

Pediatricians' Perceptions of the Use of Sweetened Medications Related to Oral Health

Beatriz Gonçalves Neves* / Viviane Santos da Silva Pierro** / Lucianne Cople Maia ***

Objective: To evaluate pediatricians' perceptions and attitudes about the use of liquid pediatric medicines and their relationship with dental caries and dental erosion. **Study design:** A cross sectional study was conducted. Data was collected by questionnaires handed out in hospitals, medical clinics and offices. A convenience sample of 104 pediatricians was obtained. **Results:** Most respondents (80.8%) stated that pediatric medicines could be related with dental disorders. Dental caries (64.7%) and tooth discoloration (43.7%) were the most frequent mentioned alterations, while only 3 (4.2%) respondents pointed out dental erosion. A considerable number of respondents (62.5%) recognized the presence of fermentable carbohydrates as a contributing factor to tooth decay, however not all of them recommended oral hygiene after their consumption (50.8%). Besides, 48 respondents (46.2%) also believed that pediatric medicines could cause dental wear. **Conclusions:** Pediatricians in this study did not perceive the correct relationship between the presence of acidity in medicines and dental erosion; however, most of them presented a reasonable awareness about the relationship between sugared pediatric medicines and dental caries. Besides, they were unaware about the need of recommending oral hygiene after medicines' use.

Key words: dental caries, tooth erosion, perception, attitude, pediatricians, liquid medication

J Clin Pediatr Dent 32(2): 133–138, 2007

INTRODUCTION

Liquid oral medicines are extensively used in children to facilitate compliance. However, some of the inactive agents used in pediatric medications can damage dental tissues.^{1,2} These drugs can place patients at risk for dental caries and dental erosion, especially when used on a regular basis and over long periods of time. The cariogenic and erosive potential of some pediatric liquid medications involve several factors such as their high frequency of intake, low pH, high viscosity, bedtime consumption, salivary flow reduction and high sugar content.³

The role of fermentable carbohydrates in the carious

process is well known, so that the effect of long term consumption of sugar-containing liquid medicines on the teeth must be a dental health issue of concern. Several studies have shown that sugars in medicines play an important role in the etiology of dental caries in children.³⁻⁷ These sugars are added to pediatric medicines in order to promote a pleasant taste, thus increasing compliance³ and also to act as a preservative, antioxidant as well as a bulking agent.⁷

Tooth dissolution can also be caused by erosion, which is defined as a loss of tooth substance by chemical process not involving bacteria. The etiology of dental erosion is a source of acid, which may be intrinsic or extrinsic, acting on a susceptible tooth.⁸ Use of acidic preparations is often necessary for drug dispersion. Some medicines considered acidic due to their low pH and high titratable acidity may act as extrinsic agent, producing erosive lesions on teeth, especially if consumed frequently.^{1,2}

Since pediatricians are the first to establish contact with children and their families⁹ and also have frequent access to children during regular visits, these health professionals may be able to play an important role in providing anticipatory guidance on oral health issues.¹⁰ Therefore, as main providers of pediatric prescriptions, they are in an ideal position to influence the supply and use of pediatric medicines. However, Duward and Thou³ suggest that pediatricians are not fully aware of the damage which regular consumption of liquid medicines can cause to children's teeth.

Thus, the purpose of the present study was to verify the perceptions and attitudes of a group of pediatricians regard-

* Beatriz Gonçalves Neves, DDS Post-graduate student, Departamento de Odontopediatria e Ortodontia, Universidade Federal do Rio de Janeiro

** Viviane Santos da Silva Pierro, DDS, MSD Master in Pediatric Dentistry, Universidade Federal do Rio de Janeiro Captain in the Health Corp of Fire Department, Rio de Janeiro

*** Lucianne Cople Maia, DDS, MSD, PhD Associate Professor, Departamento de Odontopediatria e Ortodontia, Universidade Federal do Rio de Janeiro

Send all correspondence to: Dr. Lucianne Cople Maia, Rua Gastão Gonçalves 47 apto. 501 – Santa Rosa, Niterói-RJ-Brasil, CEP: 24240-030

Tel: (21) 2629.3738/9994.3131

Email: professormaia@gmail.com

ing the use of pediatric medicines and their cariogenic and erosive potentials.

