Sucrose concentration and pH in liquid oral pediatric medicines of long-term use for children

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ABSTRACT

Objectives. *To determine the pH and sucrose concentrations (SC) of pediatric liquid drugs of long-term use by children in order to evaluate the potential risk for dental caries and dental erosion.*

Methods. *After assessing the pH, we analyzed 71 aqueous medicine samples for sucrose by the Lane–Eynon general volumetric method. The pH and SC values (mean ± standard deviation (SD) were calculated according to therapeutic action.*

Results. *The highest and the lowest SC values (mean ± SD) were found in respiratory (37.75% ± 17.23%) and endocrine drugs (11.97% ± 15.16%) (P < 0.01). The values for medicines prescribed for daily ingestion were 47.15% ± 9.57%, whereas for twice daily and three or four times a day, these numbers were 24.42% ± 18.03% and 34.43% ± 14.83%, respectively (P < 0.01). The SC (mean ± SD)) values were higher in syrups (36.32% ± 17.62%) than in other formulations (P > 0.05). The overall pH (mean ± SD) was 5.89 ± 2.02 (range 2.3 ± 0.01 to 10.6 ± 0.02). In products with acidic pH, the SC (mean ± SD) was significantly lower (22.14% ± 15.72%) than in nonacidic medicines (39.22% ± 15.82%) (P < 0.001).*

Conclusions. *It can be concluded that the pediatric medicines studied have a high SC and low pH, which vary according to therapeutic class, daily dose, and brand. Caution about dental caries, dental erosion, and systemic diseases such as diabetes mellitus is warranted when these medicines are ingested frequently.*

Key words Sucrose; hydrogen-ion concentration; child; child, preschool; dental caries, tooth erosion, Brazil.

Studies focusing on the use of medicines in long-term use by children and adolescents are rare, especially in developing countries. In the United States, an increasing prevalence in prescription drug therapy to treat chronic conditions in children was observed (1). This trend might be taking place in some Asian and Latin American countries as well. Recent reports showed that medicines can be provided free of charge in many countries and the availability and affordability of medicines were fairly high in Brazil and Sri Lanka (2, 3). Although the availability of certain key medicines prescribed for treating chronic diseases in children and adults is poor in many developing countries, over-the-counter drug sales have expanded (4). Moreover, the availability of medicines prescribed by a health professional at the previous appointment has increased substantially (5, 6). Thus, there is enough evidence to support the information that long-term use of prescription medicines by children has increased in recent years.

It is noteworthy that many liquid oral pediatric medicines are embedded with carbohydrates, such as sucrose and glucose, and some carbohydrates can di-

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rectly influence the cariogenic potential of the solutions (7–10). Liquid medicines can be part of a daily routine for children with chronic diseases (8–13). As a result, these children are likely to take in more sugar from liquid medicines, increasing the possibility of health impairment (14, 15).

Many pharmaceutical companies argue that improving the palatability of liquid medicines with sucrose increases patient compliance. On the other hand, chronic administration of sweetened liquid medicines increases the risk for dental caries and gingivitis in children (9, 13). In general, this issue is neglected because the principal medical problem covers up the less obvious aspects of the child's health. Under such circumstances, parents' major focus is the medical problem. As a result, the child's regular routine is changed and a condition of poor oral hygiene is likely to take place.

Recent studies with liquid pediatric medicines have shown sucrose concentrations (SC) ranging from 3.7% to 67.0% by weight (wt/wt) (8, 12, 13). Higher SC (80%) in pediatric medicines have been reported. These SC in medicines are higher than in soft drinks (4.3%) and ice cream (15.1%) (14).

In addition to the sucrose content in medicines and the caries risk in children, these products sometimes have a low pH, which increases the risk of dental erosion (8). The combination of sugar and low pH of these medicines is sometimes complemented by a low salivary flow rate as a supplemental risk factor for dental problems.

The aim of this study was to determine the pH and SC in liquid oral pediatric medicines that are frequently used by Brazilian children in order to estimate the potential risk of these drugs for dental caries and dental erosion.

