Fluoride content of infant formulas and market milk in Turkey

Atilla Ataç, Nil Altay, Seval Ölmez

Department of Pediatric Dentistry, Hacettepe University Faculty of Dentistry, Ankara, Turkey

SUMMARY: Ataç A, Altay N, Ölmez S. Fluoride content of infant formulas and market milk in Turkey. Turk J Pediatr 2001; 43: 102-104.

The aim of the present study was to test the fluoride contents of infant formulas and market milk in Turkey. Fifteen formulas and nine market milks were prepared according to manufacturers' instructions with deionized water. Fluoride contents were analyzed with a spectrophotometer (CADAS 50S) and results were obtained as ppm (μgF/ml). Mean fluoride content of the formulas was 0.101 ppm F and of the milks was 0.08 ppm F. Formulas reconstituted with water containing < 0.3 ppm F do not provide a daily fluoride intake at any age. To decrease dental caries among children in Turkey, fluoride supplements could be prescribed at minimal dosages according to the ADA fluoride schedule.

Key words: fluoride, fluoride supplements, infants formulas, milk.

The goal of the dental profession is to help individuals achieve and maintain maximum oral health throughout their lives. Success in attaining this objective is highlighted by the decline of caries throughout the western world[1,2]. This progress has been mainly due to the use of water fluoridation and fluoride products and acceptance of primary preventive dentistry procedures. Due to technical and/or financial considerations it has not been possible to fluoridate water supplies in Turkey. But in this case, it is still possible and even easy to receive the systemic or topical benefits of fluorides, for example by installing small fluoridation units in school water supplies or by taking dietary supplements like fluoride tablets or drops. Fluoride applied directly to the teeth through fluoridated dentifrice gels or mouth rinses is referred to as topical applications and requires education and/or professional help.

Although the prevalence of dental caries has declined markedly over the past 20 years in most countries, the disease is still a major problem for both adults and children, especially in developing and underdeveloped countries. The change in the mean number of decayed, missing and filled surfaces in permanent teeth (DMFS) is well documented from four surveys carried out in the United States[3-6]. The earlier reductions in dental caries of 40-70 percent resulted from the fluoridation of public water supplies and use of fluoride supplements; the most recent resulted from use of topical fluorides[7].

The oral health status of the Turkish population was well documented in 1988 and reported as dft (decayed and filled primary teeth-total) scores in five year olds as 5, and DMFT (decayed, missing and filled permanent teeth-total) scores in 12-year-olds as 3.16, which is quite high in comparison to developed countries[8]. To reduce dental caries in children, fluoride supplements like fluoride tablets are recommended starting at six months to 16 years of age[9].

To avoid excessive fluoride intake by an infant or child, the fluoride level of drinking water, infant formulas, milk (breast and cow milk) and foods must be determined before hand. For an undesirable degree of dental fluorosis to be avoided, the total daily fluoride intake should not exceed 0.05-0.07 mgF/kg of body weight[10]. The fluoride levels of drinking water available at markets and from tap water sources in Turkey have been determined before[11,12].

This study was designed to evaluate the fluoride content of 15 infant formulas and nine market milks to prepare recommendations for fluoride tablets or drops for children in Turkey.

Material and Methods

The 15 infant formulas and nine market milks selected for analysis are listed in Table I.

Infant formulas were prepared with deionized water according to manufacturers' instructions. Milk and freshly prepared formulas were diluted

with deionized water adding 1/10 ratios. To analyze the fluoride contents, 5 ml from each sample were converted into Photometric (Reagent) Test Kits and placed in a CADAS 50S spectrophotometer, which is automatically calibrated after each measurement. Results were obtained directly as ppm units (μgF/ml). Five measurements were made from each sample and mean values are shown in Table I.

topical effects of the fluoride supplement in addition to the systemic effects.

To prescribe such supplements for children, pediatric dentists and pediatricians should be aware of the daily dietary fluoride intake of infants. As mentioned before, the fluoride level of water sources and drinking water in Turkey is not at optimum levels (0.7-1.2 ppm F)[11,12].