MATERIALS AND METHODS

This was a sectional and descriptive study conducted in the city of Rio de Janeiro, Brazil. It was carried out with a convenience sample, which included pediatricians from different health services. This study was approved by the local

ethics committee. An informed consent was required from each of the respondents and their anonymity was assured by means of coding the returned questionnaires.

Before data collection, a pilot study was carried out in order to pretest a questionnaire. This sample was not included in this study. The questionnaire was then modified with a combination of 13 open and closed questions (Figure 1). The questionnaires were delivered in public and private

Figure 1. Questionnaire applied to pediatricians

1) Gender: Male Female **Graduation year** _____
Age: _____ years **University where graduated** _____

2) Do you usually attend?
 Only children Adults and children Others _____

3) Where do you work?
 Public service and private practice Public service
 Private practice Others _____

4) Based on your daily practice, which of the factors below do you consider relevant when choosing pediatric medicines (number from 1 to 5 in order of importance, number 1 being the most important factor) ?
 Medication features (spectrum of action, side effects, flavor and mode of administration)
 Child characteristics (age, medicine's acceptability)
 Disease characteristics (severity of the infection)
 Socio-economic factors (patient's financial status, availability of the medicines in the public health services)
 Personal factors (drug companies' preferences, habits, etc)

5) When prescribing medicines for children, which way of administration do you usually elect?
 Oral IM IV Others _____

6) In your opinion, can liquid pediatric medicines be related to dental alterations?
 No Yes- Which alterations? _____
If yes, which medicines do you believe can be involved? _____

7) What usually sweetens liquid pediatric medicines (you may choose more than one option)?
 I do not know Sugar substitutes Glucose Lactose Sucrose Fructose Others _____

8) Do you recommend children's oral hygiene after liquid medicines' intake?
 No Yes

9) If yes, do you also recommend oral hygiene after medicines taken at night?
 No Yes

10) In your opinion, are the pediatric medicines sweet?
 Do not know No Yes

11) In your opinion, are the pediatric medicines acidic?
 Do not know No Yes

12) In your opinion, can medicines cause dental wear or cause tooth structure defects ?
 No- Why? _____
 Yes- Why? _____
If yes, which medicines can cause dental wear or tooth structure defects?

13) Which factors do you think can be related with the use of liquid pediatric medicines and the development of dental caries (you may choose as many options you think are necessary) ?
 Do not know
 In my opinion, the medicines are not involved with the development of dental caries
 Presence of fermentable carbohydrates
 High viscosity of the medicines
 Low endogenous pH of some medicines
 Lack of oral hygiene after medicines' intake
 Mode and frequency of medicines' intake
 Reduction of salivary flow caused by some drugs
 Chronic use of liquid medicines

14) If you want to receive the results of this research, write your address or email in the space below:
Address.: _____
email: _____

hospitals, and also in private medical clinics and offices.

Questionnaires were handed out in those health services and were collected one week after delivery. Data were collected and analyzed using SPSS 11.0 and the results were expressed as absolute values and percentages. All the answers of the open questions were reviewed to identify categories for analyses.¹¹ Appropriate tests were carried out when necessary and were considered significant at 0.05 level.

RESULTS

224 questionnaires were delivered. A total sample of 104 filled out questionnaires was obtained. Pediatricians aged between 24-61 years (40.0 ± 11.5 years old) and 75% were female. Regarding their medical practice, 82.7% of the physicians worked in public service and the same percentage exclusively treated children.

Among the factors considered relevant to the prescription of medicines, disease characteristics – diagnosis of the disease – were emphasized as the most important factor by the majority of the pediatricians (66.3%), followed by medication features such as spectrum, side effects, flavor, and mode of administration (19.1%). It was also noted that child characteristics – age, acceptability of the medicine and immune deficiency – were considered more relevant (5.8%) than socioeconomic factors – patient’s financial status and the availability of the medicines in the public health service (1.9%). Personal factors such as habits and drug companies’ preferences were the least relevant factors according to pediatricians (0%).

