# The effectiveness of two antibacterial regimens on salivary *Mutans Streptococci* and *Lactobacilli* in children.

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*This study aimed to evaluate the long-term effect of the topical use of an iodine agent on the salivary mutans streptococci (MS) and lactobacilli (LB) and compare it with the professionally applied topical fluoride. The study included 54 children with high caries activity. Children received one application of topical fluoride gel (APF) then they were divided into two groups. In group I, twenty seven patients received topical application of fluoride gel weekly for 4 weeks followed by one application of fluoride gel every 3 months for one year. For group II, 10% povidone iodine was carried out weekly for 4 weeks for 27 patients followed by alternative applications of fluoride gel or povidone iodine every 3 months for one year. Bacteriological evaluation was done at base line, after 1, 3, 6 and 12 months. Saliva samples were grown on selective culture media. The differences between the two groups were evaluated at the end of the study. Drop out of patients was reported throughout the different evaluation periods. The results were evaluated statistically and showed no statistical significant difference between the two groups. It is concluded that iodine solution reduced the number of caries related microorganisms as compared to the base line. Antimicrobial approaches need more studies to confirm the findings and optimize the regimens.*

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## INTRODUCTION

The development of dental caries can be formulated in terms of three indispensable factors: carbohydrate (diet), bacteria and susceptible teeth (the host).[1] Fundamentally, caries is a bacterial infectious disease. The critical bacterial virulence factors are carbohydrate-derived organic acids. A separate major cariogenic impact of saliva has also long been recognized.[2] This impact is such that caries process may also be described as reflecting the imbalance between the effect of saliva, the dominant protector of the tooth surface, on the one hand, and the combined impact of the factors dietary carbohydrate and the plaque flora on the other. The use of salivary tests in general dental practice has been reported to identify children of high caries risk for participation in preventive programs, to motivate them to carry out preventive measures and to monitor preventive therapy.[3,4]

Numerous authors have reported positive associations between levels of *mutans streptococci* (*MS*) in plaque and /or saliva and dental caries.[5-14] The count of *MS* has been found to be significantly related to the caries prevalence (decayed, filled teeth and surfaces, dft and dfs).[15] Loesche et al[16] have showed that teeth destined to become decayed exhibited a significant increase in the proportion of *MS* from six to twenty-four months before the clinical diagnosis of dental caries could be made.

The caries severity index has been found to be significantly related to the *MS* count.[15] Such high numbers of acidogenic microorganisms combine with frequent carbohydrate intake to produce abundant acid that lowers plaque pH for extended periods demineralizing the child's teeth. It has also been found that both *MS* and *LB* play an important role in the initiation and progression of the caries process.[17]

Caries experience has improved in most developed countries[18] however, improvements in caries index of preschool children are no longer seen, and the dental health of those children may be worsening.[19] Epidemiologic studies carried out in Sweden have shown that 7% of children develop caries between 1 and 2 years of

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age and 20% between 2 and 3 years.[20,21] The prevalence of caries in 3-to 5-year-old U.S. Head Start children has been reported to range as high as 90%.[22] Caries is believed to be the same disease throughout the world, yet the impact of various etiological factors can be quite different in different individuals and in different parts of the world.[23] Dental decay has become a significant health problem in some developing countries.[24] Increased urbanization and changes in food customs are contributing factors in dental health in these countries.[24,25] Recent epidemiological studies carried out in Jeddah, Saudi Arabia have shown that 20% of the 3-6 year old children have early childhood caries[26] and 73.3% of the 6 year old children have caries in their primary teeth with mean decayed, missed and filled teeth (dmft) of 7.54%.[27] Caries experience in a selected group of Kindergarten and primary school children in Kuwait showed that 54% and 80% of 3 year old and 6 year old children respectively had caries with mean dmft of 3.1 in the 3 year olds and 5.2 in the 6 year old.[28] There is a considerable evidence that children who experience early childhood caries (ECC) continue to be at high risk for new lesions as they get older, both in the primary and permanent dentitions.[29-32] Perhaps the high levels of infection by cariogenic microorganisms or the establishment of poor nutritional practices may be determinants of caries progression.[33] Treatment of ECC is expensive, often both requiring extensive restorative treatment and extraction of teeth at an early age. Estimates of the cost of restoring the teeth alone may exceed $1,000 per child.[34] In addition to these expenses, general anaesthesia or deep sedation may be required because such young children lack the ability to cope with the procedures. General anaesthesia to facilitate dental treatment adds between $1,000[35] and $ 6,000[36] to the cost of dental care.