MATERIALS AND METHODS

A preliminary survey with pediatricians was performed to validate the information that the selected prescribed medicines were available in pharmacies and hospitals and that they were used by children in Brazil (data not shown). In total, 71 pediatric medicines of long-term use were listed and purchased for laboratory analysis (Table 1). The medicines were distributed according to therapeutic class as follows: antibiotics (n = 34, 47.9%), respiratory (n = 17, 23.9%), nutritional (n = 12, 16.9%), endocrine (n = 6, 8.5%), and cardiovascular (n = 2, 2.8 %).

TABLE 1. Medicine therapeutic class and trade name of liquid oral pediatric medicines frequently used for long term by children in Brazil, 2009

Therapeutic class	Trade name (concentration,[a] manufacturer)
Respiratory	Mucofan (100 mg/5 mL, União química),[b] Mucolitic (20 mg/mL, Altana),[b] Mucocistein (100 mg/5 mL, Neoquímica),[b] Carbocisteína (100 mg/5 mL, Neoquímica),[b] Carbocisteína (20 mg/mL, Medley),[b] Mucoplus (100 mg/5 mL, Medquímica),[b] Carbocisteína (100 mg/5 mL, Biosintética),[b] Asmax (1 mg/mL, Otivus),[c] Asmofen® (1 mg/5 mL, Teuto),[b] Zaditen® (0.2 mg/mL, Novartis),[b] Asmalergin® (1 mg/5 mL, Merck),[b] Fumarato de Cetotifeno (1 mg/5 mL, Medley),[b] Fumarato de Cetotifeno (1 mg/5 mL, Biosintética),[b] Apmed (240 mL, Grupo Cimed),[b] Apevitin BC (240 mL, EMS Sigma Pharma),[b] Polytina BC (4 mg/5 mL, IMEC),[b] Cobavital® (4 mg/5 mL, Solvay Farma),[b] Petivit® B-C (240 mL, Brasterápica),[b] Beritin BC (240 mL, Vitapan),[b] Cobactin® (0.8 mg/mL, Zambon),[b] Zetalerg (1 mg/mL, Uci-farma)[c]
Antibiotic	Trimexazol (40 mg + 8 mg, Sanofi-synthelabo),[d] Bactrim (200 mg/40 mg, Roche),[d] Medtrim F (400 mg + 80 mg/5 mL, Medquímica),[d] Bactropin (400 mg/10 mL+80 mg/10 mL, Grupo CIMED),[d] BacSulfaprim® (40 mg + 80 mg/mL, Sobral),[d] Belfactrim F (400 mg/5 mL+80 mg/5 mL, Belfar),[d] Infectrim (80/400 mg/10 mL, Boehringer Ingelheim),[d] Cefexina (250 mg/5 mL, Eurofarma),[d] Keflaxina (250 mg, Hexal),[d] Neoceflex (250 mg/5 mL, Neoquímica),[d] Uni Cefalexin (250 mg/5 mL, União química),[d] Cefagran (250 mg/5 mL, EMS Sigma Pharma),[d] Keflex (250 mg/5 mL, Lilly),[c] Duzimicin (250 mg/5mL, Prati, donaduzzi),[d] Amoxicilina (250 mg/5 mL, Furp),[d] Velamox (500 mg/5mL, Sigma Pharma),[d] Ocylin (250 mg/5 mL, Multilab),[d] Amox-EMS (250 mg/5 mL, EMS Sigma Pharma),[d] Amoxibron (250 mg/ 5 mL, Kinder),[d] Amoxicilina (500 mg/5 mL, Eurofarma),[d] Amoximed (250 mg/5 mL, Grupo CIMED),[d] Uni Amox (250 mg/5 mL, União química),[d] Medxil (250 mg, Medquímica),[d] Amoxina (250 mg/5 mL, Hexal),[d] Azitrolab (200 mg/5 mL, Multilab),[d] Astro (200 mg/5 mL, Eurofarma),[d] Azitromicina (600 mg, EMS Sigma Pharma),[d] Azi (200 mg/5 mL, Sigma Pharma),[d] Clindal AZ (200 mg/5 mL, Merck),[d] Azitrosol (600 mg, Luper),[d] Zitromax (200 mg/5 mL, Pfizer)[d]
Nutritional	Folacin (2 mg/5 mL, Otivus),[c] Folifer (0.2 mg/mL, Otivus),[c] Complexo B (120 mL, EMS Sigma Pharma),[b] Cewin (200 mg/mL, Sanofi-synthelabo),[c] Max tônico (25 mg/mL, Natulab),[b] Anemifer (100 mL, Pharmascience),[b] PerFER (300 mg/10 mL, Luper),[c] Sulferbel (250 mg/10 mL, Belfar)[b]
Cardiovascular	Digoxina (0.05 mg/mL, GlaxoSmithKline),[e] Digoxina (0.05 mg/mL, Prati, Donaduzzi)[e]
Endocrine	Dexazona (0.5 mg/5 mL, Bunker),[e] Dexaglós (0.5 mg/5 mL, Belfar),[e] Koide (0.5 mg/5 mL, Eurofarma),[e] Betamethasone (0.5 mg/5 mL, EMS Sigma Pharma),[e] Celestone (0.5 mg/5 mL, Schering-Plough),[e] Betamethasone (0.5 mg/5 mL, Medley)[e]