Table I. Fluoride Content of Infant Formulas and Market Milk

Infant formulas	ppm F mean	Market milk	ppm F mean
Humana 1 (Mamsel İlaç Sanayi)	0.03	Mis	0.13
Humana 2 (Mamsel İlaç Sanayi)	0.07	Mis Kalsiyum	0.16
Humana HN (Mamsel İlaç Sanayi)	0.15	Kay Yağlı	0.13
Aptamil 1 (Milupa)	0.09	Nestle Anne	0.04
Almiron (Nutricia)	0.19	Migros	0.01
Nutrilon forte (Nutricia)	0.18	SEK	0.02
Nutrilon soya (Nutricia)	0.19	AOÇ	0.10
Nutrilon 1 (Nutricia)	0.01	Pınar Light	0.14
Protifar (Nutricia)	0.11	Pınar	0.04
Milupa (Milk and Fruit) (Milupa)	0.09		
Milupa (Milk and Rice) (Milupa)	0.11		
Milupa (Milk and Banana) (Milupa)	0.08		
SMA-S-26 (Wyeth)	0.16		
Starmil (Wyeth)	0.05		
Nutrilon 2 (Nutricia)	0.01		
MEAN AMOUNT	0.101		0.08

Results

The fluoride levels of infant formulas and market milks are seen in Table I. The fluoride levels observed in this study in infant formulas ranged from 0.01-0.19 ppm F, and in milk samples from 0.01-0.16 ppm F. Almiron and Nutrilon-Soya (Nutricia, Holland) showed the highest fluoride levels in infant formulas (0.19 ppm F). Mis Kalsiyum showed the highest level of fluoride among the milk samples (0.16 ppm F).

Discussion

Recommendations regarding fluoride supplementation are not readily available around the world. Banting[13] reported 21 countries' current recommendations for fluoride supplementation by tablets, salt and milk. Fourteen countries had specific recommendations for fluoride tablets. In Turkey, there is not a specific recommendation for fluoride tablets, although the oral health status of children is very poor.

Fluoride supplements in chewable form are effective in reducing dental decay rates. In this way, all teeth benefit from the cumulative

The fluoride content of the market milk tested in this study ranged from 0.01-0.16 ppm F with a mean value of 0.08 ppm F. Dabeka and McKenzie[14] reported cow milk fluoride contents as 0.41 ppm F in Canada, which is five times higher than those in Turkey.

The fluoride content of the infant formulas tested in this study ranged from 0.01-0.19 ppm F with a mean value of 0.101 ppm F. Dabeka and Mckenzie[14] reported the mean fluoride concentration of powdered infant formulas available in Canada as 1.13 ppm F, which is higher than that found in the formulas available in Turkey. The difference is probably due to the fluoride content of the water used in preparation of the powdered formulas.

Silva and Reynolds[15] reported that when infant formulas available in Australia are reconstituted with water not containing fluoride, the range is 0.240 ppm F. In another study, Johnson and Bawden[16] evaluated infant formulas purchased in seven cities across the USA, and reported fluoride contents as 0.03-0.38 ppm F. These authors showed that when the infant formulas

were reconstituted in water containing 0.1 ppm F, their estimated contribution to an infant's daily fluoride intake at six months of age ranged from 0.018-0.076 mg/kg/body mass. In fact, even if the water content is 1 ppm F, it ranges from 0.124-0.184 mg/kg/body mass[15].

In this study, the mean value of fluoride content of formulas was 0.101 ppm F, and they were reconstituted with deionized water containing less than 0.1 ppm F. However, none of the formulas, when reconstituted with water containing up to 0.3 ppm F should provide a daily fluoride intake, at any age, above the suggested threshold for fluorosis of 0.05-0.07 mgF/kg/body mass/day.

If water fluoridated at 1.0 ppm F was used to reconstitute the infant formulas, all would provide a daily fluoride intake above the suggested threshold for fluorosis[15].

According to Ataç et al.[11], almost all market drinking waters contain fluoride levels less than 0.3 ppm F. Usmen et al.[12], reported tap water fluoride concentrations around Turkey and found fluoride levels very low. Thus, it is safe to assume that infant formulas reconstituted with these drinking or tap waters could not cause fluorosis in infants' teeth.