ECC has been implicated as contributing to other health problems. Children with ECC were shown to weigh less than 80% of their ideal weight, and to be in the lowest 10th percentile for weight.[37] Perhaps the pain or infections associated with ECC may make it difficult for affected children to eat. Alternatively, poor nutritional practices may be responsible for both the reduced body weight and the caries.

Caries prevention has focused on educational programs to alter children's eating practices and to reduce levels of *MS* infection. Suppression of *MS* populations to non pathogenic levels would decrease risk for ECC. In this regard, human[38,39] and animal[40,41] model studies indicate that topical iodine agents can significantly suppress dental levels of *MS*. A recent report attempted to reduce transmission of *MS* to infants by giving the mothers' dentitions six applications of Iodine and sodium fluoride at the time of the child's tooth eruption. This study found that *MS* colonization and caries experience of the test group did not differ from controls.[42] A clinical trial has suggested that topical application of an iodine solution to the child's dentition significantly reduces the incidence of ECC in high-risk children. This preliminary finding has potential clinical significance and underscores the rationale for initiating larger and more in-depth clinical trials.[43] Another recent study has shown that the application of an antimicrobial varnish in combination with a fluoride varnish significantly reduced the number of *MS* in plaque during the first 48 weeks of treatment.[44] Recent studies[45,46] which supported the role of mutans streptococci in the initiation and lactobacilli in the progression of dental caries showed that, salivary *MS* levels among young children with ECC were higher than would be expected in a dentally healthy population, children with $\log_{10} MS \geq 3.0$ or $\log_{10} LB \geq 1.5$ were about five times as likely to have ECC than those with lower bacterial levels. To prevent *MS* from accumulating to pathologic levels topical application of antimicrobial agents was recently studied in a group of babies (12 to 19 month old) at high risk for ECC.[47] Bimonthly topical application of a 10% povidone–iodine solution for one year to the dentition of those babies increased the percentage (91 ± 5 %) of caries free babies.

Besides considering behavioral techniques to change adverse health behaviors, perhaps intense preventive interventions that do not rely on patient compliance also should be examined as methods of reducing caries. In some groups, lack of preventive behaviors and deeply entrenched feeding practices may be so difficult to change that it would not be practical to alter them. Frequent professional tooth brushing or professional administration of an antimicrobial agent, or fluoride may need to be considered to reduce caries incidence in such groups. The focus of such programs is to place the responsibility for caries prevention on the dental health professional, rather than on the parent. This study aimed to evaluate the long-term effect of the topical use of an iodine agent on the salivary *MS* and *LB* and compare it with the professionally applied topical fluoride.

## MATERIALS AND METHODS

54 healthy children, 4-6 year old, having at least 8 dmf, were selected from the pediatric dental clinic at King Abdulaziz University. They were divided into 2 groups each containing 27 children. For all the children, the dmf was recorded according to WHO 1992 using the visual inspection method. [23]

Group I children received prophylaxis and one topical fluoride gel (thixotropic 1.23% acidulated phosphate fluoride (APF), Sultan Topex, USA) application then one fluoride application weekly for 4 weeks followed by one application every 3 months for one year.

Group II children received prophylaxis and one application of topical fluoride (APF) gel then one application of 10% povidone iodine (PI) solution (Betadine,the Nile Co for Pharmaceuticals & Chemical

