Characteristics Affecting Oral Pigmentation in Passive Smoker Children

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KEY WORDS
Mouth;
Oral health;
Pigmentation;
Passive smoking;
Tobacco;
Child;

ABSTRACT
Statement of the Problem: Smoking affects not only smokers themselves, but also the people around them. 700 million children are exposed to second hand tobacco worldwide. One of the adverse effects of being a passive smoker is oral pigmentation.
Purpose: Evaluating association between being a passive smoker and oral pigmentation.
Materials and Method: This is a historical cohort. 140 healthy children aged from 4 to 10 with the mean age of 6.68±1.60 years old (70 with a smoker parent and 70 without smoker parents) were examined for oral pigmentation. Environmental factors were evaluated by asking the parents to fill a questionnaire. Data were analyzed using Chi-square test, Fisher’s exact test, Logistic regression and Spearman scale.
Results: There was a meaningful relationship between having a smoker parent and oral pigmentation (P-value=0.0001). Spearman correlation showed parents’ duration of cigarette smoking and the number of cigarettes per day meaningfully affect the severity of oral pigmentation (R=0.329). The study did not find a statistical relationship between oral pigmentation in passive smoking and sex or house area.
Conclusion: Children exposed to secondhand tobacco are at more risk for oral pigmentation. Its severity depends on duration of cigarette smoking and the number of cigarettes per day.

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Introduction
Smoking affects not only the smokers themselves, but also the people around them. According to WHO, 700 million children (40% of children) are exposed to second hand tobacco worldwide [1]. Studies have shown various adversities for being a passive smoker: children respiratory problems, low birth weight, children developmental disabilities, increased risk for COPD and cancers such as lung cancer [1-3].

Smokers develop areas of darkened mucosa in their oral cavity called hyperpigmentation which are the excessive sedimentations of melanin [4-5]. Although most studies have shown a relationship between oral pigmentation and being a passive smoker; there is controversy on the effect of sex, duration of exposure and house area [4, 6-11].

The purpose of this study was to examine the Association between smoking of a parent at home and oral pigmentation in children and the characteristics affecting that.

Materials and Method
Design and sampling
This is a historical cohort. Considering oral pigmentation prevalence in passive smoker children (62%) and non-passive smoker children (38%) in AlYassiri's
study, the sample size for each group was calculated to be \( n=70 \) using the following equation (significance level = 0.05, power test = 0.80):

\[
    n = \left( \frac{Z_{1-\alpha/2} + Z_{\beta}}{\delta} \right)^2 \left( \frac{P_1(1-P_1) + P_2(1-P_2)}{P_1-P_2} \right)^2
\]

70 children (4.5 to 10 years old) attending the pediatric department of Yazd Dental School in the period from October to December 2017 whom at least one of their parents or care-givers were a smoker at home were selected as the case group. In this study, a person who had consumed at least ten cigarettes during the last month in the presence of their child was considered as smoker. This data was acquired by asking the parents. Seventy children attending pediatric department of Yazd Dental School were selected as the control group (without a parent who smokes). The control group had the same age range as the case group. Following inclusion and exclusion criteria was applied to both groups. All children were psychologically and physically healthy and did not take any medications (such as Bismuth, etc.) which would have effects on the pigmentation of periodontium (children health status was acquired through questionnaires).

In this study, the inner side of arm was chosen to determine the skin color [7]. MY cream (MY, Iran) was used as an indicator to classify the skin color. 5 tinted cream numbers were used from 1 to 5. numbers 1 to 3 were considered as light skin complexions, and numbers 4 and 5 as dark skin complexions. Due to higher possibility of occurrence of physiological pigmentation in people with darker skin color, dark-colored skin subjects were excluded and replaced [3].

Evaluating Environmental factors
A form was designed containing information on the study and asking about the parents’ consent on participating. After the consent was given, a questionnaire including questions on demographic information (child’s age and gender), parents’ education and child’s medical history (presence or history of hyperthyroidism, hypothyroidism, adrenal hyperthyroidism, adrenal insufficiency, Allergies, abnormal hemorrhag-es, vitamin B12 deficiency, Peutz-Jeghers syndrome) The surface area of their house was asked with the two options, below and over 100 square meters. This variable was analyzed only in the case group to see how the house area affects the children who have a smoker parent.

During the sampling process, the control group was selected to be similar to cases on the distribution of age, sex and skin color.