Most respondents (80.8%) believed that pediatric medicines could be related with dental disorders and approximately 68.3% exemplified these alterations. Dental caries was the most frequently cited disorder (64.7%), followed by tooth discoloration (43.7%). Only 3 (4.2%) respondents pointed out the occurrence of dental erosion and 1 (1.4%) mentioned oral pH change due to the use of pediatric medicines. The drugs mentioned as responsible for these disorders were sugared medicines (42%), ferrous sulfate (34.2%), antibiotics (22%) and tetracycline (16.4%). Almost half of the doctors (39; 46.4%), who believed that these medications could cause dental disorders (84; 80.8%), did not recommend oral hygiene after medicines intake (χ^2 ; $p>0.05$).

Concerning the sweetening agents added in pediatric liquid oral medicines, 34.6% of the respondents did not know which ones were commonly used, and the other physicians cited sucrose (39.4%), sugar substitutes (37.5%), glucose (16.3%), fructose (12.5%) and lactose (5.8%). Although 39.4% of the doctors considered sucrose as a sweetening agent, 43.9% of these did not provide oral health instructions after medicines’ intake (χ^2 ; $p>0.05$) (Table 1). On the other hand, considering the respondents who recommended oral hygiene after medications’ administration (55; 52.9%), 88.5% of them also gave this instruction when medicines were taken at night.

Factors related with the use of oral liquid medicines and the development of dental caries included: lack of oral

Table 1. Pediatricians’ perception about the presence of sucrose in pediatric medicines and their recommendation on oral hygiene instructions to their patients after prescription (%). Rio de Janeiro, Brazil (n=104)

Sucrose	Oral hygiene instructions		Total
	Yes	No	
Yes	23 (56.1%)	18 (43.9%)	41 (39.4%)
No	32 (50.8%)	31 (49.2%)	63 (60.6%)
Total	55 (52.9%)	49 (47.1%)	104 (100%)

(χ^2 ; $p>0.05$)

Table 2. Pediatricians’ perception about lack of oral hygiene as a contributing factor to dental caries and their recommendation on oral hygiene instructions to their patients after prescription (%). Rio de Janeiro, Brazil (n=104)

Lack of oral hygiene	Oral hygiene instructions		Total
	Yes	No	
Yes	49 (57%)	37 (43%)	86 (82.7%)
No	6 (33.3%)	12 (66.7%)	18 (17.3%)
Total	55 (52.9%)	49 (47.1%)	104 (100%)

(χ^2 ; $p>0.05$)

Table 3. Pediatricians’ perception about the relationship between acidic medicines and dental wear (%). Rio de Janeiro, Brazil (n=104)

Dental wear	Acidic medicines			Total
	Yes	No	Do not know	
Yes	11 (22.9%)	22 (45.8%)	15 (31.1%)	48 (46.2%)
No	—	29 (64.4%)	16 (35.3%)	45 (43.3%)
Do not know	—	—	11 (100%)	11 (10.6%)
Total	11 (10.6%)	51 (49%)	42 (40.4%)	104 (100%)

(χ^2 ; $p<0.05$)

hygiene after medicines’ intake (82.7%), presence of fermentable carbohydrates (62.5%), chronic use (43.3%), mode and frequency of ingestion (30.9%), high viscosity (27.9%), reduction of salivary flow caused by some drugs (25%) and low endogenous pH (13.5%). Only 4.8% of the respondents believed that these drugs are not involved as an etiological factor for dental decay. From those (62.5%) who considered presence of fermentable carbohydrates as a contributing factor to tooth decay, half of them did not recommend oral hygiene after their consumption (50.8%). Despite 82.7% of the pediatricians believed that the lack of oral hygiene after medicines’ intake was a contributing factor for the development of dental decay, 43% of them did not give oral hygiene instructions after medicines’ intake (χ^2 ; $p>0.05$) (Table 2).

