Additives in Milk and Its Effect on Dental Caries in 13-15 Year Old Adolescents

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ABSTRACT

It is a multifactorial disease with susceptible host, cariogenic microflora and a diet conducive to enamel demineralization. Milk has established anticariogenic effects. In India sugar, tea and coffee are most commonly used milk additives. Aim of the present study was to determine the association of dental caries with type and amount of milk additive consumed in 13-15 year old adolescent population. A school dental survey was conducted to determine quantity of different additives consumed with milk and DMFT index of children. Students consuming milk since less than five years and students not adding any additive were excluded. Interobesrver reliability by kappa statistics was determined. Type of additive and DMFT association was determined with one way ANOVA. Quantity of additive was correlated with DMFT by Spearman's rho. Kappa value of 0.8 showed excellent interobserver reliability. Significant association found between DMFT and type of additive added (p=0.016). Children consuming sugar as additive showed maximum mean DMFT. Quantity of additive consumed showed positive correlation with DMFT (correlation coefficient = 0.069). Sugar was found to be most cariogenic additive as compared to tea and coffee. While determining ant cariogenic effect of milk, sugar substitutes should be considered simultaneously.

Keywords: DMFT, Sugar, Tea, Coffee, Adolescent

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INTRODUCTION

Dental caries is an infectious, microbiological disease that results in localized dissolution and destruction of the calcified tissues of the teeth. It leads to pain and discomfort amongst all age groups. It is a multifactorial disease with susceptible host, cariogenic microflora and a diet conducive to enamel demineralization being important pre-requisites for the disease to progress. The rate and prevalence of dental caries has increased alarmingly in developing countries in recent times. [1]

Sprawson conducted the earliest research regarding milk and dental health. The studies concluded that milk improved oral health. Milk contains factors which are protective in nature against dental caries such as calcium, phosphates, casein and other proteins [2]. Milk, especially for children is routinely flavored with sugar and other flavorings. In India sugar, tea and coffee are most commonly used milk additives.

Numerous studies have been conducted to determine the effect of sugar in milk. They demonstrated that children who had milk with sugar had a higher caries experience as compared to those who had milk without sugar. Also caries increment was higher in children drinking milk with 6% sugar as compared to those who drank plain milk only [2].

Thus the aim of the present study was to determine the association between additives in milk viz. sugar, tea and coffee with dental caries.

MATERIALS AND METHODS

A survey was conducted at a High School containing 201 students between 13-15years age group. Students consuming milk since less than five years and students not adding any additive were excluded. Written consent was taken prior to survey from the school children's parents for their ward's inclusion in the study. Sample size for main survey was determined after conducting a pilot survey with forty one sample size.

Table 1:- QUESTIONS INCLUDED IN THE QUESTIONNAIRE DURING SURVEY

QUESTION	EXPECTED ANSWER
Do you drink milk regularly?	Yes/no
Since how many years?	
Which additive do you use in milk?	Sugar/ tea/ coffee/ other
In how much quantity?	1/ 2/ 3 Table spoons

Questionnaire form (Table 1) was explained to school students one day before survey. Students were instructed to find out answers for the survey questions. DMFT scores were determined by intraoral examination which was conducted by two dentists. First forty students were examined by both the dentists to check the inter observer reliability. Intraoral examination was done under day light illumination with help of mouth mirror and straight probe. Required protective barriers were used and disinfection protocol was followed.

Students, who did not know answer of questions, were contacted next day to acquire the answers.

Interobserver reliability was checked using kappa statistics. Associations between mean DMFT score and which additive used was determined by one way ANOVA. Correlation between DMFT score and quantity of additive used was determined by spearman's rho. Statistical analysis was done using SPSS (Statistical Package for Social Science) version 16.

RESULTS

Interobserver reliability test showed kappa value of 0.8 which is excellent agreement with statistical significance.

Total 36 students were excluded (14 students who were not having habit of drinking milk and 22 students who used to consume plain milk without any additive).

Children consuming only Sugar as an additive showed highest mean DMFT of 3.75 followed by children consuming tea, coffee and sugar as an additive showed mean DMFT of 3.41. Least mean DMFT i.e. 1.75 was found with children having sugar and coffee as an additive. Significant association found between DMFT and type of additive added (p=0.016) (Table 2). DMFT showed positive correlation with quantity of additive consumed (correlation coefficient = 0.069) (Figure 1).

