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Comunicação Breve *Brief Communications*

Sugar content in liquid oral medicines for children

Concentração de açúcares em medicamentos pediátricos na forma líquida

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Keywords
Pharmaceutical preparations, analysis. Administration, oral. Drug evaluation. Pediatrics.

Abstract
The most sold and/or prescribed liquid oral medicines for children in Tubarão, Southern Brazil, were assessed. Their sugar concentration was tested and compared to those in their directions for use. All pharmacies and pediatricians working in the city were visited by a previously trained interviewer. Pre-tested questionnaires were applied in order to assess the most sold pediatric as well as the most prescribed pediatric liquid oral medicines. Three samples of each medicine were analyzed by Lane-Eynon general volumetric method. Among the 14 most sold/prescribed medicines only four did not have sugar contents (analgesic, cortisone, and syrups). Sugar concentration ranged from 8.59 g/100 g of drug (SD=0.29 g/100 g) to 67.0 g/100 g of drug (SD=6.07 g/100 g). Only 50.0% of the total medicines that presented sugar in their ingredients showed this information in their directions.

Descritores
Preparações farmacêuticas, análises. Administração oral. Avaliação de medicamentos. Pediatria.

Resumo
Foram identificados os medicamentos infantis líquidos de uso oral mais vendidos e/ou prescritos em Tubarão, Brasil. Foi analisada a concentração de açúcares e comparados os achados com as informações presentes nas bulas dos medicamentos. Todas as farmácias e todos os médicos pediatras que trabalham na cidade foram visitados por um entrevistador previamente treinado. Utilizaram-se dois questionários pré-testados, para conhecer os medicamentos pediátricos mais vendidos e os mais receitados. Três amostras de cada medicamento foram analisadas pelo método geral de análise volumétrica Lane-Eynon. *Dentre os 14 medicamentos mais vendidos/prescritos somente quatro não apresentavam açúcares na sua composição (analgésico, cortisona, e xaropes). A concentração de açúcares variou de 8,59 g/100 g (DP=0,29 g/100 g) à 67,0 g/100 g (6,07 g/100 g). Somente 50% dos medicamentos analisados que continham açúcares apresentavam esta descrição na bula do medicamento.*

Sugar has been widely added to antibiotics and other pediatric medicines in order to improve their palatability. It is thus an additional source of sugar for pediatric patients, especially those chronically ill, who receive a greater sugar load from liquid medications than healthy children do and, consequently, have high caries prevalence.[3]

Most studies addressing this core issue have helped policy decision makers and health professionals to

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implement legislation and surveillance systems to control, avoid or replace sugar in medicines for non-cariogenic sugar, and showed promising results.[4]

The objective of this study was to assess the most prescribed and sold liquid oral medicines for children, verify their sugar concentration and to compare it to that in their directions for use.

METHODS

The study was undertaken in Tubarão, a medium-sized city located in the state of Santa Catarina (SC), Southern Brazil.

The study was divided in two phases. In the first phase, all public and private pharmacies (n=60) in the city were visited by a previously trained researcher. A questionnaire was applied to pharmacists in order to assess the most sold pediatric liquid oral medicines. Also, all pediatricians working in the city (n=13) were invited to answer a questionnaire about the most prescribed pediatric liquid oral medicines. It was asked for both pharmacists and physicians to list generic and commercial medicines. The two questionnaires were pre-tested in the neighbor city of Imbituba, SC.

In the second phase, the determination of sugar levels was carried out in the 14 most prescribed/sold commercial and generic medicines. It was used the Lane-Eynon General Volumetric Method (AOAC 968.28)[1] a titration method of determining the concentration of reducing sugars in a sample. A burette was used to add the carbohydrate solution under analysis to a flask containing a known amount of boiling copper sulfate solution and a methylene blue indicator. All solutions were prepared with deionized water and analytical reagent quality chemicals. Aqueous extracts of the samples (triplicate, n=3) were prepared using clearing agents as necessary, containing 250-400 mg reducing sugars per 100 mL. The per cent reducing sugar as glucose in the sample was determined as follows:

Per cent glucose = [(100 x A x a)/P x V]

(A= volume (mL) of solution of glucose] of sample; P= amount of glucose of sample; V= volume (mL) of sample aqueous solution used in titration; a= amount of glucose equivalent to 20 mL Fehling's solutions).

Sucrose amount was also determined through the inversion of a portion of sample aqueous solution with acid followed by neutralization with alkali and titration by the Lane and Eynon method, using standard invert sugar solution for calibration. *Per cent invert sugar x 0.95= per cent sucrose*. For the liquid oral medicines, by the presence of reducing sugars, the per cent of glucose was determined in the sample solution before acid inversion, and the per cent sucrose after that. If BI was the percentage of reducing sugars *before inversion* expressed as glucose and TI was the percentage of total reducing sugars determined *after inversion*:

Per cent sucrose = (TI - BI)

The inversion was prepared to a portion of the sample solution (containing 1 per cent total sugars) in a 200 mL flask, adding 20 mL inversion acid (50 mL conc. hydrochloric acid + 950 mL water). Left to the boil for exactly 30 s, the solution was rapidly cooled and neutralized by the cautious addition of 1 M sodium hydroxide in the presence of both litmus and Congo red indicator papers until red simultaneously.

All study medicines were purchased and there were no previous contacts with the pharmaceutical industry.