Only a small number of respondents (n=11; 10.6%) stated that pediatric liquid medicines are acidic, moreover all of them believed that these drugs can induce dental wear (χ^2 ; $p<0.05$) (Table 3). Among the reasons for the occurrence of dental wear related with the use of medicines, the pediatri-

Downloaded from http://meridian.allenpress.com/jcpd/article-pdf/32/2/135/1749469/jcpd_32_2_5773462618772x1_1.pdf by Bharati Vidyapeeth Dental College & Hospital user on 25 June 2022

cians mentioned the presence of sugar in the formulations (43.7%), long-term use (15.6%), lack of oral hygiene (6.3%), oral pH change (6.2%), acidity (3.1%) and high viscosity (3.1%).

DISCUSSION

Pharmaceutical products often contain agents that have a variety of purposes, including improvement of the appearance, bioavailability, stability, and palatability. These pharmaceutical adjuvants are usually considered to be inert and do not add to or affect the intended action of the therapeutically active ingredients.¹² In the treatment of pediatric patients, physicians often have a difficult task ensuring the compliance of the patient to a particular medication regimen, so the use of pleasant-tasting oral liquid medicines has helped in the administration of these drugs for decades.⁶

Pediatricians may favor certain medicines at prescription, and there are a variety of reasons for this, for example, the influence of drug companies, costs, perceived efficacy or patient preference.^{3,13} However, in the present study, it seems that the influence of pharmaceutical industry appears as the least relevant factor for the majority of the professionals regarding their prescriptions patterns' decision. It must be pointed out that even in countries where sugar-free medicines have become widely available; many doctors continue to prescribe sugared medicines.¹⁴ This is due partly to the increased use of cheaper generic preparations, which contain sugar more frequently⁶ and because they prescribe whatever they are used to.¹³

People are generally unaware of the damage regular use of these medicines can sometimes cause to children's teeth¹⁴ and pediatricians are in an ideal position to influence parents' attitudes towards oral health.⁹ Unfortunately, the lack of familiarity with oral health issues can make it difficult for pediatricians to promote oral health.¹⁵ It has also been reported that these health professionals usually do not receive much oral health training at any level of medical education.¹⁶ However, in this study, the results are generally encouraging and indicate a reasonable awareness of the problem among pediatricians, since most of them (80.8%) believed that pediatric medicines may be involved with dental disorders.

It has been postulated that the use of sugar-containing liquid oral medicines poses a threat to dental health, especially when taken long-term.³⁻⁵ However, in Brazil, there are no public debate on the issue of sugar-containing liquid medicines and dental care, as well as no prescribing initiatives or campaigns for sugar-free medicines, differently of some European countries, where this issue have already been discussed and established.^{13,17} Many pediatricians in the present study appeared to have a positive perception towards this matter, since only a small number (4.8%) stated that these drugs were not involved with dental decay and some of them also were aware about the possibility of the use of sugar substitutes in pediatric medicines (37.5%).

The inclusion of sugars, particularly sucrose, in children's

medicines, primary to mask the less pleasant taste of active ingredients, is of concern⁷ and many studies have related those substances to dental caries.^{3,7} Some studies conducted in Brazil have found that sucrose was the main sweetener of various pediatric liquid medications.¹⁸⁻²¹ Unfortunately, physicians may not always know whether a liquid medicine contains sugar neither recognize the reasons for avoiding sugar-containing medicines in first place.^{3,9} In the present study, 34.6% of practitioners did not know which sweetening agents were added to these pharmaceutical preparations.

Although many physicians (39.4%) considered sucrose as a sweetening agent, similarly to what was found in doctors' responses of previous studies,^{13,14} not all of them recommended oral hygiene after consumption (43.9%) (χ^2 ; $p > 0.05$) (Table 1). It should be also acknowledged that even those pediatricians who believed that the lack of oral hygiene was a contributing factor for the development of dental caries, many of them did not apply that in their daily practice (Table 2). This finding also corroborates with the study of Pierro *et al*,⁹ who showed that many pediatricians did not give oral health instructions after medicines' intake. Another study has shown that most of the interviewed guardians (84.9%) stated that they had never received instructions from pediatricians on oral hygiene after medicines' intake.²² This could be an alert to the fact that pediatricians' answers in this study may not represent patients' actual experiences. Moreover, it is possible that in an effort to provide a more desirable response, respondents of this study might have overestimated their attitudes regarding oral health.