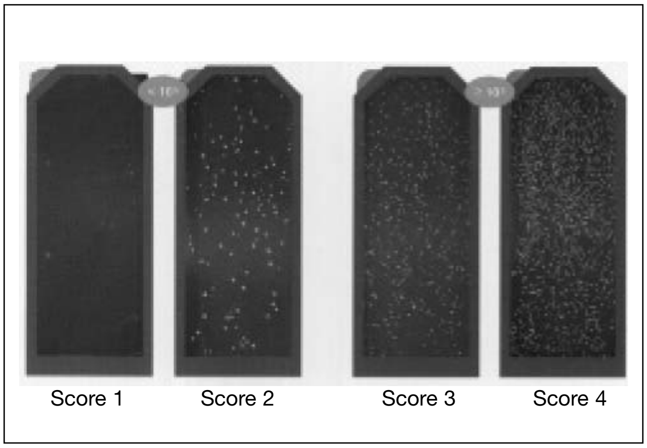


**Figure 1.** Evaluation scores for Mutans Streptococci.

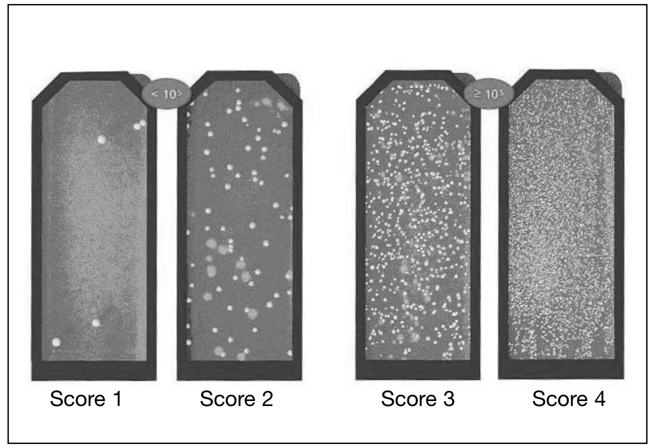


**Figure 2.** Evaluation scores for Lactobacilli.

Industries, Cairo – Egypt) weekly for 4 weeks by swabbing the dentition with a sterile cotton pellet that was saturated with the solution. Then alternative application of topical fluoride or povidone iodine every 3 months for one year. (APF, PI, PI, PI, PI, APF, PI, APF, PI).

The carious lesions were restored along the progress of the study. Bacteriological examinations were done according to the following: Two ml of stimulated saliva were collected in a sterile cup from each child by chewing on a paraffin pellet at base line (before any application), after 4 weeks (before the last application of fluoride or Iodine treatment), 3 months, 6 months & one year. At each of these intervals, dmf was recorded to assess the progress of restorations.

The collected saliva was applied on selective culture media (CRT bacteria, Ivoclar Vivadent AG - Liechtenstein) for the determination of *MS* and *LB* counts according to the manufacturer's instructions and incubated at 37ºC for 48 hours. After removal of the vial from the incubator, the densities of the *MS* and *LB* colonies were compared with the corresponding evaluation pictures (Figs 1 & 2) in the model chart supplied by the manufacturer and given a score from 1 to 4. Where score 1 & 2 indicated < $10^5$ colony forming units CFU/ml saliva and score 3 & 4 $\geq 10^5$ CFU/ml saliva

The data was cross tabulated and analyzed using the Mann-Whitney test to compare the two groups. Wilcoxon Rank test was used to compare the different evaluation periods to the base line in each group. Spearman correlation was also done to find a correlation to the reduction in *MS* and *LB* scores. Statistical significance was set at P<0.05.

## RESULTS

The statistical analysis of the collected data showed that there were no significant differences between the two groups (P>0.05) at all the evaluation periods for *MS* (Table 1) and *LB*. (Table 2) When *MS* and *LB* scores of the different evaluation periods were compared to the base line in group 1 a significant difference was found (P<0.05) for the *MS* at 1, 3, 6 & 12 month

**Table 1.** Distributions of MS scores in the two groups at the different evaluation periods.

| | Base line | | | | | 1 - month | | | | | 3 - month | | | | | 6 - month | | | | | 12 - month | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 |
| | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) |
| MS | 20 | 4 | 3 | 2 | 11 | 20 | 2 | 13 | 3 | 2 | 19 | 5 | 9 | 4 | 1 | 17 | 7 | 6 | 3 | 1 | 17 | 5 | 6 | 6 | 0 |
| Group I | (100) | 20 | 15 | 10 | 55 | (100) | 10 | 65 | 15 | 10 | (100) | 26.3 | 47.4 | 21.1 | 5.3 | (100) | 41.2 | 35.3 | 17.6 | 5.9 | (100) | 29.4 | 35.3 | 35.3 | 0 |
| Willcoxon Z (P-value) | | | | | | 2.445* (.014) | | | | | 2.814* (.005) | | | | | 2.522* (.012) | | | | | 3.086* (0.002) | | | | |
| MS | 22 | 5 | 3 | 6 | 8 | 22 | 2 | 8 | 9 | 3 | 19 | 5 | 9 | 4 | 1 | 19 | 11 | 3 | 4 | 1 | 18 | 2 | 6 | 7 | 3 |
| Group II | (100) | 22.7 | 13.6 | 27.3 | 36.4 | (100) | 9.1 | 36.4 | 40.9 | 13.6 | (100) | 26.3 | 47.4 | 21.1 | 5.3 | (100) | 57.9 | 15.8 | 21.1 | 5.3 | (100) | 11.1 | 33.3 | 39.9 | 16.7 |
| Willcoxon Z (P-value) | | | | | | 0.693 (.488) | | | | | 2.055* (0.04) | | | | | 2.309* (0.021) | | | | | 0.250 (0.803) | | | | |
| Mann-Whitney Z (P-value) | 0.7883 (0.4305) | | | | | 1.5164 (0.1294) | | | | | 0.0 (1.00) | | | | | 0.6349 (0.5255) | | | | | 1.704 (0.088) | | | | |

