

Original Article

IN-VITRO STUDY FOR COMPARATIVE ANALYSIS OF EROSION POTENTIAL OF PAEDIATRIC LIQUID MEDICINAL SYRUPS ON DECIDUOUS TEETH

Lakshay Dhawan¹, Geetanjali¹, Akshay Narang¹, Gaganjot Singh Gill¹, Jaswant Singh Toor,¹
Satwant Singh Sandhu¹

¹BDS Student, Dasmesh Institute Of Research And Dental Sciences, Faridkot.

Abstract

Background: The trifling illnesses in childhood such as fever, cough, and anaemia are very common and frequently need medications such as antipyretic deiron syrups for these conditions.³ A high consumption of these oral medicinal syrups may be strongly associated with severe cases of dental erosion in childhood especially among children under age of 2 years. The present study was planned to comparatively analyse the erosive potential of paediatric liquid medicinal syrups on deciduous teeth. **MATERIALS AND METHOD:** A total of 20 extracted non-carious deciduous molars were selected for the study. To check the erosion potential of medicinal syrups, commonly used pediatric syrups were selected. The selected medicinal syrups included FeriumXT (for anaemia), Crocin syrup (antipyretic), Wikoryl syrup (cough syrup), and artificial saliva (control). **RESULTS:** The comparison of microhardness between four groups shows that there is a continuing loss of microhardness in all the groups on all days as compared to control group. Crocin was observed to be the most erosive with loss of microhardness from 301.16 ± 0.72 on 7th day to 295.76 ± 0.46 on 30th day. **CONCLUSION:** The evaluation of micro hardness of enamel showed that antitussive syrup (Ascoril-D) had highest erosive potential. Because of the regular need of these syrups for children and associated risk of tooth damage certain recommendations should be made to avoid the same like mouth rinsing with water; addition of calcium, fluoride, or phosphate to formulations; and consumption of the medication at meal times.

Keywords: Deciduous Teeth, Dental Erosion, Pediatric Syrups

Corresponding Author-Dhawan L. BDS Student, Dasmesh Institute Of Research And Dental Sciences, Faridkot.

This article may be cited as Dhawan L, Geetanjali, Narang A, Gill GS, Toor JS, Sandhu SS. An in-vitro study for comparative analysis of erosive potential of paediatric liquid medicinal syrups on deciduous teeth. *Int J Com Health and Med Res* 2017;3(2):92-95

Article Received: 23-05-17

Accepted On: 03-06-2017

INTRODUCTION

Nowadays, dental erosion is commonly seen as an important etiological factor in the loss of tooth structure in adults as well as quite commonly seen in children and adolescents. Dental Erosion is the chemically dissolving of the hard tissues of the teeth by intrinsic or extrinsic acids, exposure of teeth to acidic drinks or foods consumed frequently, or reflux of gastric acid in mouth.¹ Deciduous teeth are more susceptible to acidic and cariogenic environment because of difference in its

enamel thickness, mineralisation levels, and structural arrangement from that of permanent teeth.² The trifling illnesses in childhood such as fever, cough, and anaemia are very common and frequently need medications such as antipyretic deiron syrups for these conditions.³ A high consumption of these oral medicinal syrups may be strongly associated with severe cases of dental erosion in childhood especially among children under age of 2 years.⁴ These preparations are often acidic in nature which is necessary for drug

dispersion and chemical stability maintenance to ensure physiological compatibility and for improvement of flavour.⁵ Other factors such as prolonged and frequent ingestion (i.e., two or three times daily), bedtime and between meals consumption, high viscosity, and additional effect of reduced salivary flow may precede and increase the risk for medication induced dental erosion.⁶ So, the present study was planned to comparatively analyse the erosive potential of paediatric liquid medicinal syrups on deciduous teeth.

MATERIAL AND METHODS

The study was conducted in the Department of Paediatric Dentistry of Dental institution. The ethical approval for the study was obtained from ethical committee of the institute. A total of 20 extracted non-carious deciduous molars were selected for the study. The teeth were cleaned and hand scaled before the use to get rid of any calculus or debris on the surface of teeth. Teeth with any kind of structural ability were excluded from the study. The selected teeth were cut from the CEJ and roots were separated from the crowns. Now, only crowns were mounted in the wax blocks. To check the erosion potential of medicinal syrups, commonly used pediatric syrups were selected. The selected medicinal syrups included FeriumXT (for anaemia), Crocin syrup (antipyretic), Wikoryl syrup (cough syrup), and artificial saliva (control).

