternal perception about child oral health is associated to child dental caries and to maternal self-report about oral health. *Acta Odontologica Scandinavica* **77**, 359-363.

Chapple, I.L., Bouchard, P., Cagetti, M.G., Campus, G., Carra, M.C., Cocco, F., Nibali, L., Hujoel, P., Laine, M.L., Lingstrom, P., Manton, D.J., Montero, E., Pitts, N., Rangé, H., Schlueter, N., Teughels, W., Twetman, S., Van Loveren, C., Van der Weijden, F., Vieira, A.R., and Schulte, A.G. (2017): Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases: Consensus report of group 2 of the joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *Journal of Clinical Periodontology* **44**, S39-S51.

Childers, N.K., Momeni, S.S., Whiddon, J., Cheon, K., Cutter, G.R., Wiener, H.W., Ghazal, T.S., Ruby, J.D., and Moser, S.A. (2017): Association between early childhood caries and colonization with Streptococcus mutans genotypes from mothers. *Pediatric Dentistry* **39**, 130-135.

DiOrio, L.P., Miller, S.A., and Navia, J.M. (1973): The separate effects of protein and calorie malnutrition on the development and growth of rat bones and teeth. *Journal of Nutrition* **103**, 856-865.

Dye, B.A., Vargas, C.M., Lee, J.J., Magder, L., and Tinanoff, N. (2011): Assessing the relationship between children's oral health status and that of their mothers. *Journal of the American Dental Association* **142**, 173-183.

Green, J.C., and Vermillion, J.R. (1964): The simplified oral hygiene index. *Journal of the American Dental Association* **68**, 7-13.

Green, J.C. (1967): The Oral Hygiene Index--development and uses. *Journal of Periodontology* **38**, 625-637.

Harris, R., Nicoll, A.D., Adair, P.M., and Pine, C.M. (2004): Risk factors for dental caries in young children: A systematic review of the literature. *Community Dental Health* **21**, 71-85.

Hooley, M., Skouteris, H., Boganin, C., Satur, J., and Kilpatrick, N. (2012): Parental influence and the development of dental caries in children aged 0-6 years: A systematic review of the literature. *Journal of Dentistry* **40**, 873-885.

ICDAS, International Caries Detection and Assessment System Coordinating Committee. (2005): *Rationale and Evidence for the International Caries Detection and Assessment System (ICDAS II)*. pp.1-43. Baltimore, Md, USA.

Kim Seow, W. (2012): Environmental, maternal, and child factors which contribute to early childhood caries: A unifying conceptual model. *International Journal of Paediatric Dentistry* **22**,157-168.

Laniado, N., Shah, P., Moss, K.L., and Badner, V.M. (2019): Mother's caries experience as a risk factor for child's oral health: An analysis of a high-risk population in the Bronx, New York. *Pediatric Dentistry* **41**, 279-284.

MINSALUD, Ministerio de Salud y Protección Social de Colombia (2017): [*IV Estudio Nacional de Salud Bucal (ENSAB IV)*]. Bogotá, Colombia: https://www. minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/ENSAB-IV-Situacion-Bucal-Actual.pdf

Nolvi, S., Bridgett, D.J., Korja, R., Kataja, E.L., Junttila, N., Karlsson, H., and Karlsson, L. (2019): Trajectories of maternal pre- and postnatal anxiety and depressive symptoms and infant fear: Moderation by infant sex. *Journal of Affective Disorders* **257**, 589-597.

Nourijelyani, K., Yekaninejad, M.S., Eshraghian, M.R., Mohammad, K., Rahimi Foroushani, A., and Pakpour A. (2014): The influence of mothers' lifestyle and health behavior on their children: An exploration for oral health. *Iran Red Crescent Medical Journal* **16**, e16051.

Pinto, G.D.S., Azevedo, M.S., Goettems, M.L., Correa, M.B., Pinheiro, R.T., and Demarco F.F. (2017): Are maternal factors predictors for early childhood caries? Results from a cohort in Southern Brazil. *Brazilian Dental Journal* **28**, 391-397.

Sheetal, A., Hiremath, V.K., Patil, A.G., Sajjansetty, S., and Kumar, S.R. (2013): Malnutrition and its oral outcome - a review. *Journal of Clinical and Diagnostic Research* **7**, 178–180.

Stanley, B.O., Feingold, E., Cooper, M., Vanyukov, M.M., Maher, B.S., Slayton, R.L., Willing, M.C., Reis, S.E., McNeil, D.W., Crout, R.J., Weyant, R.J., Levy, S.M., Vieira, A.R., Marazita, M.L., and Shaffer, J.R. (2014): Genetic association of MPPED2 and ACTN2 with dental caries. *Journal of Dental Research* **93**:626-632.

Tinanoff, N., Baez, R.J., Diaz Guillory, C., Donly, K.J., Feldens, C.A., McGrath, C., Phantumvanit, P., Pitts, N.B., Seow, W.K., Sharkov, N., Songpaisan, Y., and Twetman, S. (2019): Early childhood caries epidemiology, aetiology, risk assessment, societal burden, management, education, and policy: Global perspective. *International Journal of Paediatric Dentistry* **29**, 238-248.