Oral health behaviour and attitude towards caries among mothers with 0- to 3-year-olds: A survey in Lithuania

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Abstract

Background Mothers greatly influence their children's oral health. This study aimed to investigate the oral health behaviours of mothers with young children and their attitudes towards dental caries. Material and methods The survey targeted all mothers with children under three years attending a primary healthcare centre (Department of Family Medicine at the LSMU Hospital) in Kaunas, Lithuania. The Bioethics Centre of the LSMU approved the study (No. BEC-OF-14). Of 176 mothers, 123 (69.9%) took part in the 2016-2017 study. The self-administered questionnaire enquired about mothers' attitudes towards oral health and behaviours related to the potential transmission of oral bacteria to their children, dietary habits, tooth brushing, smoking, and background factors. The chi-squared test and univariate/multivariate logistic regression analyses, including the odds ratio (OR) and its confidence interval (95% CI), served for the statistical analysis. (P-values ≤ 0.05 indicated statistically significant differences.) Results Most (68.5%) of the mothers brushed their teeth twice daily, and 87.4% reported themselves as non-smokers. We found a statistically significant association between mothers who brushed their own teeth twice daily and those who cleaned their children's teeth likewise (OR = 5.42, 95% CI 1.28-6.63; p = 0.005). We observed significant associations among mothers who gave their children sugar-sweetened beverages (SSB) daily and the mothers' college or lower education (OR = 6.51, 95% CI 1.59-27.19; p = 0.01) and maternal tooth brushing less than twice daily (OR = 3.88, 95% CI 0.99-15.18; p = 0.05). Conclusions A considerable number of the Lithuanian mothers did not follow the universal recommendations for tooth brushing, and most of them did not brush their children's teeth as recommended. Mothers with a lower education and who brushed their teeth less than twice daily offered their children SSB more frequently. More emphasis needs to focus on children's oral health promotion and education.

Background

Parents, and especially mothers, greatly influence their children's oral health as messengers of good health behaviour. Their greater understanding of oral hygiene and dietary habits also contributes to their children's oral health [1]. The children of parents with poor oral health are more likely to show poor oral health in adulthood than the children of parents with good oral health [2].

Health behaviour comprises a complex variety of knowledge, attitudes, and behaviour which all impact oral health [3]. Poor maternal oral health can significantly impact the general health of both the mother and her child, and can, for example, increase the risk of developing caries in early childhood [2]. Mothers’ health behaviours are associated with their practices towards their children's consumption of various sugar-sweetened products [4]. Mothers may also be sources of bacterial transmission to their children [3, 5]. Some studies have reported a strong association between mothers' perceived oral health status and their children's oral health condition [6].

Mothers' attitudes towards and knowledge of oral health directly affect their children's dental health outcomes; in contrast, insufficient knowledge of oral health, the main risk factors and caries prevention, can lead to inadequate counselling for children later [5, 7]. Knowledge is one of the main risk indicators,
and predictors of the disease make it possible to identify the individuals who would benefit most from early preventive measures [7]. Oral health education targeting mothers may positively impact oral health status in children [5].

Oral hygiene plays an important role in the prevention of caries and periodontal diseases, and proper oral hygiene ought to be emphasised already from early childhood [8]. Oral hygiene habits are established in stages of development and are influenced by parental behaviours, predominantly of mothers, as they are often the primary caregivers of their children [9]. Furthermore, when children are introduced to good health habits in early childhood, the good behavioural approach tends to continue later into adulthood [5].

Parental oral health-related attitudes are also associated with children's oral health in both early childhood and later in life [1]. Parental awareness of their children's oral hygiene and their primary teeth status may play an important role in preventing future oral health problems [5]. Oral health in preschool children is largely determined by behavioural factors, namely inadequate oral hygiene habits, frequent consumption of sugar-containing snacks and drinks, and lack of preventive visits to the dentist [8].

Studies have shown tooth brushing to be a good indicator of other habits affecting oral health. Both poor oral hygiene and high sugar consumption often occur in the same individuals [10]. Some parents believe that tooth brushing is the main caries-preventive measure, whereas control of cariogenic eating habits has received less attention [11]. Researchers have found that behavioural dietary factors such as the extent, frequency and time of sugar consumption relate more significantly to caries development than diet itself [8]. Intake of sugar-sweetened products begins in early infancy, and consumption frequency tends to increase among older children [4]. Patterns of sugar consumption change along the life course. The sense of taste changes, and independence in selecting food and beverages is higher among adults than among children [12].