[a] mg = milligrams, mL = milliliters.
[b] Syrup.
[c] Solution.
[d] Suspension.
[e] Elixir.

The Lane–Eynon general volumetric method (AOAC method 968.281) adapted by the Adolfo Lutz Institute (15) was used to determine the SC, with glucose associated to fructose used as a reference measurement.

The glucose standards and medicine samples were weighed (2 to 5 grams (g)). Then, known volumes were transferred to volumetric flasks (100 milliliters (mL)) supplemented with distilled deionized water. The solutions were transferred to a burette and used to titrate the Fehling's solution under shaking and boiling conditions (electric plate model 752A, Fisatom, Brazil). The amount of solution used (mL) was recorded to estimate the percentage (wt/wt) of free glucose ($glucose_a$), as in the equation below:

$$\%\ \text{glucose} = 3.905 \bullet \frac{V^{-1.0251}}{2} \bullet \frac{100}{P}$$

where V is the volume of sample solution (mL) and P is the amount of the sample (g).

Medicine samples were prepared as described, acidified with 1 mL of hydrochloric acid (32%), and heated in a water bath (100°C ± 2°C) for 40 minutes to accelerate the hydrolysis of sucrose. After cooling, the solutions were neutralized with sodium hydroxide (40% wt/volume). Then, Fehling's solution was poured into each neutralized sample. SC was estimated by the difference between the glucose concentration of the sample solution after acid reaction ($glucose_b$) and the concentration obtained before the acid inversion ($glucose_a$) according to the following equation:

$$\%\ \text{sucrose} = [\text{glucose}_b] - [\text{glucose}_a]$$

All reagents were of analytical-reagent grade. The samples were analyzed in triplicate. The data were analyzed with

the aid of the computer program SPSS (Statistical Package for the Social Sciences, SPSS Inc., Chicago, Illinois, United States of America, version 13.0). Pearson's correlation and nonparametric tests (Kruskal–Wallis, Mann–Whitney U test) were applied when appropriate. Differences were considered significant at $P < 0.05$.

RESULTS

In general, SC ranged from 2.23% to 65.01% with a mean ± standard deviation (SD) of 31.75% ± 17.84% (wt/wt). Sucrose was not found in four preparations: sulferbel (nutritional), betamethasone (EMS Sigma Pharma) (endocrine), Medtrim F® (antibiotic), and Belfactrim F® (antibiotic). In the first two medicines, glucose concentrations were 30.25% ± 0.43% (wt/wt) and 28.19% ± 0.0% (wt/wt), respectively. In the remaining two, sugar was not detected. Glucose was found in 16 medicines, ranging from 6.60% to 33.57% (wt/wt). From all 71 package inserts, only two medicines (antibiotic) state the concentration of sucrose: 1.49% for Zitromax® suspension (Pfizer, 1.94 g/100 mL) and 27.78% for Keflex® solution (Lilly, 300 mg/mL). The SC values determined in our study for Zitromax® and Keflex® were 53.5% and 25.0% (wt/wt), respectively. Two antibiotic medicines with sulfamethoxazole and trimethoprim as active ingredients (Belfactrim F® and Medtrim F®) have package inserts that indicated the presence of sugar, although no reference to concentration was available. According to our analysis, sucrose and glucose were not present in these medicines.