*** Statistically significant P< 0.05**

Willcoxon test compare each period to base line.
Mann Whitney test compare the two groups at each period.

**Table 2.** Distribution of LB scores in the two groups at the different evaluation periods.

| | Base line | | | | | 1 - month | | | | | 3 - month | | | | | 6 - month | | | | | 12 - month | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 | Total | 1 | 2 | 3 | 4 |
| | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) |
| LB | 20 | 4 | 2 | 9 | 5 | 20 | 5 | 6 | 7 | 2 | 19 | 5 | 11 | 2 | 1 | 17 | 1 | 9 | 5 | 2 | 17 | 1 | 6 | 9 | 1 |
| Group I | (100) | 20 | 10 | 45 | 25 | (100) | 25 | 30 | 35 | 10 | (100) | 26.3 | 57.9 | 10.5 | 5.3 | (100) | 5.9 | 52.9 | 29.4 | 11.8 | (100) | 5.9 | 35.3 | 52.9 | 5.9 |
| Willcoxon Z (P-value) | | | | | | 1.656 (0.098) | | | | | 2.514* (.012) | | | | | 1.588 (0.112) | | | | | 1.732 (.083) | | | | |
| LB | 22 | 3 | 4 | 4 | 11 | 22 | 5 | 7 | 7 | 3 | 19 | 7 | 9 | 3 | 0 | 19 | 4 | 10 | 3 | 2 | 18 | 5 | 6 | 7 | 0 |
| Group II | (100) | 13.6 | 18.2 | 18.2 | 50 | (100) | 22.1 | 31.8 | 31.8 | 13.6 | (100) | 36.8 | 47.4 | 15.8 | 0 | (100) | 21.1 | 52.6 | 15.8 | 10.5 | (100) | 27.8 | 33.3 | 38.9 | 0 |
| Willcoxon Z (P-value) | | | | | | 2.721* (0.007) | | | | | 2.899* (.004) | | | | | 1.985* (0.047) | | | | | 2.839* (0.005) | | | | |
| Mann-Whitney Z (P-value) | 1.0704 (0.2845) | | | | | 0.1839 (0.8541) | | | | | 0.5639 (0.5728) | | | | | 1.2111 (0.2259) | | | | | 0.8083 (0.4189) | | | | |

*** Statistically significant P< 0.05**

Willcoxon test compare each period to base line.
Mann Whitney test compare the two groups at each period.

(Table 1) and for *LB* was only significant at the 3-month evaluation period (Table 2). In group II *MS* showed a significant difference at 3 and 6 month evaluation periods compared to the base line (Table 1). While, *LB* scores had a significant difference (P<0.05) at the 1, 3, 6 and 12 month evaluation periods (Table 2.)

Comparing the number of decayed, missed, and filled teeth in the two groups, no significant differences (P>0.05) were found between the two groups at any time (Table 3). The number of decayed teeth was significantly reduced at the 1, 3, 6 and 12 month evaluation periods in both groups compared to the base line in each group. The number of the missed & filled teeth was significantly increased at the 1, 3, 6 and 12 month periods in both groups compared to the base line (P<0.05).

When the data were analyzed using the Spearman correlation coefficient to detect the correlation between each of the following: number of teeth present, decayed, missed and filled, the dmf index with the *MS* and *LB* scores. No correlation could be found with any of the above parameters in both groups except between *MS* and numbers of missed teeth in group I at the base line (r = 0.6053, P<0.05), and *MS* with the

**Table 3.** The number of teeth present (T), decayed (d), missed (m) and filled (f) teeth in two groups at different evaluation times.