Dental caries among children are common in Lithuania. Reports indicate that about half of 3-year-old children have early childhood caries (ECC) [13]. Bottle-feeding, dietary habits and lack of oral hygiene were the main determinants in ECC development. Up to 90% of 4- to 6-year-old children suffer from caries [14], leading to poor quality of life [15]. Yet research on maternal attitudes and behaviour towards oral health is scarce in Lithuania. We therefore aimed to investigate the oral health behaviours of mothers with young children and their attitudes towards ECC risk indicators.

**Materials And Methods**

The study targeted mothers with children under three years attending a primary healthcare centre in Kaunas, Lithuania. A self-administered anonymous questionnaire [3] assessed the mothers’ health behaviour and background information. The Bioethics Centre of the Lithuanian University of Health Sciences approved the study (No. BEC-OF-14).

The study population comprised mothers with children under three years attending the Department of Family Medicine at the LSMU Hospital, the mid-sized primary healthcare centre in Kaunas city providing
free-of-charge services. With 300,000 inhabitants, Kaunas is the second largest town in central Lithuania. The most developed industries in Kaunas are the food and beverage industries, textile and light industries. The majority (93.6%) of citizens are Lithuanians.

The Department of Family Medicine at the LSMU Hospital invites all mothers with children between 1 and 36 months for health check-ups and vaccinations. About 200 mothers visit the centre annually. During routine visits for regular check-ups and vaccinations for the children, the mothers were invited to voluntarily complete a self-administered anonymous questionnaire distributed by the health nurses. To obtain a representative sample of (ca. 200) mothers from the health clinic, the estimated time needed to conduct the survey was one year. The survey was carried out from August 2016 to August 2017. During the mothers’ routine visits to the clinic, two health nurses distributed the questionnaires to all and collected them immediately after the mothers completed them. Of 176 mothers visiting the centre, 123 completed the questionnaires (response rate: 69.9%). About 15% of registered children live abroad and do not pay routine compulsory visits. Fathers and grandparents with children paid regular visits to the public health clinic; mothers who refused to complete the questionnaire were excluded.

The questionnaire

The self-administered questionnaire enquired about the mothers’ background characteristics, perceived oral health status, smoking, attitudes toward oral health and behaviours regarding the potential transmission of oral bacteria to their children, the dietary habits of both the mothers and their children, such as the consumption of sugar-sweetened beverages (SSB) and sweets, and their own and their children's tooth brushing [3].

The first part of the questionnaire enquired questions about the mothers’ oral health, tooth brushing habits, dental visits, smoking, and sweets consumption. The mothers’ behaviour and understanding of their own oral health may impact their children's oral health behaviour [3].

The second part of the questionnaire enquired questions about the mothers’ knowledge of and attitude towards indicators of dental caries risk [3]. The questions were: Gingivitis is caused by bacteria in the mouth; A sugary diet causes gingivitis; Frequent use of sugar increases dental decay; The use of fluoride prevents dental decay; Good oral hygiene inhibits tooth decay; Tooth decay is caused by too little use of fluoride toothpaste, frequent consumption of sugar, bacterial activity, characteristics of one's teeth, and how often one brushes one's teeth; Bacterial transfer from the mother's mouth to the child's mouth. Answer options used a Likert scale (totally agree, partially agree, don't know, partially disagree and totally disagree). The question “Bacterial transfer from the mother’s mouth to the child’s mouth” had the following answer options: never, seldom, quite often, often, and always. The question “When should one start to brush one’s child’s teeth with fluoride toothpaste?” had several answer options: at eruption of the first tooth, when all primary teeth erupt, when permanent teeth start to erupt, and when child the learns how to brush its teeth. The last question “At what age would it be good/beneficial to stop using a pacifier?” had the following answer options: until 1 year old, until 2 years old, until 3 years old and as long as the child wants.
The third part of the questionnaire included questions about the mothers' behaviour towards their children's oral hygiene (1 question), sweets consumption (2 questions) and bacterial transmission from mother to child (4 questions) [3]. Inadequate oral hygiene, frequent sweets and SSB consumption, and possible transmission of cariogenic bacteria from mother to child are risk indicators of early childhood caries.

The mothers' background information included age in years (< 25, 25-29, 30-34, 35-39, 40+), later categorised into four by combining the two oldest age groups into one (35+). The mothers' level of education was categorised as basic, secondary, college and university education, which was later combined into two groups: ≤ college and university. Each child was classified into one of three age groups: 1-11 months, 12-23 months and 24-36 months.

Questions about the mothers' tooth brushing had four options: never, almost every day, once a day, and more than once a day. These options were later dichotomised into two groups: less than twice daily and twice daily. Questions about tooth brushing of the children's teeth had the following options: not at all, seldom, once a week, every other day, once a day, more than once a day. These options were later combined into four groups: never, less than daily (seldom, once a week and every other day), once a day, and more than once a day [4].