Examination
Size of pigmentations was measured by a graded periodontal probe and were documented along with their locations in oral cavity (mucosa, lips, tongue and gums). Following classification was used to determine severity of the lesions:

1. Mild (0.5-1cm)
2. Moderate (1-2cm)
3. Severe (more than 2cm or multiple sites of pigmentation)

Statistical analysis
Data was collected, coded and entered to the computer. They were analyzed Using SPSS23 software. Qualitative variables were analyzed via chi-square test. Pigmentation severity was considered an ordinal variable therefore spearman correlation was used for its analysis.

Results
Sample of 140 children with an average age of 6.68±1.60 years was randomly selected. Out of the 140 samples examined, only two had mild allergies and did not use any drugs. The two samples were excluded and replaced so that the effect of systemic diseases variable was excluded from the study. After reviewing the data, the following results were obtained:

Oral mucosal pigmentation, regardless of the effect of passive smoking on children, was observed in 50.7% of the subjects. 20.7% of them had mild pigmentation, 20.7% had moderate pigmentation, and 3.9% had severe pigmentation. Therefore, the least frequent type of pigmentation was severe (Table 1).

Sex
The sample was consisted of 69 girls and 71 boys.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Male</th>
<th>Female</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None n(%)</td>
<td>33 (46.5)</td>
<td>36 (52.2)</td>
<td>69 (49.3)</td>
</tr>
<tr>
<td>Mild n(%)</td>
<td>19 (26.8)</td>
<td>10 (14.5)</td>
<td>29 (20.7)</td>
</tr>
<tr>
<td>Moderate n(%)</td>
<td>12 (16.9)</td>
<td>17 (24.6)</td>
<td>29 (20.7)</td>
</tr>
<tr>
<td>Severe n(%)</td>
<td>7 (9.8)</td>
<td>6 (8.7)</td>
<td>13 (9.3)</td>
</tr>
<tr>
<td>Total n</td>
<td>71</td>
<td>69</td>
<td>140</td>
</tr>
</tbody>
</table>

P value=0.280
There was no significant relationship between sex and the presence of pigmentation (Table 1; p = 0.280).

Smoker parent
The case group consisted of 70 children with a smoker parent, all of whom their fathers were the smoker. Of these 70 patients, 31.4% had no pigmentation, 34.3% had mild pigmentation, 20% had moderate pigmentation and 14.3% had severe pigmentation. In total, 48 had oral pigmentation. The control group consisted of 70 children without a smoker parent or caregiver. 67.1% had no pigmentation, 7.2% had mild pigmentation, 21.4% had moderate pigmentation, 4.3% had severe pigmentation. In total, 23 children with oral pigmentation were observed in the control group.

There was a significant statistical difference between the presence of oral pigmentation and having a smoker father (Table 2; p = 0.0001). Relative risk of passive smoking for the occurrence of oral pigmentation in passive smoker children was 2.10 (C.I. = 95%: 1.45 – 3.05).

Oral site
In all cases, the involvement area was observed in the anterior region of the mouth and the labial gingiva.

House area
The area of the house was asked from parents by a questionnaire form. Options were over 100 square meters and under 100 square meters. Data are presented in table 3. P-value is about 0.2 in the case of the house area variable, which means that there was no statistically significant difference and no meaningful relationship between house size and the occurrence of children oral pigmentation (Table 3; p = 0.2).

Age
The relationship between age and oral pigmentation was statistically significant (Table 4; p = 0.001). Spearman's correlation coefficient for the age variable was 0.282.

### Table 2: Relationship between the presence of oral pigmentation and a smoker parent

<table>
<thead>
<tr>
<th>Smoker parent</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22 (31.4)</td>
<td>24 (31.4)</td>
<td>14 (20)</td>
<td>10 (20)</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>47 (67.1)</td>
<td>5 (7.2)</td>
<td>15 (21.4)</td>
<td>3 (4.3)</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>69 (94.3)</td>
<td>29 (20.7)</td>
<td>29 (20.7)</td>
<td>13 (9.3)</td>
<td>140</td>
</tr>
</tbody>
</table>

P-value=0.0001

### Table 3: Relationship between house size and the occurrence of children oral pigmentation

<table>
<thead>
<tr>
<th>House area</th>
<th>Over 100</th>
<th>Under 100</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>None</td>
<td>13 (38.24)</td>
<td>9 (25)</td>
<td>22 (31.43)</td>
</tr>
<tr>
<td>Mild</td>
<td>12 (35.29)</td>
<td>12 (33.33)</td>
<td>24 (34.29)</td>
</tr>
<tr>
<td>Moderate</td>
<td>6 (17.65)</td>
<td>8 (22.23)</td>
<td>14 (20)</td>
</tr>
<tr>
<td>Severe</td>
<td>3 (8.82)</td>
<td>7 (19.44)</td>
<td>10 (14.28)</td>
</tr>
<tr>
<td>Total n</td>
<td>34</td>
<td>36</td>
<td>70</td>
</tr>
</tbody>
</table>