The extracted teeth were immersed in 5 ml sample of each medicinal syrup for 1 min, 3 times daily after an interval of 6 hours. This cycle was repeated for 28 days. Between the immersion cycles, the teeth were thoroughly washed with distilled water and placed in artificial saliva at 37°C. The surface microhardness of the teeth were measured using universal micro hardness machine at 7, 14, 21, and 28 days and was noted for analysis. The statistical analysis of the data was done using SPSS software for windows. Chi-square test and Student’s t-test were used for determining significance of the data. Statistical significance was predetermined at P<0.05.

RESULTS

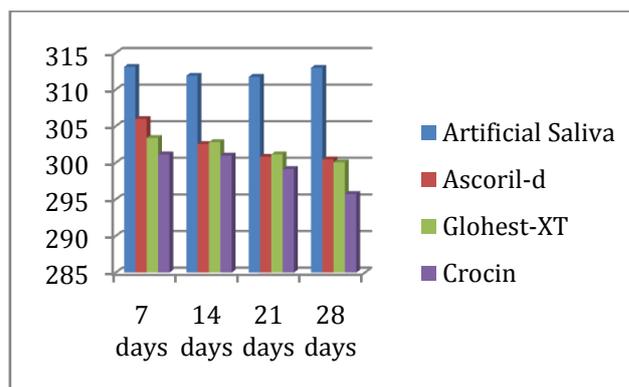
We observed that significant erosive effect of Ascoril-D on primary enamel was seen on all days but only 7th and 28th day demonstrated statistically significant difference with P value less than 0.05. As seen in Table 1, the comparison of microhardness between four groups show that there is a continuing loss of microhardness in all

the groups on all days as compared to control group. (P<0.05). On comparison between three medicinal syrups, Crocin was observed to be the most erosive with loss of microhardness from 301.16±0.72 on 7th day to 295.76±0.46 on 30th day. (P<0.05) [Figure 1].

Table 1: comparative analysis of microhardness of all groups

Solutions	7 days	14 days	21 days	28 days	P-value
Artificial Saliva	313.12±1.45	311.91±1.42	311.75±1.25	312.9±0.28	0.45
Ascoril-d	306.00±1.50	302.58±0.14	300.83±0.38	300.46±0.70	0.22
Glohest-XT	303.41±0.38	302.83±0.57	301.17±0.80	300.08±0.87	0.013
Crocin	301.16±0.72	301.00±0.25	299.17±0.62	295.76±0.46	0.023

Figure 1: Comparative analysis of microhardness of all the groups



DISCUSSION

The present research provided evidence that the studied medicines could potentially erode deciduous tooth enamel after successive immersion cycles. There was a decrease in the microhardness of the surface of enamel which is the result of mineral loss caused by medicine intake. In our study, antitussive syrup (Ascoril-D) presented the highest erosive potential showing substantial in microhardness compared to iron preparation(Glohest-XT) and Crocin. Zhao, D et al examined the softening and erosive impacts of different pediatric over-the-counter (OTC) oral fluids on deciduous teeth. Twenty separated and cleaned deciduous extracted teeth were ground on the buccal surface and arbitrarily partitioned into five gatherings, drenched into four financially accessible pediatric OTC oral fluids (two for paracetamol, both sugared; and two for chlorpheniramine, one sugared and one lacking sugar), with deionized water as control. The pH of

the oral fluids runs from 2.50 to 5.77. Each piece was drenched into the test or control bunches for 15 s, washed with deionized water, and Vickers miniaturized scale hardness ($n = 5$) was measured. After twenty cycles of submersion and hardness estimations, Scanning Electron Microscope (SEM) and Energy Dispersive X-beam Spectrometry (EDS) were utilized to assess the surface morphology and science of the tooth pieces, separately. The pH estimations of the fluids were additionally recorded. Quickly diving patterns in the miniaturized scale hardness proportions of the four test gatherings were watched that were factually not the same as the control gathering ($p < 0.001$). EDS demonstrated an expansion of Ca/C proportion after medication submersion, while SEM demonstrated a polish misfortune in all the test gatherings. Pediatric OTC oral fluids could essentially mollify the finish and render them more helpless to caries, to such an extent that the detailing of the oral fluids is the central point. Camila S et al assessed, in vitro, the erosive capability of pediatric fluid solutions in essential tooth finish, contingent upon the introduction time. Sixty deciduous incisors were arbitrarily allocated to 4 gatherings ($n=15$), as indicated by the inundation arrangements: guaifenesin; ferrous sulfate; salbutamol sulfate and simulated spit. The drenching cycles in the medications were attempted under a 1-min fomentation, which was performed three times day by day, amid 28 days. Surface microhardness was measured at 7,14, 21 and 28 days. The titratable acidity and buffering limit of the submersion media were resolved. Information were broke down by Analysis of Variance and Tukey's test ($\alpha=0.05$). Salbutamol sulfate caused a continuous misfortune in veneer microhardness deciduous, seen at all circumstances ($p<0.005$). Presentation to guaifenesin or ferrous sulfate brought about huge abatement of lacquer microhardness simply following 28 days ($p<0.005$). In the control gathering (counterfeit salivation), microhardness did not changed ($p>0.005$) at any of the examined times. Checking Electron Microscopy (SEM) pictures uncovered that following 28 days the surfaces plainly showed auxiliary misfortune, which was not at all like those inundated in manufactured salivation. Disintegration of deciduous polish was reliant on the sort of medication and presentation time.^{7, 8} Kiran et al investigated the exogenous erosive potential of most commonly used pediatric syrup medicaments on primary teeth. The erosive potential of 17 syrups was assessed by measuring their inherent

