ORIGINAL ARTICLE

Prevention of Dental Decay: Role of Fluoride in Dentifrices

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ABSTRACT

Objective: To identify the different fluoride levels and compounds in locally manufactured tooth pastes and the dental caries status of Karachi, Pakistan. Cross-Sectional Study
This study was conducted in the Dental Out Patient Department (OPD) of a public sector tertiary care hospital, over a period of 15 days. The local brands of toothpastes available were collected through the market survey of a major departmental store of Karachi. The quantity and the compound of fluoride claimed by the manufacturer were recorded. A group of 300 patients were evaluated through a structured proforma for their demographic characteristics, brand name of the tooth paste which they claimed to use for the past six months and the number of decayed teeth (by type 1 dental examination).
Results: The clinical dental examination revealed that active tooth decay of 32.33%, 15.33% and 52.33% was observed in subjects reported the use of tooth paste with 1000ppm, 1400ppm and those which did not claim any fluoride concentration, respectively. Decay count of 52.66% was identified in subjects who used tooth pastes with sodium fluoride, while it was 37.33% where sodium mono fluoro phosphate was present.
Conclusion: Relative caries preventive effects of fluoride toothpastes increase with increase in fluoride levels. NaF has been found to be superior to SMFP for the control of dental caries.

Key words: fluorides, toothpastes, dental caries, primary prevention.

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INTRODUCTION

Oral diseases have been considered as major public health problems because of their high prevalence and incidence throughout the world.[1] Even though majority of these diseases including dental caries are highly preventable; the prevalence of dental decay is increasing significantly.[2] So far World Health Organization (WHO) global data has reported DMFT score in Pakistan as 1.38 which was previously 0.9.[3-5] Many reasons have been identified for this trend. The most prominent one is the lack of implementation of oral health programs recommending the use of self applied topical fluoride as a major primary preventive measure to avoid the severe consequences of dental caries. WHO strongly advocate the availability of affordable fluoride toothpastes after recognizing dental caries as the major public health problem.[6]

Fluoride is a naturally present cavity fighter and fluoride dentifrices are the most cost effective methods towards the prevention of dental caries.[2] It has been reviewed that reduction in dental caries prevalence is associated with increased use of fluoridated dentifrices. Therefore, this has been proposed as the method of choice for caries prevention.[7] However, the action of fluoride in reducing dental caries is affected by the concentration of fluoride, type of fluoride compound, frequency of brushing and the total exposure time.[8] In the developed countries, fluoride was included in almost all commercial toothpastes since 1980, with the concentration ranging from even less than 500 - 1500 parts per million of fluoride (ppm F).

Sodium fluoride (NaF), sodium monofluorophosphate (SMFP) and amine fluoride are the commonly incorporated fluoride compounds in dentifrices.[9]

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Previous studies have identified the effective level and compound of fluoride in tooth pastes to prevent caries in many developed[7,10] and developing countries,[11] but there has been no data reported in Pakistan. This indicated the need to determine the effective elements for fluoride utilization in the local population that still remains caries-activ.[12]

Therefore, this study was undertaken to identify the different fluoride levels and compounds in locally manufactured tooth pastes and the dental caries status of our local population.

METHODOLOGY

For this cross-sectional study, methodology was divided into two phases. In phase-1, a single biggest departmental store of Karachi was visited to identify the local brands of toothpastes available for its local population. All these brands were observed for the presence or absence of fluoride claimed by the manufacturer, their concentrations in ppm and fluoride compound in the active ingredient list. Findings of this survey were transferred on to a pre-designed information sheet. This sheet had three categories for both, the fluoride concentrations (500-1000 ppm F, 1100 -1500 ppm F and no claim level) and fluoride compounds (NaF, SMFP and no claimed compound).

In the phase-2, a structured proforma was designed to collect and record the data. The proforma included the close ended questions regarding the details of demographic characteristics (age, gender and area of residence), names of the tooth pastes brands identified in phase-1 and the number of dental decay evaluated through dental examination.

A group of 300 subjects visiting the dental OPD of a public sector tertiary care hospital was selected through convenient sampling. Demographic details were entered in the questionnaire and the subjects were asked to report the name of any one of the regular toothpaste in their use for past six months. Later, Type-1 dental examination[13] was performed to record the number of decayed teeth in each individual. Patients, who reported toothpastes other than those which were identified in phase- 1 and who did not consent, were excluded from this study.