Since the medicines can present different densities, the SC was also calculated taking into consideration the volume of the solution. Thus, for SC as g/100 mL the total mean ± SD value observed was 26.99 ± 14.85 g/100 mL, with a slightly lower value when using the weight. Figure 1 shows the median and quartiles of the SC (g/100 mL) for medicines within each therapeutic group. For glucose, the total mean ± SD value was 3.80 ± 8.14 g/100 mL. Fifty-eight medicines (81.7%) presented SC values above 10 g/100 mL, which might be clinically relevant for caries development.

The correlation between pH and SC of the medicines was statistically significant but not strong ($r = 0.58$; $P < 0.001$). The results are similar when the SC value is calculated by the volume of solution (g/100 mL) ($r = 0.57$; $P < 0.001$). Figure 2 shows this relationship in a regression line. The coefficient of determination obtained was $r^2 = 0.33$. For pH and glucose concentration, a statistically significant correlation of moderate intensity ($r = –0.60$; $P < 0.001$) was also identified. However, the relationship was inverse (negative).

FIGURE 1. Sucrose concentration (grams/100 milliliters) in relation to therapeutic class of medicines; median values are dark lines and boxes represent quartiles (note the outlier (O13) in the endocrine therapeutic group)

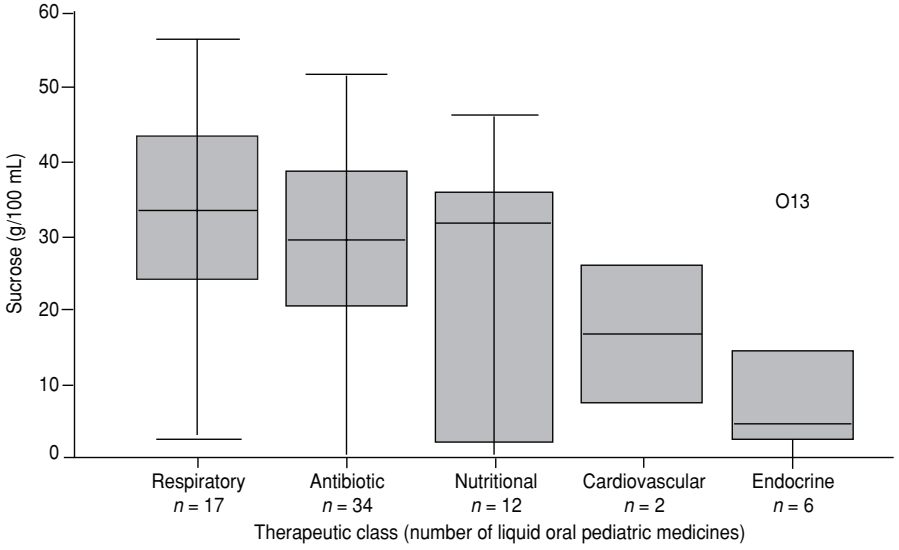
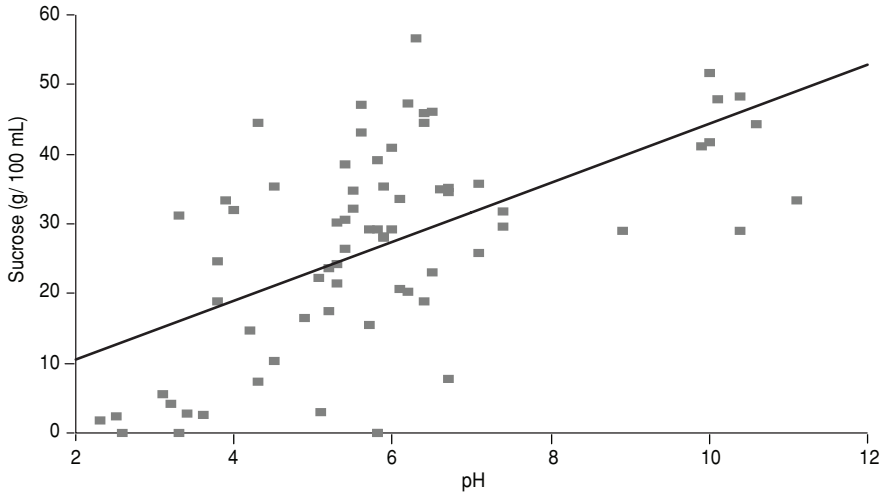