| | Base line | 1 month | 3 month | 6 month | 12 month |
|---|---|---|---|---|---|
| **T (Group 1)** | | | | | |
| Min - Max | 13 - 24 | 13 - 24 | 15 - 24 | 13 - 23 | 10 - 24 |
| Mean ± SD | 20.75 ± 2.59 | 18.70 ± 2.79 | 19.26 ± 2.81 | 18.71 ± 2.42 | 18.93 ± 3.75 |
| Wilcoxon Z (p) | | 3.2318* (0.0012) | 2.3906* (0.0168) | 2.8698* (0.0041) | 2.348* (.019) |
| **T (Group II)** | | | | | |
| Min - Max | 18 - 24 | 16 - 24 | 12 - 24 | 11 - 24 | 14 - 24 |
| Mean ± SD | 20.73 ± 1.88 | 20.0 ± 2.29 | 18.79 ± 2.82 | 19.53 ± 3.29 | 20.16 ± 2.83 |
| Wilcoxon Z (p) | | 1.7770 (0.0756) | 2.6978* (0.0070) | 1.2211 (0.2220) | 0.715 (.475) |
| Mann-Whitney Z(p) | 0.5146 (0.6068) | 1.2093 (0.2266) | 0.4561 (0.6484) | 0.8937 (0.3715) | 0.879 (.379) |
| **d (Group 1)** | | | | | |
| Min - Max | 5 - 20 | 0 - 16 | 0 - 14 | 0 - 10 | 0 - 11 |
| Mean ± SD | 11.35 ± 3.57 | 4.15 ± 4.86 | 1.95 ± 4.65 | 0.82 ± 2.43 | 0.93 ± 2.92 |
| Wilcoxon Z (p) | | 3.7236* (0.0002) | 3.7236* (0.0002) | 3.6214* (0.0003) | 3.306* (.001) |
| **d (Group II)** | | | | | |
| Min - Max | 6 - 19 | 0 - 20 | 0 - 11 | 0 - 8 | 0 - 6 |
| Mean ± SD | 11.27 ± 3.92 | 6.77 ± 5.87 | 1.11 ± 2.88 | 1.37 ± 2.27 | 1.06 ±1.78 |
| Wilcoxon Z (p) | | 3.4410* (0.0006) | 3.8230* (0.0001) | 3.8230* (0.0001) | 3.625* (.00) |
| Mann-Whitney Z(p) | 0.2275 (0.8201) | 1.8127 (0.0699) | 0.1840 (0.8540) | 1.4235 (0.1546) | 1.379 (.168) |
| **m (Group 1)** | | | | | |
| Min - Max | 0 - 9 | 0 - 8 | 0 - 7 | 0 - 7 | 0 - 9 |
| Mean ± SD | 1.10 ± 2.10 | 3.25 ± 2.02 | 3.05 ± 1.90 | 3.29 ± 1.65 | 2.86 ± 2.54 |
| Wilcoxon Z (p) | | 3.3137* (0.0009) | 3.0770* (0.0021) | 3.4386* (0.0006) | 2.956* (.003) |
| **m (Group II)** | | | | | |
| Min - Max | 0 - 5 | 0 - 8 | 0 - 10 | 0 - 14 | 0 - 12 |
| Mean ± SD | 1.41 ± 1.68 | 3.32 ± 2.42 | 2.89 ± 2.71 | 3.00 ± 3.46 | 3.47 ± 3.06 |
| Wilcoxon Z (p) | | 2.2357* (0.0254) | 2.8966* (0.0038) | 2.6052* (0.0092) | 2.759* (.006) |
| Mann-Whitney Z(p) | 0.9212 (0.3570) | 1.5870 (0.1125) | 0.7851 (0.4324) | 1.1732 (0.2407) | 0.565 (.572) |
| **f (Group 1)** | | | | | |
| Min - Max | 0 - 3 | 0 - 13 | 0 - 12 | 2 - 12 | 2 - 11 |
| Mean ± SD | 0.30 ± 0.92 | 5.10 ± 4.30 | 7.05 ± 3.57 | 7.94 ± 2.90 | 6.21 ± 2.52 |
| Wilcoxon Z (p) | | 3.4078* (0.0007) | 3.6214* (0.0003) | 3.6214* (0.0003) | 3.301* (0.001) |
| **f (Group II)** | | | | | |
| Min - Max | 0 - 2 | 1 - 7 | 1 - 16 | 2 - 16 | 2 - 16 |
| Mean ± SD | 0.14 ± 0.47 | 3.86 ± 1.70 | 7.05 ± 3.60 | 6.68 ± 3.59 | 6.65 ± 4.18 |
| Wilcoxon Z (p) | | 4.1069* (0.0001) | 3.8230* (0.0001) | 3.8230* ( 0.0001) | 3.666* (.000) |
| Mann-Whitney Z(p) | 0.1978 (0.8432) | 0.4820 (0.6298) | 0.2944 (0.7685) | 1.4641 (0.1432) | 0.222 (.825) |

* Statistically significant P<0.05

number of teeth present at the 6-month evaluation period in group II (r = -0.5787, P<0.05) and *MS* with number of decayed teeth at the 12-month evaluation period (r = - 0.7885, P<0.05) in group II.