Number of decayed teeth was then evaluated at three different levels of fluoride concentration, that is, at 500-1000 ppmF, at 1100-1500 ppmF and at no claimed level. Decay count was also investigated in accordance with the fluoride compounds present in dentifrices, which were NaF, SMFP and no claim level.

Data entry and analysis was done using Statistical Package of Social Sciences (SPSS) software version 16.0. Descriptive statistics were performed that involved the frequencies of age and gender. Cross-tabulations were done between dental decay count and different fluoride levels and compounds.

RESULTS

Out of the total 20 toothpastes brands identified from local market, 15 claimed the presence of fluoride. Out of these 15 fluoridated toothpastes, only two claimed to have fluoride concentration of 1400 ppm, five with 1000 ppm and eight with no fluoride concentration labeled on the toothpaste. Eleven brands claimed to have sodium mono fluoro phosphate, whereas, sodium fluoride was observed in four different brands.

Total 300 subjects were acquired with a response rate of 85%. Out of total subjects (mean age 31.60 ± 15.57) 148 were males (49.33%) and 152 were females (50.66%). Clinical dental examination revealed that the active dental decay count ranged from zero to 10 with and a mean active decay= 2.71 (SD=2.28).

Table 1: Fluoride levels and decay count.

Decay Count	Fluoride Levels			Total
	500 to 1000 ppm	1100 to 1500 ppm	No claim	
0	15	5	28	48
1	22	9	36	67
2	14	7	30	51
3	11	6	21	38
4	10	8	15	33
5	10	1	11	22
6	6	5	9	20
7	5	4	0	9
8	0	0	5	5
9	3	1	2	6
10	1	0	0	1
Total	97	46	157	300

ppm = parts per million

Table 1 represents cross-tabulation between the three fluoride concentration categories (1400 ppm, 1000ppm and no fluoride concentration label) with the total active decayed teeth count. The clinical dental examination revealed that active tooth decay of 32.33%, 15.33% and 52.33% was observed in subjects reported the use of tooth paste with 1000ppm, 1400ppm and those which did not claim any fluoride concentration, respectively.

The two compounds, sodium fluoride and sodium mono fluoro phosphate were also cross tabulated with number of dental decay [table 2]. Increase in decay

count (54.33%) was observed in subjects using toothpastes with sodium mono fluoro phosphate in comparison to those with sodium fluoride (37.33%).

Table 2: Cross tabulation between fluoride compounds and decay count

Decay Count	Fluoride Compounds			Total
	NaF	SMFP	No claim	
0	18	28	2	48
1	20	40	7	67
2	18	32	1	51
3	12	23	3	38
4	14	14	5	33
5	11	7	4	22
6	7	13	0	20
7	6	3	0	9
8	1	1	3	5
9	4	2	0	6
10	1	0	0	1
Total	112	163	25	300

NaF = sodium fluoride
SMFP = sodium mono fluoro phosphate

DISCUSSION

It is frequently encountered that the fluoride level and type are not clearly labeled on local dentifrices.[11] The outcome of this short term evaluation study also reported that majority of the commercial brands of tooth pastes did not mentioned the details of fluoride concentration and compound in the active ingredient list. This may suggest that the dentifrices do not contain the required and recommended concentrations and compounds.

World Health Organization strongly advocates the availability of affordable fluoride toothpastes after recognizing dental caries as the major public health problem.[6] The international standard level of fluoride in tooth pastes is 1000 to 1500 ppm for all ages in order to reduce the caries burden.[14-16] Evidences have changed the trend further; it has been now proved that fluoride has more preventive effect against dental caries when it is used in the concentration of 1500 ppm in comparison to those having 1000 ppm of fluoride.[7,17] The outcomes of this study are concomitant with the previous literature available and has shown that decreased caries count was present in patients reported the use of toothpaste with 1400 ppm of fluoride.

Given the fact that a small difference in dental caries count has been calculated in the two categories of toothpastes one having NaF and other SMFP, increase decay is seen in the second group. Previous studies have suggested NaF and amine fluoride as more superior to SMFP for the control of dental caries.[10,18]

The data for this study was collected from an OPD of a public sector dental hospital located in the highly populated area of Karachi. This hospital provides the quality dental treatment to the patients on very nominal charges and so has a huge turnover of the patients coming from almost all the localities of the city. The novel approach of this research was to identify the different concentrations and compounds of fluoride in tooth pastes and the dental caries status of local population of Karachi, which has not been done earlier.