Questions about smoking had four options: smoke daily, smoke occasionally, do not smoke, and have quitted. All options were later dichotomised into the following groups: smoke daily/occasionally (smoker) and do not smoke/have quitted (non-smoker).

Questions about the mothers' frequency of sugar-sweetened products (SSP) consumption (coffee or tea with sugar; other sweet drinks; biscuit, raisins or chips; candies) had five options (corresponding scores appear in brackets): more than 3 times per day (2), 1-2 times per day (2), 2-5 times a week (1), less frequently (0), never (0). These scores were summed to describe the intensity of the mothers' SSP consumption and ranged from 0 to 8. The higher the score, the more frequent their reported SSP consumption. The scores for the intensity of the mothers' SSP consumption were categorised as low (scores 0-1), moderate (scores 2-6) and high (scores > 6).

Questions about the children's consumption of SSB and sweets/candies had six answer options (the corresponding scores appear in brackets): not at all (0), seldom (1), once a week (2), every other day (3), once a day (4), and more than once a day (5). The frequency of the children's SSB or sweets consumption was categorised as never, less than daily (seldom, once a week, every other day) and daily (once a day, more than once a day). For further analysis, the original scores for SSB and sweets consumption were combined to assess the intensity of the children's SSP consumption. The scores for the intensity of the children's SSP consumption ranged from 0 to 10. The higher the score, the more frequent their total reported SSP consumption [4]. The scores for the intensity of the children's SSP consumption were categorised as low (scores 0-1), moderate (scores 2-6), and high (scores > 6).
**Statistical analysis**

The Statistical Package for Social Sciences (SPSS version 22) served for the analysis. Chi-squared tests served to measure differences between the mothers’ background characteristics: smoking habits, their own health behaviour and their oral health behaviour towards their children. We then calculated the means and standard deviations (SD); a P-value ≤ 0.05 indicated statistically significant differences.

Univariate logistic regression analysis, including the odds ratio (OR) and its confidence interval (95% CI), served to calculate the probability of an event (mothers giving SSB or sweets/candies to their children, the frequency of their children’s tooth brushing, sharing a spoon or mug/plate with their children, cleaning their children’s pacifier in their own mouth) corresponding to a certain risk indicator (the mother’s education level, the frequency of the mother’s tooth brushing, and kissing the child on the lips).

Multivariate logistic regression models, including the odds ratio (OR) and its confidence interval (95% CI), served in the complex evaluation of the probability of an event (giving SSB to a child daily), in light of certain indicators (mother’s education level ≤ college and the mother’s tooth brushing less than twice daily).

**Results**

The most prevalent age group of the mothers was 30-34 years (40.7%), whereas mothers under 25 years comprised only 9.8% of the participants. The results revealed that a majority (69.4%) of the mothers had a university education (Table 1).

The largest group of children was 24-36 months old (41.5%), and 26% were 1-11 months old. The mean age of the children was 18.56 (10.0) months. Families with one or two children were the most common (43.9% vs. 46.3%) in this survey (Table 1). Regarding child care, home care was significantly more prevalent among children under 36 months than care in day care centres (73.6% vs. 26.4%) (p < 0.001).

Overall, a majority (87.4%) of the mothers reported themselves as non-smokers. In addition, significantly more mothers with a university education reported themselves as non-smokers (93.5%) than did mothers with a college or lower education (73.5%), respectively (p = 0.003) (Table 2). Considering the frequency of the mothers’ tooth brushing, the results revealed that 68.5% of the mothers brushed their teeth twice daily. The mothers’ education background showed no association with their tooth brushing behaviour. Although fewer mothers with a college or lower education (58.8%) brushed their own teeth twice daily than mothers with a university education (72.7%), the difference did not reach statistical significance (p = 0.146) (Table 2).

In this survey, about one-third of the mothers (38.5%) brushed their children’s teeth once daily, and one quarter (24.8%) brushed their children’s teeth twice daily. Among mothers with a young child (1-11 months old), about half (45.2%) reported not brushing their children’s teeth, whereas 54% of those with a 24- to 36-month-old brushed their teeth twice daily (p < 0.001). More mothers with a university education
than mothers with a college or lower education (24.2%) brushed their children's teeth once daily, whereas more mothers with a college or lower education (39.4%) than mothers with a university education (18.9%) brushed their children's teeth twice daily (p = 0.048) (Table 2). Mothers brushing their own teeth twice daily showed a statistically significant association with those who cleaned their children's teeth likewise (OR = 5.42, 95% CI 1.28-6.63; p = 0.005) (Table 4).