Heilman et al.[17], reported that fluoride concentrations found in infant foods ranged from 0.01-8.38 ppm F, and that the highest values were obtained from chicken-based infant foods. On the other hand, Van Winkle et al.[18] analyzed infant formulas and reported that 17 soy-based formulas showed the highest level of fluoride at 0.26 ppm F. In our study, Nutrilon-Soya (Nutricia, Holland), a soy-based formula, also showed the highest level of fluoride.

Chowdhury et al.[19] emphasized that in non-fluoridated areas infants' intake of dietary fluoride is five to seven times less than in optimal fluoridated areas.

In conclusion, consumption alone of the infant formulas and/or market milk tested in this study is unlikely to be a risk factor for dental fluorosis in non-fluoridated communities in Turkey.

The dental status of children in Turkey is very poor when compared to that in Western countries. Prescription of fluoride supplements at minimal dosage[9] together with application of topical fluorides can decrease dental caries among children in Turkey.

REFERENCES

1. Bohannan HM, Graves RC, Disney JA, et al. Effect of secular decline in caries on the evaluation of preventive dentistry demonstrations. J Public Health Dent 1985; 45: 83-89.
2. Graves RC, Bohannan HM, Disney JA, et al. Recent dental caries and treatment patterns in US children. J Public Health Dent 1986; 46: 23-29.
3. Kaste LM, Selwitz RH, Oldakowski RJ, et al. Coronal caries in the primary and permanent dentition of children and adolescents 1-17 years of age: United States 1988-1991. J Dent Res 1996; 75: 631-641.
4. National Center for Health Statistics. Vital and Health Statistics. Series II. No: 144. DHEW Pub. No. HRA75-1626. Washington (DC). Government Printing Office, 1974.
5. NIDR. The prevalence of dental caries in United States Children. The National Dental Caries Prevalence Survey: 1979-80. NIH Publication No. 82-3245. National Institutes of Health, 1981.
6. Brunelle JA. Oral health of United States children: The National Survey of Dental Caries in US Schoolchildren: 1986-87. Vol NIH Pub No. 89-2247. National Institutes of Dental Research, 1989.
7. Burt BA, Fejerkskov O. Water fluoridation. In: Fekerskov O, Ekstrand J, Burt BA (eds). Fluoride in Dentistry. Cophenagen: Munksgard; 1996: 275-290.
8. Saydam G, Oktay İ, Möller I. Analyzing the oral-dental health in Turkey. (WHO Report No. 001) 1988.
9. New fluoride schedule adopted. ADA News 1994; 25: 12-14.
10. Burt BA. The changing patterns of systemic fluoride intake. J Dent Res 1992; 71: 1228-1237.
11. Ataç A, Ölmez S, Kayalıbay H, Altay N. Determination of fluoride levels of tap water and bottled water with specific ion electrode in Ankara. Turk Dişhekimleri Birliği Dergisi 1993; 24: 12-13.
12. Usmen E, Altay N, Ölmez S, Ataç A, Batırbaygil Y. Fluoride levels in water sources in Turkey. Türk Dişhekimleri Birliği Dergisi 1997; 39: 42-43.
13. Banting DW. International fluoride supplement recommendations. Community Dent Oral Epidemiol 1999; 27: 57-61.
14. Dabeka RW, McKenzie AD. Lead, cadmium and fluoride levels in market milk and infant formulas in Canada. J Assoc Anal Chem 1987; 70: 754-757.
15. Silva M, Reynolds EC. Fluoride content of infant formulae in Australia. Aus Dent J 1996; 41: 37-42.
16. Johnson J Jr, Bawden JW. The fluoride content of infant formulas available in 1985. Pediatric Dent 1987; 9: 33-37.
17. Heilman JR, Kiritsy MC, Levy SM, Wefel JS. Fluoride concentrations of infant foods. JADA 1997; 128: 857-863.
18. Van Winkle S, Levy SM, Kiritsy MC, et al. Water and formula fluoride concentrations: significance for infants fed formula. Pediatric Dent 1995; 17: 305-310.
19. Chowdhury NG, Brown RH, Shepherd MG. Fluoride intake of infants in New Zealand. J Dent Res 1990; 69: 1828-1833.