The results of this study would have been more authentic, if the frequency and time period of brushing was also recorded, as dental decay is also strongly related with these two variables.[8] As the data was been collected from a dental OPD, majority of the subjects presented with decayed teeth and candidates with 'no decay' were very few and the results are not applicable at community level.

This may be suggested from this institutional based study that further research is needed before definitive recommendations can be made regarding the use of fluoride tooth pastes. There is a clear requirement of larger scale, community level research in this field. Clinical trials should be performed to measure the claimed fluoride concentrations. Later on, the manufacturers should be advocated to incorporate the recommended fluoride concentrations and to have a strict quality control on the fluoride dentifrices in order to reduce the caries burden from this part of the world.

CONCLUSION

Within the limits of the present study, the results indicated that the relative caries preventive effects of fluoride toothpastes of different concentrations increase with higher fluoride levels.

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REFERENCES

1 Petersen PE. The World Oral Health Report 2003: Continuous Improvement of Oral Health In The 21st Century, The Approach of the WHO Global Oral Health Programme. Community Dent Oral Epidemiol 2003;31:3-24.

2 Petersen PE, Phantumvanit P. Perspectives in the Effective use of Fluoride in Asia J Dent Res.2012;91:119-21.

3 Khan AA, Sharea I, Ayma S, Ambreena Q, Inayatullah P, Sofia S. Oral Health inÊPakistan: A situation analysis. Dev Dent 2004;5:35-44.

4 Bratthall D. Estimation of Global DMFT for 12year Olds in 2004. Int J Dent 2005;55:370-2.

5 Maxood A. Dental Caries Status in 6-9 Years Old Children. Pak Oral Dent J 2008;28:107-12

6 Petersen PE, Lennon MA. Effective Use of fluorides for the Prevention of Dental Caries in the 21st Century: The WHO Approach. Community Dent Oral Epidemiol 2004;32:319-21.

7 Walsh T, Worthington HV, Glenny AM, Appelbe P, Marinho VC, Shi X. Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents [Internet]. Cochrane Database Syst Rev; 2010.doi:10.1002/14651858.CD007868.pub2.

8 Zero D. Dentifrices, Mouthwashes and Remineralization / Caries Arrestment Strategies. BMC Oral Health 2006;6:1-9.

9 Marinho VC, Higgins JP, Sheiham A, Logan S. Fluoride toothpastes for preventing dental caries in children and adolescents [Internet]. Cochrane Database Syst Rev;2003.doi:10.1002/1465/858.CD002278.

10 Arnold W, Dorow A, Langenhorst S, Gintner Z, Banoczy J, Gaengler P. Effect of fluoride toothpastes on enamel demineralization. BMC Oral Health 2006;6:8.

11 Van LC, Moorer WR, Buijs MJ, Van PH. Total and free fluoride in toothpastes from some non-established market economy countries. Caries Res 2005;39:224-30.

12 Zero DT, Marinho VC, Phantumvanit P. Effective Use of Self-Care Fluoride Administration in Asia. Adv Dent Res 2012;24:16-21.

13 Hiremath SS. Textbook of Preventive and Community Dentistry. New Delhi: Elsevier ; 2007.

14 Wong MC, Clarkson J, Glenny AM, Lo EC, Marinho VC, Tsang BW et al. Cochrane reviews on the benefits/risks of fluoride toothpastes. J Dent Res 2011;90:573.

15 Pine CM, Curnow MM, Burnside G, Nicholson JA, Roberts AJ. Caries prevalence four years after the end of a randomised controlled trial. Caries Res 2007;41:431-6.

16 Ammari AB, Bloch-Zupan A, Ashley PF. Systematic Review of Studies Comparing the Anti-Caries Efficacy of Children Toothpaste Containing 600 ppm of Fluoride or Less With High Fluoride Toothpastes of 1, 000 ppm or Above. Caries Res 2003;37:85-92.

17 Twetman S, Axelsson S, Dahlgren H. Caries-Preventive Effect of Fluoride Toothpaste: A Systematic Review. Acta Odontol 2003;61:347-55.

18 Stookey GK, DePaola PF, Featherstone JDB. A Critical Review of the Relative Anti Caries Efficacy of Sodium Fluoride and Sodium Monofluoro Phosphate Dentifrices. Caries Res 1993;27:337-60.