Fluoride varnish application: a new prophylactic method in Albania. Effect on enamel carious lesions in permanent dentition

L. XHEMNICA, D. SULO, R. RROÇO, D. HYSI

ABSTRACT. Aim The aim of this study is to assess the effects of fluoride varnishes on enamel caries lesions on permanent dentition. Materials and methods 92 children from primary school (“Vasil Shanto”, Tirana, Albania) aged 11-12 years were divided into varnish (experimental) and control group. The experiment group received the first fluoride varnish application (Fluoridin, Voco) at baseline, the second application after 3 months and the third application at 6 months from baseline, while the children in the control group received no professional fluoride application. Examinations were performed at baseline and after 7 months. Results We observed a slight increase in caries prevalence in the control group compared with the varnish group at the 7 month interval (P<0.1 for DMFT and P<0.5 for DMFS and DS). When enamel lesions were included the mean of DeMFT, DeMFS, DeS the caries prevalence was significantly lower in the varnish group after 7 months (P<0.001 for DeMFT, DeMFS). Conclusion Fluoride varnish is an effective mean for arresting early enamel lesions. It is a safe, convenient and well accepted method by patients.

Keywords: DMFT; Fluoride varnish; Caries prevalence; Enamel lesion.

Introduction
Dental caries is an infective transmittable bacterial disease characterised by a multi factorial pathology. There are studies that report a high prevalence of caries lesions in Albania. The main reasons for this situation are the following.
- Low Fluoride level in drinking water (below 0.3 ppm).
- Lack of financial resources for applying a caries prevention strategy all over the country.

This study will assess the effect of Fluoride varnishes on permanent dentition focused on superficial caries lesions [Strohmenger and Roberto, 2003]. We intended to measure their effect in relation to fluoride content and long-term release.

Fluoride effect on caries lesions. The important cariostatic effect of fluoride occurs in its water phase on the tooth surface, between enamel crystals during the demineralisation and remineralisation process. In the active caries lesion in pre-cavitation phase, fluorides are accumulated on bacterial plaque and saliva as CaF2 because of topical fluoride application (varnishes, gel etc). The acidic environment will react with the enamel surface by stimulating CaF2 dissolution. This enamel surface represents a micropore filter where fluoride ions (F\textsuperscript{-}) and hydrogen ions (H\textsuperscript{+}) diffuse in the lesion surface increasing the fluoride concentration level compared with the intact enamel surface. Inside the lesion fluoride ions prevent the demineralisation process and stimulate remineralisation by increasing the fluorapatite content [Arends et al., 1999]. Therefore, lesions can be prevented by:
- bacterial plaque control (good oral hygiene);
- topical fluoride application (gel or varnishes).

Material and methods
The study population consists of 92 children of 11-12 years (“Vasil Shanto” School). We prepared a form which explained the procedure to the parents and
asking their consent (they all signed the form). We selected this age group because it allows an easy assessment of the effects of fluoride varnishes on permanent dentition. The children were of different socioeconomic levels. We divided them in two groups: varnish group (experimental), N = 40, and Control group, N = 52. We did an intraoral examination to the children of both groups to set up the baseline information concerning dental caries level. We consulted several guideline about caries diagnostic criteria and we decided to use a modified system which differentiates the cavity phase from the pre-cavitation phase [Zimmer and Robke, 1999]. This classification is known as “Nyvad classification” (Table 1).

We used 6 (six) indices.
1. DMFT (decayed, missing and filled teeth).
2. DMFS (decayed, missing, filled surfaces).
3. DS (decayed surfaces).
4. DeMFT (Decayed enamel lesion, missing and filled teeth).
5. DeMFS (Decayed superficial enamel lesion, missing and filled teeth).
6. DeS (Decayed superficial enamel lesion) [Abbinante et al., 2001].

The purpose of the last three variables is to investigate the varnish action on superficial caries lesions while the first three variables investigate the varnish action on sound teeth. The data were analyzed using the software STATVIEW, which is usually used in epidemiological studies. We used Student test to define the P-value [Anusavice, 1997] (Fig. 1, 2, 3, 4).

After intraoral examination we applied fluoride varnish (Bifluoride 12, 6% NaF + 6% CaF2) on the experimental group teeth (varnish group). Before varnish application we cleaned all teeth using brushes and pumices, making sure that there was no dental plaque left which would have lowered the fluoride varnish effect. The varnish placement was performed through micro brushes penetrating in proximal tooth areas [Jaana, 2001]. The children were advised not to consume hot drinks for 2 hours nor eat for 4 hours, they also had to avoid hard food and brushing their teeth for the following 24 hours. The children were advised not to get similar treatment during the study period. Varnish application was performed once every three months for a period of 7 months.

We set a follow up study of 7 months to determine the fluoride varnish effect on first stage caries lesions [Ten Cate, 1990].

Results

The varnish group (N= 40 children) is composed of 59% males and 41% females, the mean age is 11.7 years for both.