P-value=0.2

### Table 4: Spearman correlation for age, duration of smoking and number of cigarettes per day

<table>
<thead>
<tr>
<th>Variable</th>
<th>Spearman correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.282</td>
<td>0.001</td>
</tr>
<tr>
<td>Duration of smoking</td>
<td>0.371</td>
<td>0.0001</td>
</tr>
<tr>
<td>Number of cigarettes per day</td>
<td>0.358</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Given the positive number obtained, the age was directly related to the pigmentation, meaning that older children showed more oral pigmentation.

### Duration of smoking
This variable had a significant relationship with children’s oral pigmentation (Table 4; p = 0.0001). Spearman correlation coefficient of duration of smoking (the number of years the parent has been smoking) was 0.371. Therefore, duration of consumption was directly related with the pigmentation.

### Number of cigarettes per day
There was a statistically significant difference and this variable was related to pigmentation (Table 4; p = 0.0001). Spearman's correlation coefficient in relation to this variable is 0.358. Therefore, it also had a direct relationship with the two other variables.

### Discussion
This study aimed to examine the relationship between smoking of a parent at home and oral pigmentation in children and the characteristics affecting that. Studies on effects of passive smoking on oral pigmentation are conducted on different target groups. Moravej-Salehi et al. have investigated its effects on non-smoking women [11]. Haji-fattahi et al., Hanioka et al., Al Yassiri et al., Sridharam et al. like this study investigated its effects on children with a smoker parent. All these studies have confirmed the positive relationship between passive smoking and oral pigmentation [4, 6, 10-12].
Hanioka et al. and Al Yassiri et al. also matched age and sex in their case and control groups and have also demonstrated the positive relation between severity of the lesions and age. Other studies have not considered this variable [4, 12].

As mentioned before, using Spearman’s correlation analysis, a positive relation between oral pigmentation and the children’s exposure to second hand tobacco (smoker parent’s years of consumption with the presence of child and their number of cigarettes smoked per day) was found. Some studies on effects of active smoking have shown the same results [8, 13] but unfortunately, studies on effects of passive smoking have not considered these variables [6, 11].

In this study, subjects were in complete physical and psychological health and were not using any drugs causing pigmentation. Madani et al. and Hanioka et al. have not excluded these intervening variables [4, 7].

Using MY cream, Skin complexions were matched and subjects with darker skins were were not included in the study. Haji-Fattahi et al., moravej-salehi et al., and Sridharam et al. also used similar methods to eliminate the possibilities of physiological pigmentation [6, 10-11]. However, Madani et al. and Al Yassiri et al. have not mentioned any attention to skin color [7, 12].

In this study lesions are categorized by size. Periodontal probe was used to measure the size of the lesions. The examinations were conducted by one clinician to ensure the objectivity of study. Madani et al. classified lesions using DOPI coloring [7]. Hanioka et al. also measured the size, however they used photos of the lesions, not direct examination [4]. Other previous studies, only reported the presence of lesions with no attempt to measure the size of the lesions [11-12]. But in this study, we classified lesions on the basis of size.

Concerning involved oral sites, most lesions were found in the anterior areas of maxilla and mandible. Other studies that investigated site of the lesions have had the same findings [6, 11].

Despite this study, Morravej-Salehi et al. were able to find a meaningful relationship between oral pigmentation in passive smokers and surface area of their houses. This can be due to the age difference of the subjects. Children are more dependent to their parents and keep least distance from them. Their subjects included adult women who had smoker husbands whom may keep away from their husbands while they are smoking [11].

It must be mentioned that smoking has different adverse effects on the consumer’s and their families’ health. This study has investigated just one of the many harmful effects of children's passive smoking.

**Conclusion**

Children exposed to secondhand-tobacco regardless of their sex are at more risk to develop oral pigmentation. Investigating factors affecting the severity of pigmentation, study found that parents’ duration of cigarette smoking and the number of cigarettes per day have a meaningful relationship with their child’s oral pigmentation. As for the extent of house area, this study couldn’t find a relationship.

In conclusion, not smoking in the presence of children may prevent oral pigmentation- in addition to other adverse effect of being a passive smoker.

**Acknowledgment**

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**Conflict of interest**

The authors declare that there is no conflict of interest.

**References**

[1] International Consultation on Environmental Tobacco Smoke (ETS) and Child Health, 11-14 January 1999, Geneva, Switzerland. Available at: https://apps.who.int/iris/handle/10665/65930