FIGURE 2. Relationship of sucrose concentration (grams/100 milliliter) and pH in medicines; regression line is indicated and coefficient of determination (r^2) = 0.33



The highest mean ± SD and median values of SC were observed in respiratory drugs (Table 2 and Figure 1). The mean SC value in respiratory drugs was followed by antibiotics, nutritional, cardiovascular, and endocrine medicines (descending order). Mean sucrose values for respiratory and endocrine medicines were found to be statistically significantly different ($P = 0.008$). This trend was also present for antibiotic and endocrine drugs ($P = 0.009$) (Table 2).

The sucrose content of the drugs was also evaluated according to the number of doses per day given to 7- to 12-year-old children (Table 3). The SC was higher in syrups (36.32% ± 17.62%) but with no statistically significant difference compared with other formulations ($P < 0.05$) (Table 4).

TABLE 2. Mean, standard deviation, confidence interval, and median sucrose concentration, according to therapeutic class, of liquid oral pediatric medicines frequently used for long term by children in Brazil, 2009

Therapeutic class	*n*	Percent sucrose (weight/weight)				pH			
		Mean (standard deviation)[a]	Confidence interval	Median	Mean rank	Mean (standard deviation)[a]	Confidence interval	Median	Mean rank
Respiratory	17	37.75 (17.23)^{v}	28.89–46.61	39.33	43.12	5.71 (0.89)^{v}	5.25–6.16	5.60	36.18
Antibiotic	34	34.23 (15.27)^{v}	28.90–39.56	34.10	37.82	6.85 2.10)^{v,w}	6.11–7.58	5.95	43.93
Nutritional	12	28.58 (20.80)^{v,w}	15.36–41.80	37.30	33.54	4.32 (1.76)^{x,y}	3.20–5.44	3.90	21.04
Cardiovascular	02	17.18 (14.53)^{v,w}	–11.43–47.79	17.18	18.50	6.90 (0.28)^{w,x}	4.35–9.44	6.90	58.25
Endocrine	06	11.97 (15.16)^{w,x}	–3.9–27.88	5.78	16.25	3.85 (1.07)^{y,z}	2.71–4.98	3.35	13.08
Total	71	31.76 (17.84)	27.53–35.98	33.93		5.89 (2.02)	5.41–6.37	5.80	

[a] Groups whose means are followed by distinct superscript letters (v to z) differ statistically (Kruskal–Wallis test).

TABLE 3. Mean, standard deviation, confidence interval, and median sucrose concentration, according to daily dose, of liquid oral pediatric medicines frequently used for long term by children in Brazil, 2009

Posology (daily doses)	*n*	Percent sucrose (weight/weight)			
		Mean (standard deviation)[a]	Confidence interval	Median	Mean rank
One time	13	47.15 (9.57)^{v}	41.36–52.93	53.29	49.15
Two times	22	24.42 (18.03)^{x}	16.42–32.41	26.22	22.45
Three and four times	30	34.43 (14.83)^{w}	28.89–39.97	36.12	33.73
Total	71	31.76 (17.84)	27.53–35.98	33.93	

[a] Groups whose means are followed by distinct superscript letters (v to w) differ statistically (Kruskal–Wallis test).

TABLE 4. Mean, standard deviation, confidence interval, and median sucrose concentration, according to formulation, of liquid oral pediatric medicines frequently used for long term by children in Brazil, 2009

Formulation	*n*	Percent sucrose (weight/weight)			
		Mean (standard deviation)[a]	Confidence interval	Median	Mean rank[a]
Syrup	23	36.32 (17.62)[a]	28.70–43.94	38.88	33.43
Suspension, solution, and elixir	48	29.57 (17.71)[a]	24.43–34.72	32.14	41.37
Total	71	31.76 (17.84)	27.53–35.98	33.93	

[a] Groups whose means are followed by distinct superscript letters differ statistically (Mann Whitney–U test).