Acidic medicines often taste good, thus enhancing patient compliance; however they may produce unwanted dental side effects in children when used for treatment of chronic diseases.² *In vitro* studies have shown that an acid medication may reduce enamel hardness¹ and influence the enamel roughness,²³ characterizing its erosive potential. Furthermore, an *in vivo* investigation also observed that frequent medications' intake may constitute possible etiological or aggravating factors for severe dental erosion.²⁴

These drugs may be erosive because they can possess some characteristics including acid components, low endogenous pH, high acidity, and absence or low concentrations of ions such as calcium, fluoride and phosphate in their composition.¹ Brazilian studies verified that most pediatric medicines evaluated presented endogenous pH value lower than the critical pH of 5.5 for enamel dissolution.^{9,18,19} Although, in the present study, many pediatricians believed that pediatric medicines can cause dental wear (48; 46.2%), only 11 (22.9%) of them considered these drugs as acidic (Table 3) and also few of them correctly justified this disorder with oral pH change, acidity and high viscosity. The majority wrongly justified the occurrence of dental wear with the presence of sugar in the formulations. It seems that physicians may not perceive the possible relationship between acidic medicines and dental erosion.

Many recommendations have been made for minimizing tooth damage caused by the regular use of liquid medica-

tions, including: taking the medicine in tablet form, when possible; rinsing with water or chewing sugar-free gum after taking the medicine; home and dental office fluoride applications, when possible; taking medicines at meal times rather than between meals; avoiding the ingestion of the medicine before bedtime; and seeking regular preventive dental care.³ However, a practical and effective way of preventing dental caries caused by medicines is to provide sugar-free preparations, since non-sugar sweeteners do not produce dental decay.⁴

In Brazil, no government regulations were found with regard to the use of sugar substitutes in medicines.²¹ Awareness of the danger posed by these medications should be promoted among practitioners, pharmacists, manufacturers, regulatory authorities, and the public in order to bring about increased availability and use of sugar-free medicines.³ Manufacturers are able to produce sugar-free medicines that are just as effective, stable, and acceptable as sugared forms,⁴ however use of alternative sweeteners may require reformulation of the medicine, and could add to its cost.³

A clear policy on the labeling of sugar-containing medicines is therefore needed. All medicines should be labeled with the type of sweetener and its concentration²¹ and, if sugar containing, with a warning on the dangers for teeth.⁴ This should be a routine practice in order to alert health surveillance agencies to adopt policies on this issue.²¹ However, when drug labels mention their sugar content, most warnings are only to prevent sugar consumption by diabetic patients.

The results of this study support that the pediatricians presented a reasonable awareness about the relationship between pediatric medicines and dental caries, which was not noticed for the relationship between those medicines and dental erosion. There is a need for increased education for these health professionals in order to persuade them to put in practice oral health instructions for their patients, since most of the pediatricians of this study recognized the relationship between dental caries and sugared medicines.

This research was carried out with a convenience sample; therefore it was not possible to represent all Brazilian pediatricians. In addition to this, other limitations – such as the high dropout rate and the small sample size from a localized area – limited the generalization of the obtained results. Although these factors may be considered important limitations, it should be stressed that this research can lead to further studies.

ACKNOWLEDGMENTS

We would like to thank CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) for the research grant (308029/2006-2), FAPERJ (Fundação Carlos Chagas de Amparo à Pesquisa do Estado do Rio de Janeiro) (E-26/171.241/2006) and CAPES for the financial support to this project.