Considering the frequency of the children's SSB consumption, a majority (58.7%) of mothers reported that their children consumed SSB less than daily. A majority (71.9%) of mothers with a 1- to 11-month-old gave their children no SSP (p < 0.001).

Significantly more mothers with a university education than mothers with a college or lower education (40.8% vs. 17.6%) reported not giving sweets and candies to their children (p = 0.05) (Table 2). In addition, significantly fewer mothers brushing their teeth twice daily than mothers brushing their teeth less than twice daily (4.8% vs. 18.4%) reported giving SSB to their children daily (p = 0.039) (Table 3).

Mothers giving their children SSB daily showed significant associations with mothers having a college or lower education (OR = 6.51, 95% CI 1.59-27.19; p = 0.01) and maternal tooth brushing less than twice daily (OR = 3.88, 95% CI 0.99-15.18; p = 0.05) (Table 5). Mothers kissing their children on the lips associated with giving their children SSB daily (OR = 3.07, 95% CI 1.36-6.92; p = 0.013) as well as with giving their children sweets/candies (OR = 2.75, 95% CI 1.23-6.15; p = 0.012) (Table 4).

Overall, a majority (70.2%) of mothers had no habit of sharing a spoon with their children. Mothers’ tooth brushing twice daily associated significantly with not sharing a spoon with their children (OR = 2.91, 95% CI 1.28-6.63; p = 0.01) (Table 4). Consequently, mothers brushing their teeth twice daily associated significantly with not sharing a plate or mug with their child (OR = 2.18, 95% CI 0.99-4.77; p = 0.049) and not cleaning their child's pacifier in their own mouth before giving it to their child (OR = 5.30, 95% CI 1.96-14.36; p = 0.001) (Table 4).

The scores for the intensity of the children's SSP consumption ranged from 0 to 10 (mean score: 2.64 (2.31)). Overall, 69.7% of the children consumed up to two different SSPs daily or less than daily. Subsequently, the scores for the intensity of the mothers’ SSP consumption ranged from 0 to 8 (mean score: 2.97 (2.09)). In sum, 58.8% of the mothers consumed up to three different SSPs daily (Figure 1).

**Discussion**

Our study found that a considerable number, about one-third, of Lithuanian mothers did not follow the universal recommendations for tooth brushing, and a clear majority of them did not brush their children's teeth as recommended. Mothers with a lower education and who brushed their teeth less than twice daily offered their children SSB frequently.

*International comparisons*
A number of studies have focused on parental oral health attitudes and behaviour towards children's oral health in order to prevent caries development in early childhood [3-5, 11, 16]. Parents feel responsible for their role in their child's tooth brushing and caries prevention, but pay inadequate attention to their dietary habits [11]. Although tooth brushing twice daily is widely recommended [17], our study showed that, as in many other countries, a majority of the mothers cleaned their young children's teeth once a day or less [4, 5]. More efforts ought to focus on improving tooth brushing habits in Lithuania, as in Finland, for instance, where a majority of mothers reported optimal behaviour, such as tooth brushing twice daily and not smoking [3].

In line with a recent Finnish study showing a weak correlation between mothers' smoking and their practice towards their children [4], our study showed no association between smoking and mothers' behaviour towards their children. In Japan, however, children exposed to smoking had insufficient tooth brushing and SSP consumption [18]. Nevertheless, parents' non-regular tooth brushing of their children's teeth and household smoking are risk factors for ECC development [16, 18, 19]. Smokers tended to have poor oral habits, an unhealthy lifestyle, and low oral health awareness, which may also affect their children's oral health status [18]. Smoking parents tended to brush their child's teeth less frequently, to clean their child's pacifier in their own mouth before giving it to their child, and to give their children SSB more frequently than non-smokers [18].

**Sugar consumption and oral health/general health**

High sugar consumption may impair not only children's oral health, but also their general health. For instance, the risk for obesity and certain systemic diseases, such as diabetes and cardiovascular diseases, increases [20, 21]. In recent decades, childhood overweight and obesity have become a global public health concern [22]. Excessive sugar consumption has increased and starts early [4]. The relationship between high sugar intake and dental caries is well known [23, 24], and studies have reported an association between childhood obesity and dental caries [25]. Caries often occur when sugar constitutes 2-3% of one's energy intake [26]. The World Health Organization has been concerned with high sugar consumption and the development of dental caries and has issued the WHO guidelines for free sugars consumption: to limit free sugars intake to less than 10% of total energy intake and ideally to less than 5% [27]. Our study showed that a high number (> 70%) of children received SSP, and about 10% consumed SSB daily/frequently. This result is in line with those of earlier studies [16, 28]. Considering the intensity of SSP consumption, the findings of this study revealed that about two-thirds of the children consumed up to 2-3 SSPs daily. The same pattern of SSP consumption among young children is evident in Finland, China, and Japan [4, 16, 28]. In Sweden, about one-third of mothers gave beverages to their one-year-olds, a habit that associated with the presence of mutans streptococci [29].