Figure 1:- GRAPH SHOWING POSITIVE CORRELATION OF QUANTITY OF ADDITIVE AND MEAN DMFT
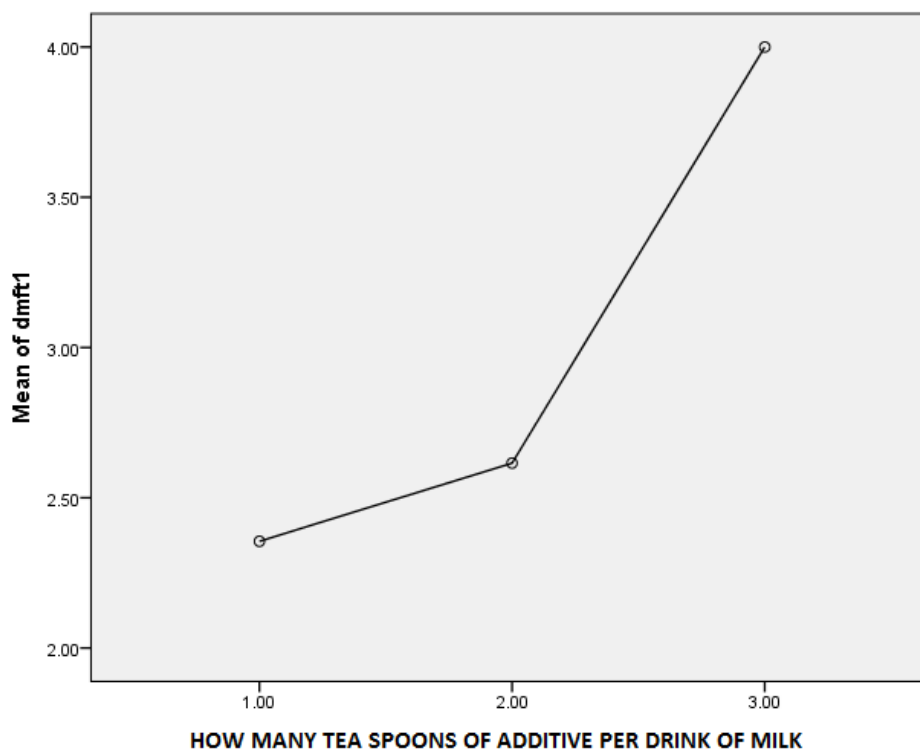
TABLE 2:- SHOWING ASSOCIATION BETWEEN DMFT AND TYPE OF ADDITIVE

	N	Mean	Std. Deviation	Mean Square	F	Sig.
Sugar	30	3.75	2.26569	14.828	2.709	**0.016**
tea+sugar	89	1.8533	2.07751			
sugar+coffee	9	1.75	2.06155			
tea+coffee+sugar	31	3.4194	2.84926			
Total	165	2.4061	2.4116			

DMFT scores of children consuming 1 tea spoon additive per drink showed minimum mean DMFT score 2.35 while those having 3 teas spoon additives per drink showed maximum mean DMFT score 4.

DISCUSSION

Results of this study clearly show the sugar as prominent cariogenic factor. Results support the theory that sugar has the ability to foster caries in humans under conditions conducive to caries formation. Sucrose is considered as important amongst all cariogenic sugars. It acts as a substrate in the production of extracellular glucans which form a major component of the matrix of dental plaque and accentuate the adherence of cariogenic bacteria to the smooth surface of teeth [3]. Several studies have shown that sucrose-mediated synthesis increases the porosity of plaque leading to an increased acid production adjacent to the tooth surface as a result of deeper penetration of sugar into the plaque matrix. [3]

Our results are in accordance with a study which has concluded the anticariogenic potential of coffee. Tea and coffee have shown their anticariogenic potential. Tea has as its components several anticariogenic substances such as caffeine, theobromine & xanthine. An inhibitor of bacterial growth and glucosyltransferase activity is tannic acid which is found in several types of tea. It also forms stable complexes with proline rich proteins of saliva which are involved in the adherence of bacteria to acquired pellicle. Other types of tea such as black, green are related to the inhibition of bacterial growth and adherence to dental surfaces & reduction in the production of extracellular polysaccharides according to several previous studies conducted [4].

The results of the present study corroborate the evidence of the role of sugars as the principal dietary component which leads to caries induction with other classical studies such as Vipeholm study, Turku sugar study, Hopewood House study, Tristan da Cunha study. [3]

Thus the use of sugar substitutes such as xylitol and sorbitol should be considered as a means of caries prevention.

CONCLUSION

Sugar was found to be most cariogenic additive as compared to tea and coffee. While determining anticariogenic effect of milk, sugar substitutes should be considered simultaneously.

ACKNOWLEDGEMENT

REFERENCES

[1] Peter S. Essentials of preventive community dentistry: Arya Publishing House. Delhi 3rd Edn: 2006.
[2] WHO. Milk fluoridation for the prevention of dental caries. 2009.
[3] DT Zero. Caries Res 2004; 38: 277–285.
[4] Da Silva Brandão EH, Oliveira LD, Landucci LF, Yumi Koga-Ito C, Jorge AOC. Brazilian J Oral Sci 2007; 6: 1274-1277.