The children distribution for both groups was as follows: 30% were coming from the rural area, 42% were born in Tirana and 28% recently moved to Tirana coming from other towns. Tables 2 and 3 show caries prevalence differences. In the second table between...
the control group and the varnish group there were small differences and not statistically significant for the indexes DMFT and DMFS [Modder et al., 1987], although there was a small increase of caries prevalence of the control group after 7 months. If we include the first stage active caries lesions, then we have a statistical significant change, a considerable reduction of enamel caries lesions and their return to an inactive stage (remineralisation of these lesions) in the varnish group.

DeMFT, DeMFS P-value < 0.001 (Table 2, 3).

The results obtained in our study group show the positive preventive effect of Bifluoride 12.

**Discussion**

The Albanian Ministry of Heath in 2005 conducted a Survey investigating the dental caries level in children of age groups 3-6; 12-13; 17-18 years. It included 14,000 children from different regions of Albania [Hysi, 2005].

The results of this survey are as follows.
- Children 3-6 years old d.f.t.=2.9; SiC=6.4.
- Children 12–13 years old DMFT= 3.13; SiC=5.8.
- Age grup 17-18 years old DMFT=5.7; SiC=9.6.

These data are far from the objectives required from the WHO for the year 2010. This situation motivated us to conduct this study about Fluoride varnish applications as a prophylactic tool to be used in public schools.

As for bias [Modder et al., 1987], we may have had interferences in our study from the plaque factor (we have insisted that the children should keep the plaque under control).

We do not have interference from fluoride in drinking water because fluoride level in drinking water in Albania is below 0.3 ppm. Zimmer et al. studied the varnishes effects in communities with low

<table>
<thead>
<tr>
<th>Index</th>
<th>Baseline ±SD before treatment</th>
<th>Baseline ±SD 7 months after treatment</th>
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<tbody>
<tr>
<td></td>
<td>Varnish gr. (40)</td>
<td>Control gr. (52)</td>
</tr>
<tr>
<td>DeMFT</td>
<td>4.15±2.28</td>
<td>4.05±2.39</td>
</tr>
<tr>
<td>DeMFS</td>
<td>6.02+3.08</td>
<td>5.01±2.75</td>
</tr>
<tr>
<td>DeS</td>
<td>3.12+1.93</td>
<td>3.05±1.7</td>
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**TABLE 2 - Prevalence of caries in varnish and control group.**

<table>
<thead>
<tr>
<th>Index</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Varnish gr. (40)</td>
<td>Control gr. (52)</td>
</tr>
<tr>
<td>DMFT</td>
<td>5.55 ± 1.98</td>
<td>2.82 ± 2.04</td>
</tr>
<tr>
<td>DMFS</td>
<td>3.07 ± 2.41</td>
<td>3.3 ± 2.23</td>
</tr>
<tr>
<td>DS</td>
<td>1.2 ± 1.12</td>
<td>1.44 ± 1.21</td>
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**TABLE 3 - Prevalence of caries in varnish and control group.**
socioeconomic level. They recommended topical placement of the varnishes 3–4 times a year, which is fully supported by our results. A study [De Bryn and Arend, 1987] demonstrates that varnishes are clinically efficient in reducing dental caries of 20-50% in a two year study period, in the permanent dentition. Also another important study shows a significant caries reduction in proximal areas, about 38% [Helfen and Steiner, 1979]. Through index analyses we notice these changes in the varnish application group (Table 2).

The initial De.M.F.T. was 4.15±2.28 and after 7 months was 3±2.07.

The initial De.M.F.S was 6.02±3.08 and after 7 months was 3.65±2.46.

The initial DeS was 3.12±1.93 and after 7 months was 0.87±1.18.

It is obvious that we have a positive effect from the fluoride varnish application. Meanwhile when we used DMFT and DMFS indexes there was a slight increase (not statistically significant) in caries level in the varnish group in baseline and after 7 months, while in the control group there was an increase in caries level.

When we use DS index, there is a great reduction in caries level comparing the varnish group in baseline and after 7 months (DS=1.2 and DS=0.55) (Table 3). In the control group the dental caries level increases from the baseline to the 7 months period:
- D.M.F.T was 2.82±2.04 increased to 3.46±2.22;
- D.M.F.S was 3.3±2.23 increased to 4.02±2.54;
- D.S was 1.44±1.21 increased to 2.07±1.03.

**Conclusion**

Based on the study results we can conclude that fluoride varnishes are an effective means for preventing and reversing early enamel carious lesions by acting as inhibitors of demineralisation and stimulating the remineralisation process. Beside this, it is a safe and comfortable procedure which is tolerated by the children well. Fluoride varnish treatment should be included in the compulsory oral prophylactic programmes applied in public and private schools. This will assist the Heath authorities to well plan the future preventive programs in dentistry.

**References**


Hysi D. A survey of caries experience in the age 6-th, 12-th, 18-th years old in Albania, pilot study 2005, Ministry of Health Albania.