## DISCUSSION

CRT technique is a reliable method to detect *MS* and *LB* in saliva. Previous studies showed that there is a significant correlation between the level of *MS* in saliva and plaque.[48,49] It can be assumed that the reduction of *MS* and *LB* in saliva will be accompanied by a similar decrease in *MS* on the tooth surfaces. In the present study reduction in bacterial scores in both groups compared to the base line may be due to the applications of the antimicrobial regimens, restorations of the caries lesions, extractions of the carious teeth or improvement in oral hygiene. Older studies showed that *MS* colonized only tooth surfaces.[50,51] However, recent studies demonstrated that *MS* can be found in plaque and the furrows of the tongue.[46,52,53] Chewing on a piece of paraffin wax will stimulate saliva and dislodge the *MS* from the teeth.[54] Hence, the number of teeth present in the oral cavity may affect the bacterial count. In the present study although significant reduction in the number of teeth present and increase in the number of missed teeth no correlation was found with the reduction in the *MS* and *LB* scores. This may indicate that the reduction in *MS* and *LB* count is due to the antibacterial regimens used. Significant associations of salivary *MS* and *LB* levels with dmfs and dft have been reported.[46] Previous studies showed that shift could occur in the number and population of various salivary organisms such as *lactobacilli, yeasts, streptococci* and *staphylococci* during dental treatment.[55,56] In the present study although the number of decayed teeth were significantly reduced and the number of filled teeth was significantly increased during the 1, 3, 6 & 12 month evaluation periods, no significant correlations were found between the reduction in *MS* and *LB* and the number of decayed or filled teeth. These findings are supported by Keene et al [57] who found that restorations of carious lesions was an effective but incomplete method for eliminating *SM* from dental plaque. Those findings suggested that the significant reduction in *MS* and *LB* found in the subsequent evaluation periods is due to the antimicrobial regimens used in the present study. This suggestions is supported by EL-Housseiny[58] and Keene et al[57] who found that following restorations of all carious lesions reduction in the prevalence of *MS* was obtained whereas subsequent sampling showed subsequent increase in the level of *MS* in stimulated saliva[58] or in plaque[57] indicating a slight trend toward re-establishment of *MS* colonization.

The present study showed no statistically significant differences between the two antimicrobial regimens evaluated. However, the combination of fluoride therapy with povidone iodine did not result in less lesion development at the 6-month evaluation period compared with the fluoride therapy alone. A previous study showed a similar result on using a combined fluoride therapy with an antimicrobial varnish (chlorhexidine) compared with fluoride varnish alone.[44] In addition, another study showed that dental caries can develop in children despite intensive professional fluoride treatments.[59] However, previous studies found that topical application of povidine iodine solution to the dentition of children at high risk for ECC significantly reduced the incidence of ECC caries.[43,47] This discrepancy between the later studies and the present one may be due to the application of iodine solution in the present study was less frequent compared with every two months application of the iodine in the other studies. Furthermore another factor such as cariogenic diet consumed by children that was not evaluated in the present study may have played a role in the initiation of caries in those children.

## CONCLUSIONS

Iodine solutions reduced the number of both *MS* and *LB* in stimulated saliva compared to the base line.

Antibacterial approaches need more investigations to both confirm the findings and optimize the regimens.

Children who developed new carious lesions despite intensive preventive regimens give some insight into the etiology and prevention of the early carious process.

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# Breast feeding rates in the United States by characteristics of the child, mother, or family. The 2002 national immunization survey

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In 2001, the National immunization survey(NIS) began collecting data on the initiation and breastfeeding duration.

71.4% of all children have been breastfed. At 3 months 42.5% were exclusively breastfed and 51.5% were to some extent. At 6 months these numbers plummeted to 13.3% and 35.1%, respectively. At 1 year only 16.1% were still receiving some milk. Non Hispanic black people had the lowest breastfeeding rates. These numbers are considerably below the national goals of 50% and 25% respectively. Greater public health efforts are needed for the socioeconomically disadvantaged groups..