REFERENCES

- Costa CC, Almeida ICS, Costa Filho LC. Erosive effect of an antihistamine-containing syrup on primary enamel and its reduction by fluoride dentifrice. *Int J Paediatr Dent*, 16: 174–180, 2006.
- Nunn JH, Ng SKF, Sharkey, Coulthard M. The dental implications of chronic use of acidic medicines in medically compromised children. *Pharm World Sci*, 23: 118–119, 2001.
- Duward C, Thou T. Dental caries and sugar containing liquid medicines for children in New Zealand. *N Z Dent J*, 93: 124–129, 1997.
- Bigeard L. The role of medication and sugars in pediatric dental patients. *Dent Clin North Am*, 44: 443–456, 2000.
- Kenny DJ, Somaya P. Sugar load of oral liquid medications on chronically ill children. *J Can Dent Assoc*, 55: 43–46, 1989.
- Maguire A, Rugg-Gunn AJ. Prevalence of long-term use of liquid oral medicines by children in the northern region, England. *Community Dent Health*, 11: 91–96, 1994.
- Shaw L, Glenwright HD. The role of medications in dental caries formation: need for sugar-free medication for children. *Pediatrician*, 16: 153–155, 1989.
- Linnett V, Seow WK. Dental erosion in children: a literature review. *Pediatr Dent*, 23: 37–43, 2001.
- Pierro, VSS, Barcelos, R, Maia, LC, Silva AN. Pediatricians' perception about the use of antibiotics and dental caries – a preliminary study. *J Public Health Dent*, 64: 244–248, 2004.
- Krol, DM. Educating pediatricians on children's oral health: past, present and future. *Pediatrics*, 13: 487–493, 2004.
- Minayo, MCS. O desafio do conhecimento: pesquisa qualitativa em saúde. 8th ed. São Paulo: Hucitec; Rio de Janeiro: Abrasco; 2004.
- Committee on Drugs. "Inactive" Ingredients in Pharmaceutical Products: Update (Subject Review). *Pediatrics*, 99: 268–278, 1997.
- Bentley E, Mackie IC, Fuller, SS. The rationale, organization and evaluation of a campaign increase the use of sugar-free paediatric medicines. *Community Dent Health*, 14: 36–40, 1997.
- Evans, DJ, Howe, D, Maguire A, Rugg-Gunn AJ. Development and evaluation of a sugar-free medicines campaign in North East England: analysis of findings from questionnaires. *Community Dent Health*, 16: 131–137, 1999.
- Lewis, CW, Grossman, DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: a national survey. *Pediatrics*, 106: 1–7, 2000.
- Krol, DM. Dental caries, oral health and pediatricians. *Curr Probl Pediatr Adolesc Health Care*, 33: 253–270, 2003.
- Mackie IC, Worthington HV, Hobson P. An investigation into sugar containing and sugar-free over-the-counter medicines stocked and recommended by pharmacists in the north western region of England. *Br Dent J*, 175: 93–98, 1993.
- Lima KT, Almeida ICS, Senna ETL. Medicamentos pediátricos – agentes edulcorantes e pH. *J Bras. Odontopediatr. Odontol. Bebê*, 3: 457–463, 2000.
- Neiva A, Silva VS, Maia LC, Soares EL, Trugo LC. Análise *in vitro* da concentração de sacarose e pH de antibacterianos de uso pediátrico. *Pesqui. Bras. Odontopediatria Clin. Integr*, 1: 9–16, 2001.
- Peres, KG, Oliveira, CT, Peres, MA, Raymundo FS, Fett R. Sugar content in liquid oral medicines for children. *Rev Saúde Pública*, 39: 486–9, 2005.
- Pierro VSS, Abdelnur JP, Maia LC, Trugo LC. Free sugar concentration and pH of paediatric medicines in Brazil. *Community Dent Health*, 22: 180–183, 2005.
- Neves, BG, Pierro VSS, Maia LC. Percepções e atitudes de responsáveis por crianças frente ao uso de medicamentos infantis e sua relação com cárie e erosão dentária. *Rev C S Col* 12: 1295–300, 2007.
- Pierro, VSS, Maia, LC, Silva, EM. Effect of pediatric syrups on roughness and erosion of enamel. *J Dent Res*, 83 (Spec Iss A): 0896–0896, 2004.
- Johansson AK, Sorvari R, Birkhead D, Meurman JH. Dental erosion in deciduous teeth – an *in vivo* and *in vitro* study. *J Dent*, 29: 333–340, 2001.