pH, titratable acidity, viscosity and ability to erode enamel. The inherent pH and titratable acidity of syrups were measured using digital pH meter and viscosity was determined using Brookfield viscometer. Enamel surface changes were evaluated using optical 3D profilometer. Api –up (appetizer) showed the least pH and Azee (Azithromycin) exhibited the highest pH. The titratable acidity was greater for Api-up (5.40ml) and least for Tonoferron (0.20ml). Asthalin exhibited highest viscosity and Ondem showed least viscosity. All the test syrups caused some degree of enamel loss, however, Api – up caused the greatest and Azee caused the least degree of enamel loss at three time intervals. The authors concluded that the medicated syrups with low inherent pH and high viscosity showed to cause a greater dissolution of enamel. Those with high viscosity showed lesser degree of enamel loss due to their basic pH. Sowmya K et al analyzed the endogenous pH, viscosity and total sugar content in 20 commonly prescribed pediatric liquid analgesics. The pH of each medicine was determined using a digital pH meter (Elico pH meter), viscosity measured using a calibrated digital rotational viscometer (Brookfield viscometer) and sugar content in these medicines was measured using Fehlings method. The pH values of all syrups tested are below critical value of 5.5 with lowest pH in Syr. Ibuprofen group with mean value of 3.98, sucrose was seen to be maximum in Syr. Ibuprofen group in the mean concentration of $43.13\% \pm 0.25\%$ and viscosity was found to be higher in Syr. Combiflam group with mean value of 897 cP. In summary, their study showed that most PLA tested had pH values below the critical value, high viscosity and high total sugar content all of which increase the medicines cariogenic and erosive potential.^{9, 10}

CONCLUSION

The evaluation of micro hardness of enamel showed that antitussive syrup (Ascoril-D) had highest erosive potential. Because of the regular need of these syrups for children and associated risk of tooth damage certain recommendations should be made to avoid the same like mouth rinsing with water; addition of calcium, fluoride, or phosphate to formulations; and consumption of the medication at meal times.

REFERENCES

1. Linnet V, Seow WK. Dental erosion in children: A literature review. *Am AcadPediatr Dent* 2001;23:1.

2. Scatena C, Galafassi D, Gomes-Silva JM, Borsatto MC, Serra MC. In vitro erosive effect of pediatric medicines on deciduous tooth enamel. *Braz Dent J* 2014;25:22-7.
3. Lussi A, Jäggi T, Schärer S. The influence of different factors on in vitro enamel erosion. *Caries Res* 1993;27:387-93.
4. Amaechi BT, Higham SM. In vitro remineralisation of eroded enamel lesions by saliva. *J Dent* 2001;29:371-6.
5. Shellis RP, Ganss C, Ren Y, Zero DT, Lussi A. Methodology and models in erosion research: Discussion and conclusions. *Caries Res* 2011;45Suppl 1:69-77.
6. Zero DT. Etiology of dental erosion – Extrinsic factors. *Eur J Oral Sci* 1996;104:162-77.
7. Zhao, D.; Tsoi, J.K.-H.; Wong, H.M.; Chu, C.H.; Matinlinna, J.P. Paediatric Over-the-Counter (OTC) Oral Liquids Can Soften and Erode Enamel. *Dent. J.* 2017, 5, 17.
8. Camila S, Daniel G, Miranda J, Cristina BM, Campos SM. In Vitro Erosive Effect of Pediatric Medicines on Deciduous Tooth Enamel. *Braz. Dent. J.* [Internet]. 2014 Feb [cited 2017 June 15]; 25(1): 22-27.
9. Kiran, Vinay C, Uloopi KS , Sekhar RC , Madhuri V and Alla RK. *BJMMR*, 5(4): 525-532, 2015; Article no.BJMMR.2015.057
10. Sowmya K, Pranitha K, Dwijendra KS, Pujita C, Nagarjuna G et al. *Int. J. Pharm. Med. Res.* 2016; 4(3):317-320

Source of support: Nil

Conflict of interest: None declared

This work is licensed under CC BY: *Creative Commons Attribution 4.0 License.*