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CHANGE IN PLAQUE PH AFTER USING SIX COMMONLY PRESCRIBED PEDIATRIC SYRUPS: A RANDOMISED CONTROLLED STUDY

Dental Science

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ABSTRACT

Dental caries is one ofthe unremitting chronic diseases worldwide. Most people are unaware of the hidden sugars, mainly sucrose in the liquid pediatric medicines that can cause dental caries in children.

AIM: To investigatethetypeof sugar, the concentration of sucrose andtheeffectof threegroup of commonly used paediatric medication- antibiotics (Augmentin duo, oflomac) - analgesics (p-250, crocin),cough syrup-(Zedex p, coscopin) in the South Indian population.

MATERIALS AND METHODS:90volunteers at age group 18-23 years were randomly selected and grouped into 6 to test the drop in plaque pH on consumption of 6 commonly used liquid drugs and were refrained from brushing for 24 hrs. Digital pH meter was used to assess the endogenous and drop in plaque pH.

STATISTICAL ANALYSIS:Mixed ANOVA and Wilcoxon signed rank test was used to determine changes in plaque pH.Significance level was set at 0.05RESULT:Traces of sucrose was detected in the drugs and analgesic group differed from others for Ph.

CONCLUSION: Sweetened medications have a high risk of cariogenicity and should be prescribed with oral hygiene measures.

KEYWORDS

Dental caries, sucrose, pediatric drugs, ph.

INTRODUCTION

Dental caries is said to be the unremitting chronic disease of people worldwide, which has been seen in most of the people at present due to change in the lifestyle. Individuals are susceptible to dental caries throughout their lifetime. It has a deleterious effect on children's oral health. It has been proved that children with severe dental caries weighed less than those children who are caries free. Studies showed that dental caries occurs due to the decrease in plaque pH, the result of consumption of products with sugar content, mainly sucrose.

Sucrose remains easily available because it is cheap and non-hygroscopic. [2]. The pharmaceutical industry uses sugar, especially sucrose, in large quantities as it acts as a preservative, an antioxidant, a solvent, a demulcent, and a bulking agent.[3] Other studies have confirmed that these liquid preparations were cariogenic and acidogenic in nature.[7][8][10][23].

Feigal [14] et al proved that continuous administration of sucrose-based drugs caused dental caries. Rekola showed that sugar which are sweetened produced drop in plaque pH.

The present study is designed to investigate the type of sugar, the concentration of sucrose and the effect of three group of commonly used paediatric medication- antibiotics (Augmentin duo,oflomac) - analgesics (p-250, crocin), cough syrup-(Zedex p, coscopin) in the south Indian population.

METHODOLOGY

The present study included 6 commonly available over the counter drugs which belonged to various pharmaceutical manufacturing units of which two were antibiotics, two analgesics and two cough syrups. These drugs were selected after the brief discussion with the paediatrician, local pharmaceutical distributors of Chennai city regarding frequently prescribed paediatric medications for common conditions. Analysis of sugars for these drugs was performed by volumetric analysis at scientific food testing services (p) Ltd, Annanagar, Chennai, Tamilnadu. According to the report, analgesics had the higher concentration of sucrose whereas coscopin does not contain sucrose. The mean pH of the drugs was calculated after three trials using a digital pH meter with glass combination electrode which was previously calibrated at pH 7 and buffer solution pH 7.

90 study subjects in the age group 18 – 23 years were selected who are caries free, not undergone any restorative treatment before, no habit of tobacco and smoking. Ethical clearance was obtained from the ethical committee of Sathyabama University, Chennai. Written consent was obtained from the participants. Baseline plaque pH was determined. Participants were requested to refrain from brushing for 24 hours. They were divided into 6 groups with 15 participants each and were asked to swish 5ml of test drug for over 1 minute and spit it. The plaque was collected using explorer from buccal surfaces of posterior teeth and mixed with 20 ml of distilled water. pH was determined at the time intervals of 0 , 10 , 20 , 30 minutes.

Obtained data were subjected to statistical analysis.

RESULT

Mixed ANOVA with Repeated Measures is used to compare mean pH between paediatrics drug groups and time intervals.

If significant shift in mean between time intervals and drug groups is evidenced in ANOVA result, a pairwise comparison is conducted between the drugs using Bonferroni post hoc test. This helps to justify which drug group has significantly increased/decreased from other.

Similarly, if significant shift in mean between time intervals is evidenced, Wilcoxon signed rank test is used to compare mean pH between the time intervals.

Significance Level: 0.05

From graph 1 it is evidenced that the pH of crocin showed the highest drop, all drugs tested had their maximum drop in pH within 10 minutes and raised in 30 minutes.

From the pairwise comparison , we evidenced that Analgesics drug group significantly differs from the other two groups for pH.