The mean ± SD value of pH for the total sample of medicines was 5.89 ± 2.02 (range of 2.3 to 10.6). Thirty-one medicines could be ranked as having the potential to provoke dental erosion as their pH values were low (≤ 5.5, the critical pH for demineralization of tooth enamel in a low-calcium environment). Forty drugs with pH > 5.5 were not classified as erosive potential drugs. The mean ± SD of the SC observed for drugs with erosive potential was 22.14% ± 15.72% (confidence interval (CI) = 16.37–27.91); for the drugs with no erosive potential, the SC was 39.22% ± 15.82% (CI = 34.16–44.28) and was statistically significantly different ($P < 0.001$).

DISCUSSION

Most drugs evaluated showed high sucrose content, supporting previous findings (8, 12, 13). Such comparisons should be examined with caution, because in our study all available medicines on the market were tested, whereas in other studies only the most prescribed medicines were evaluated. However, in general the data obtained were very similar to those in other studies. For syrups, the amount of sucrose is usually high (above 35%), as indicated in many reports (6, 8, 12).

The highest SC values were among respiratory and antibiotic medicines. These drugs apparently have a fairly good potential to form a cariogenic biofilm. However, because the SC solution to form the cariogenic biofilm is 5% (15–17), it can be argued that nearly all sweetened drugs have the potential to provide conditions satisfactory for producing extracellular polysaccharides in dental biofilms that could lead to dental carious lesions (18, 19). Nevertheless, the cariogenic potential of any medicine must take into account not only its SC but also its frequency of use, dose, and pattern of use (13). In addition to those factors, individual characteristics must also be considered, such as salivary flow rate, buffer capacity, and others (18).

The drugs prescribed to be taken three or four times per day had a significantly lower sucrose content than the drugs with an indication for once daily intake. The latter medicines may present significant cariogenic challenges in the mouth; the administration of only one dose at night occurs during a period of significantly decreased salivary flow, which may increase the risk of caries development (20, 21). Saliva is an important caries protective factor and the presence of sugar in the oral environment every night for long periods can intensify the cariogenic potential of the drug.

In general, the amount of sucrose was low for drugs with a low pH (< 5.5, the critical pH for dental demineralization). This trend was also observed in respiratory and endocrine drugs, even when these medicines were allocated in a different therapeutic class. In addition, pH values observed in this study are comparable to the level found in several soft drinks, fruit juices, and teas, which are considered potentially erosive (22–24).

The positive correlation between sucrose and pH and the negative correlation between glucose and pH support

the idea that higher activity of hydrogen ions is associated with higher hydrolysis of sucrose into glucose and fructose. This decoupling would allow a different cariogenic effect between carbohydrate classes as solubility and clearance patterns may change between them. In addition, it has been observed that sucrose exposure can maintain reduced pH values for a longer period of time than other carbohydrates and the lowest baseline pH is frequently found in biofilms formed under exposure to sucrose (21). Therefore, the presence of glucose and mainly sucrose in the same solution, as occurred in some samples, can lead to increased cariogenic potential of some medicines (19).

The use of toothpastes with fluoride is an important factor for preventing or at least controlling dental caries (21, 25, 26). As noted by Duggal et al. (25), the ingestion of sucrose at 12% may occur up to five times a day without significant loss of hard tissue if the patient's oral hygiene includes toothpaste with fluoride (NaF, 1 450 micrograms/g) twice a day. However, if toothpaste with fluoride is not used, significant demineralization is observed in individuals exposed to carbohydrates three times a day. To support these data, it was observed that an initial dental caries (white spot) is visible on enamel surfaces when it is exposed to a regimen of 20% sucrose four times a day (18). As this conclusion was based on individuals exposed to and living in areas with fluoridated water (0.7 mg/L), it can be expected that children who live in cities with a fluoridated water supply and who take sweetened medicines frequently are at risk for developing dental caries if other preventive measures are not used. Diabetes mellitus is also a matter of concern. Hence, it is important that children and parents stay aware of the need to brush their teeth after taking each dose of medicine, to take medicines at meal times rather than between meals, and to avoid taking medicines before going to bed (8, 20). A recent study showed that intensive motivation of patients to maintain good oral hygiene is necessary even in specific situations. For instance, among renal transplant patients, good oral hygiene can reduce gingival overgrowth and increase the quality of life (27).