Parents should be encouraged to control their children's cariogenic food consumption not only to minimise their children's risk of dental caries, but also of obesity [10]. Poor oral health and obesity share a common background [10]. Beverages other than water between meals greatly increase the risk for ECC
development and weight gain among young children [16]. Although parents believe juice is a healthy dietary choice [30] and a relatively high proportion of parents include it with meals [19], its potential to promote overweight is similar to that of SSB consumption [30]. These findings raise concerns that children are at risk for not only early childhood caries, but also general health problems.

Children in Lithuania

Specialists recommend that from the earliest days of birth, nutrition should be healthy and meet the needs of a growing and developing baby [31]. In Lithuania, most preschool children eat according to dietary recommendations: they eat breakfast and 4-5 meals per day, but a minority of preschool children consume SSPs and drink SSB daily [32]. Moreover, almost 40% of parents reported that their children's SSP consumption was too high, while a fifth of them believed it was insufficient [32]. Another study revealed that the frequency of SSB intake tends to rise with age, and 16.3% of 7- to 8-year-old Lithuanian children drink SSB daily or almost daily [33]. These findings show a need to raise awareness among parents in Lithuania of the potential harm caused by excessive consumption of SSP to oral and general health. In our study, a clear majority of mothers reported giving SSB less than daily or never. Healthy eating habits, such as drinking water, developed in early childhood will presumably continue throughout one's lifetime. In general, data regarding the mode of SSP consumption among young children in Lithuania is scarce, and new research is needed in this field.

The directive of the Minister of Health in Lithuania [34] states that family physicians or paediatricians chosen by the parents should examine children's health and psychomotor development at health care services. The same regulation states that a dentist or dental hygienist should perform annual dental check-ups and provide recommendations for proper oral hygiene [34]. Nevertheless, about one-third of mothers with a young child reported not following the recommendation to brush one's teeth twice daily. This points to a need for more efforts to improve the situation in the country. Proper children's oral health care should be introduced already during the prenatal period. Currently, information regarding children's oral health care is not included in the courses given to expecting mothers at primary healthcare centres [35]. Moreover, not only dentists, but also nurses should emphasise during the children's regular general health check-ups the importance of the parents’ role in their children's oral hygiene.

Our study showed that a considerable proportion of mothers with a young child had inferior oral hygiene. Because of the social desirability effect, the true number is likely to be even higher. In addition, recommended annual dental check-ups are often postponed until the children attend day care centres with mandatory dental check-ups [34]. These reasons may contribute to the poor oral health of children in Lithuania. Lithuanian children with high ECC experience have severe dental problems, poor quality of life, and undergo multiple caries treatments and extractions under general anaesthesia [15]. Moreover, new caries lesions often develop with insufficient oral hygiene following dental treatment under general anaesthesia [36].
Conclusions

This study revealed that about one-third of mothers failed to brush their teeth twice daily, and a majority did not brush their children's teeth as recommended. Mothers with a lower education and who brushed their teeth less than twice daily offered their children SSB more frequently. More emphasis on children's oral health promotion and education about the importance of proper oral hygiene habits is needed.

List Of Abbreviations

LSMU: Lithuanian University of Health Sciences
ECC: early childhood caries
SSB: sugar-sweetened beverages
SSP: sugar-sweetened products
OR: odd ratio
CI: confidence interval
SD: standard deviation

Declarations

Ethics approval and consent to participate: The study was approved by the Bioethics Center of the Lithuanian University of Health Sciences (No. BEC-OF-14). An anonymous patient characteristic form was used for data collection. Participation was voluntary and all participants provided their written consent.

Consent for publication: Not applicable

Availability of data and material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: SP, JN and JV were involved in conception and design of the study. SP carried out data collection. SP, JN and JV performed the analyses and interpretation of the data. All authors (SP, JN, AP, JV) participated in drafting and writing the manuscript. All authors read and approved the final manuscript.

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**Tables**

Due to technical limitations, tables are only available as a download in the supplemental files section.

**Figures**
Figure 1

Distribution intensity scores of SSP consumption by both mother and child.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Tables.pdf