DISCUSSION

Paediatric medications in liquid form are more commonly prescribed and widely accepted by parents and children. This is due to the presence of various forms of sugars such as sucrose, glucose, fructose etc. Furthermore, the endogenous pH of a medication can be rapidly intraorally changed by salivary buffers. The bacteria metabolize the sugar to acid end-products, thus decreasing the plaque pH that is relatively unavailable to salivary buffering. Low pH around the tooth

surface causes ionic dissolution from the hydroxyapatite crystals and eventually causes carious lesions.[13]. Hence, the aim of our study was to assess the changes in dental plaque pH after rinsing with commonly used paediatric liquid medications at the given time interval.

On an average 17% of children are given no prescribed cough syrups[14]. Analgesics, cough syrups, and antibiotics are the commonly prescribed over-the-counter liquid preparations given to children[15] Thus, the observations formed the basis for the selection of paediatric medications in our study.

The added sugars , flavours and low endogenous pH markedly contribute to the cariogenic potential of these paediatric liquid preparations. The pH of these medications ranged from 3.0 to 6.2. Lima *et al*[10]and Grenby[16] showed that the pH of many drugs is below critical pH.Cavalcanti*et al*[17] Observed that very low pH values in 4 out of 7 antitussive medicines tested. One of the medicines (Mucolin) showed an extremely low pH of 2.65. Greenwood reported an acidic pH of 2.86 in a liquid syrup.[7]. Brazilian studies demonstrated that the endogenous pH of several paediatric medications was below the critical pH of 5.5, ranging from 2.64 to 5.4.[11][18].

Sugar is used as a vehicle in almost all the paediatric formulations prepared for children. The amount of sucrose present in these medicines varies from 0% to 67%.[6][10]. Concentrations of .sucrose ranging from 11% to 86% were observed in 10 of 23 samples[10] An Indian study showed that a range of 20.62%–68.26% were present in paediatric syrups.[4]. Pomarico*et al*[19] Observed the presence of sucrose in seven of the ten samples studied, which were ranging between 5 and 54 g%. Some studies have shown that the sugar content in paediatric syrups ranged from 12.0% to 54.87%[11][13]Some investigators stated that when sugar-containing liquid medications given to chronically sick children for a prolonged period, they pose potential threat to dental health[9][13]

In the present study, a significant decrease in plaque pH was recorded after oral rinsing with liquid medications. Maximum fall in pH was recorded in most of the subjects who participated in the study; pH drop was seen within 10 min of rinse of test drugs. The baseline pH between 6 and 7. Similar results were given by other authors [20][21][22] and they concluded that the value of baseline pH is not related to the caries prevalence. However, there will be a drop in the plaque pH when liquid preparations with sugar and acids are consumed. Our findings were similar to earlier studies.[1][8][10][12][24][25] Among all the medications used, crocin showed the maximum drop in plaque pH. This may be due to the presence of high concentration of sucrose. In all the volunteers exposed to drugs, there was a gradual recovery of the oral pH to the near-normal value within 30 min. This can be due to the salivary buffering system (mainly bicarbonates), which gets activated with the increased salivary secretion and occurs due to an acidogenic challenge.

CONCLUSION

Sweeteners with low pH have the higher risk of cariogenicity. Thereby incorporation of non-sweetened or sugar-free sweeteners in the drugs, syrups are to be recommended.

Along with the prescription of sweetened medicine, drugs or syrups dental personnel or oral hygiene adviser should instruct the parent or the caretaker on oral hygiene practices after consumption of those medications.

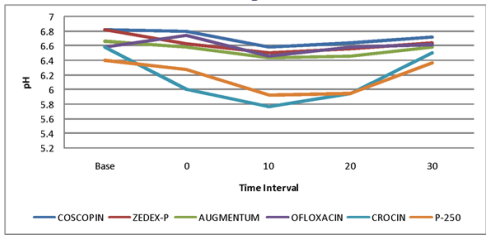
Table: 1 shows pair wise comparison with pH

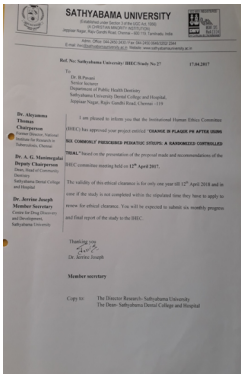
(I) Group	(J) Group	Mean Difference (I-J)	Sig.a
COUGH SYRUPS	ANTIBIOTICS	.100	.246
	ANALGESICS	.502*	.000
ANTIBIOTICS	COUGH SYRUPS	-.100	.246
	ANALGESICS	.402*	.000
ANALGESICS	COUGH SYRUPS	-.502*	.000
	ANTIBIOTICS	-.402*	.000

Table:2 sucrose concentration of each drug.

Paediatric drug syrups	Sucrose concentration in %
Coscopin	NIL
Zedex P	8.22
Augmentin duo	13.55
Oflomac	38.53
Crocin	52.94
p-250	58.37

Graph: 1 shows the mean trend of pH with time interval

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