Public health policies must be implemented in order to control the excessive amount of sugar in medicines (8). This policy is valid for all countries where medicines in long-term use by children and adolescents are frequently used (1). Although this research evaluated medicines that are commercially available in the Brazilian market, many active ingredients of these medicines are nearly the same in many countries. Certainly, each country or region may have differences in dealing with prescription medicines for children and the reasons for greater rates of drug therapy among children can vary. In the United States, the Food and Drug Administration (FDA) Modernization Act of 1997 (FDA's "pediatric rule"), which provided incentives for pharmaceutical manufacturers to perform studies in children, is particularly noteworthy. This incentive may be related to the fact that approximately 100 medicines received a pediatric indication between 1998 and 2005 (1). Pharmaceutical markets outside the United States may follow the same trend, and health professionals must be aware of these facts because many of these medications for children are sweetened to increase patient compliance.

Dental caries and dental erosion are not acute severe conditions to be regarded as an adverse event. Thus, these chronic oral conditions are not included in the FDA reporting system (28). On the other hand, acidic and sweetened oral pediatric medicines for long-term use by children must be subjected to surveillance for localized intraoral conditions (9, 13).

The main limitation of this study is that this evaluation is of sucrose and pH in medicines available in the Brazilian market. Although similar medicines are available on all continents, new formulations are released annually in many countries and a local system of drug surveillance is necessary. Standard methods of evaluation are available and, despite few differences in procedures, studies are pointing out that caries related to sweetened medicines is a neglected problem (8–12). As the use of pediatric medicines containing sucrose is increasing in many countries, it is important that health professionals, particularly pediatricians and child health care providers, be aware of the risk of oral health imbalance during the continuous use of pediatric medicines. Oral hygiene must be stimulated for all children under medication. The use of noncariogenic substances in medicines or sugar-free medicines must be prescribed when possible.

In summary, our data showed that the pediatric medicines tested had a high concentration of sucrose, which varied depending on therapeutic class, daily dose, and formulation. Caution about dental caries, dental erosion, and systemic diseases such as diabetes mellitus is warranted when frequent ingestion of these medicines occurs.

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RESUMEN

Concentración de sacarosa y pH en medicamentos líquidos pediátricos para uso a largo plazo por vía oral

Objetivos. Determinar el pH y las concentraciones de sacarosa de medicamentos pediátricos líquidos de uso oral a largo plazo, para evaluar el riesgo potencial de caries y erosión dental.

Métodos. Se analizaron 71 muestras de medicamentos líquidos; después de evaluar el pH, se determinó la sacarosa por el método volumétrico de Lane–Eynon. El pH y los valores de sacarosa (media ± desviación estándar [DE]) se calcularon de acuerdo con la acción terapéutica.

Resultados. El valor de sacarosa más alto (media ± DE) se encontró en los medicamentos respiratorios (37,75% ± 17,23%) y el más bajo en los endocrinos (11,97% 15,16% ±) ($P < 0,01$). Los medicamentos recetados para ingerir una vez al día tuvieron valores de 47,15% ± 9,57%; los que se administran dos veces al día, 24,42% ± 18,03%, y los recetados tres o cuatro veces al día, 34,43% ± 14,83% ($P < 0,01$). Los valores de sacarosa fueron mayores en jarabes (36,32% ± 17,62%) que en otras formas farmacéuticas ($P > 0,05$). El pH general fue 5,89 ± 2,02 (recorrido 2,3 ± 0,01 a 10,6 ± 0,02). La sacarosa fue significativamente inferior en los productos con el pH ácido (22,14% ± 15,72%) que en los medicamentos no ácidos (39,22% ± 15,82%) ($P < 0,001$).

Conclusiones. Los medicamentos pediátricos estudiados tienen una concentración de sacarosa alta y un pH bajo, los cuales varían según la clase terapéutica, la dosis diaria y la marca. Cuando estos medicamentos se ingieren con frecuencia, se debe tener cuidado con la caries y la erosión dental, así como con las enfermedades sistémicas como la diabetes mellitus.

Palabras clave Sacarosa; concentración de iones hidrógeno; niño; preescolar; caries dental; erosión de los dientes; Brasil.