RESULTS

The response rate was 63.3% to pharmacists' questionnaires and 61.5% to pediatricians' questionnaires. The reasons for non-responses were refusal to respond the questionnaire and lack of interviews after three different visits.

The antibiotic amoxicillin *(Neo moxilin)* was found to be at the top of the list (21.8%) followed by the analgesic paracetamol *(Tilekin)* (16.4%). When the commercial name was asked to both the pediatricians and pharmacists, the first drug recalled was an antibiotic solution (27.1%) followed by a drug for treating bronchitis (18.6%).

Among the 14 most sold/prescribed medicines only four did not have sugar contents (analgesic, cortisone and two bronchodilators). All other medicines sold and prescribed in the studied area showed cariogenic sugar levels in their ingredients. The sugar concentration found ranged from 8.6 g/100 g of drug (SD=0.3 g/100 g) to 67.0 g/100 g of drug (SD=6.1 g/100 g). Only 50.0% of all medicines containing sugar levels analyzed showed this information in their directions for use.

DISCUSSION

More than 70% of the most consumed liquid oral medicines by children in Tubarão presented sugar in

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Table - Distribution and sugar content (g/100g) of the most commercial and generic liquid oral pediatric medicines prescribed. Tubarão, SC, Brazil, 2003.

Medicines*	Reducing sugar		No reducing sugar		Total sugars mean (SD)	Sweetening agents (label)	Sugar analyses
	N	%	N	%			
Syrup	-	-	-	-	-	Sorbitol	Sorbitol
Syrup	-	-	-	-	-	Sorbitol	Sorbitol
Syrup	23.10	24.08	22.88	27.95	49.1 (2.1)	Sucrose Sorbitol	Sucrose -
Solution	1.48	1.57	7.68	8.32	9.6 (0.4)	Sucrose	Sucrose
Suspension	4.49	4.92	12.41	13.78	17.8 (0.5)	Not available	Sucrose
Suspension	11.90	13.34	7.11	7.58	19.8 (0.6)	Not available	Sucrose
Solution	1.01	1.22	13.91	15.99	15.8 (1.2)	Sucrose	Sucrose
Solution	-	-	-	-	-	Sorbitol Sodium saccharin	Sorbitol Sodium saccharin
Suspension	1.97	2.92	5.84	6.79	8.6 (0.3)	Not available	Sucrose
Solution	33.74	36.01	26.35	35.49	67.0 (6.1)	Sucrose Sodium saccharin	Sucrose Sodium saccharin
Solution	14.44	16.01	40.67	42.08	56.5 (1.5)	Not available	Sucrose
Suspension	4.34	4.88	4.12	4.64	8.9 (0.6)	Not available	Sucrose
Solution	-	-	-	-	-	Not available	-
Suspension	2.91	4.14	5.03	5.70	8.7 (0.6)	Sucrose Sodium saccharin	Sucrose -

*Medicine's names can be assessed by contacting the main author

their ingredients. The prevalence of pediatric medicines with sugar found in this study was similar to those results from the international literature.[2] Notwithstanding, it is important to emphasize that these studies were conducted in the 80's.[2]

The list of the UK National Pharmaceutical Association (1984) shows that, for the available liquid oral medicines (prescribed and over-the-counter), 23% of a total of 210 were identified as sugar-free. By 1986, this proportion had risen to 35%. Therefore, another important point relates to the labeling of these drugs. In the current study 50% of all medicines analyzed were labeled as containing sugar, while in New Zealand about one-third of sugar-free medicines were labeled as such and only one-quarter were confirmed to be sugar-free in the New Ethical Catalogue.[2] It seems that there is a misconception among parents due to lack of information. Consequently, the pressure on drug companies makes it more difficult to remove sugar from liquid medicines or to use non-cariogenic substitutes.

Reducing the cariogenic potential of children's medications should be of concern to all health professionals. From an individual point of view it would be possible through educating children and their parents regarding the need to brush the teeth after taking each dose, to take medicines at meal times rather than between meals, to avoid taking medicines before bed, and the need to fluoride applications and regular preventive dental care. On the other hand, manufacturing children's medicines containing no fermentable carbohydrates with low prices should be the best public health policy. In addition, research should be developed in order to find acceptable levels of carbohydrates to help preserving medicines' palatability.

The *Agência Nacional de Vigilância Sanitária - Anvisa** (Brazilian National Health Surveillance Agency) has the responsibility to protect and promote health, ensuring the purity and safety of products and services. In relation to the quality of medicines it means to establish norms and standards regarding restrictions of sugar in medicines, and to guarantee full information in drug directions for use. On the other hand, to pressure manufacturers for them to produce all liquid pediatric medicine in sugared and non-sugared forms is the final step. This step can only be accomplished if pediatricians preferentially prescribe sugar-free medicines and promote sugar-free medicines to their patients. While increasing the importance health professionals attach to such products, future campaigns should also aim at increasing consumer's demand. Awareness of the danger posed by these medications should be promoted not only among prescribers, but also among pharmacists, manufacturers, regulatory authorities (Anvisa), and the public in order to bring about increased availability and use of sugar-free liquid medicines.

The control of sugar consumption in medicines may contribute to avoid other health problems such as diabetes. A public health policy must be implemented in order to limit sugar in medicines.

*Agência Nacional de Vigilância Sanitária (Anvisa). [Serial on-line] 2003. Disponível em: URL: http://www.anvisa.gov.br [2004 mar 12]

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