

Relation between tobacco consumption and oral health in Swedish schoolchildren

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A group of 232 schoolchildren aged 13 - 14 years in the Municipality of Huddinge, on the outskirts of Stockholm, were examined in order to study the effects of smoking and oral use of snuff in relation to oral health. Of the schoolchildren 21.5 % smoked regularly. Snuff was taken regularly by 11 % of the boys, but none of the girls. Snuff was present in the oral cavity for an average of 3.5 hours every day. The variable «number of cigarettes» was found to be a significant ($p < 0.01$) predictor to the dependent variable «plaque» after controlling for the predictors «frequency of tooth-brushing» and «sex». Snuff usage showed a strongly significant correlation to gingival index after controlling for plaque. The result showed that use of snuff may influence on the gingival tissue directly whereas smoking affects plaque accumulation.

Key-words: Pedodontics; gingivitis; smoking; snuff-taking

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The influence of tobacco smoking on the etiology of periodontal disease is controversial (4). Epidemiological investigations have shown that smokers exhibit severe gingivitis and periodontitis compared to non-smokers (3, 11, 14, 15). Several authors have reported that plaque is more prevalent in smokers than in non-smokers (5, 12, 15). However, some studies have shown that smokers and non-smokers with a similar degree of oral cleanliness showed no difference in severity of periodontal disease (6, 15, 16). A recent report (9) states that cigarette-smoking reduces the viability and phago-

cytosing ability of the PMN cells in the oral cavity. Studies dealing with the effect of snuff on oral tissue have mainly focused on the carcinogenic aspects. Little attention has been paid to the effect of snuff upon periodontal health in the literature. Recently Lavstedt (12) reported that men taking snuff orally showed a higher degree of gingivitis at the maxillary incisors than in other parts of the mouth.

The present investigation was designed to study the relation between the use of tobacco and oral health in schoolchildren.

MATERIAL AND METHODS

The study population consisted of 232 schoolchildren from the Municipality of Huddinge, on the outskirts of Stockholm. The children, 119 boys and 113 girls, had a mean age of 13.5 years. They all received their dental treatment at the same Public Dental Service. Of the children 7% belonged to the upper, 54% to the middle, and 36% to the working class. As for the remaining 3%, their social class was unknown. Prior to the clinical examination, the children answered questions regarding their smoking, snuff-taking and toothbrushing habits. The children who smoked 10 or more cigarettes per day were classified as heavy smokers. Oral hygiene was registered according to the Plaque Index (PI I) of Silness and Løe (17), and the degree of gingival inflammation was estimated on the basis of the Gingival Index (GI) of Løe and Silness (13). The calculus was registered according to Calculus Index (CI) in OHI of Greene and Vermillion (7). Dental caries was registered clinically (10) and radiographically (8). The clinical registration included all mesial, distal, facial and lingual surfaces, a total of 24 500 surfaces. The clinical examiner was unaware of the result of the interview.

Cross tabulation and stepwise multiple regression were the statistical methods used. In order to determine the degree of significance Student's t-test was applied.

RESULTS

The mean values and the standard deviations of the variables studied are shown in Table 1.

Smoking habits

Tobacco was used regularly by 21.5% of the children. The smoker-group consisted

of 69% girls and 31% boys. The girls smoked a mean number of 5.3 and the boys 4.6 cigarettes per day. The tobacco consumption was more than 10 cigarettes a day for 28% of the girls and 17% of the boys. Of the smokers 51% had been smoking for a year, while 2% had smoked for six years. The remaining 47% fell somewhere in between these extremes. The boys started smoking at the age of 11.5, while the girls were six months older when they took up the habit.

Boy-smokers, consuming 1–9 cigarettes/day had a GI of 1.32 in the upper front jaw. The corresponding value in non-smoking boys was 0.85. This difference was statistically significant ($p < 0.05$). The heavy smokers among the boys (> 10 cig./day) showed a significantly ($p < 0.05$) higher value of GI and PI I compared to the non-smokers. This was not applicable to the girls.

Smoking, expressed as «number of cigarettes», was a significant predictor for the dependent variables «PI I», «decayed surfaces» and «filled surfaces» (Tables 2, 3 and 4).

Snuff-taking

None of the girls took snuff regularly but 11% of the boys did. The mean consumption of snuff was five pinches per day. Snuff was present in the oral cavity for an average of 3.5 hours.

Comparing snuff-takers and non-snuff-takers, the only variable which differed significantly ($p < 0.001$) was «gingival index» on all surfaces as well as in the upper front jaw. The gingival index in general was 1.10 for snuff-takers and 0.89 for non-snuff-takers.

Tables 5 and 6 show that snuff-taking has a strongly significant correlation ($p < 0.001$) with gingival index after controlling for plaque index.

Table 1. *Mean values (\bar{x}) and standard deviations (SD) of the variables studied (N = 232)*

| Variable | \bar{x} | SD |
|--|-----------|------|
| Number of teeth | 26.40 | 2.60 |
| Number of cigarettes per day | 1.10 | 2.80 |
| Pinches of snuff | 0.10 | 0.31 |
| Plaque index (PI I) | 0.63 | 0.46 |
| Plaque index (PI I) upper front jaw | 0.46 | 0.55 |
| Calculus index (CI) | 0.05 | 0.06 |
| Gingival index (GI) | 0.81 | 0.44 |
| Gingival index (GI) upper front jaw | 0.79 | 0.59 |
| Decayed surfaces | 5.91 | 5.60 |
| Filled surfaces | 8.19 | 5.55 |
| Toothbrushing frequency ≥ twice a day | 0.72 | 0.45 |

Table 2. *Stepwise multiple regression analysis with plaque index (PII) as dependent variable*

| Predictor | Regression coefficient | SE | Significance |
|----------------------|------------------------|-------|--------------|
| Brushing frequency | -0.270 | 0.065 | p < 0.001 |
| Sex | -0.185 | 0.059 | p < 0.01 |
| Number of cigarettes | 0.026 | 0.010 | p < 0.01 |
| Social class | 0.123 | 0.057 | p < 0.05 |

$R^2 = 0.17$

Table 3. *Stepwise multiple regression analysis with decayed surfaces as dependent variable*

| Predictor | Regression coefficient | SE | Significance |
|----------------------|------------------------|-------|--------------|
| Number of teeth | 0.781 | 0.127 | p < 0.001 |
| Plaque index | 0.029 | 0.008 | p < 0.001 |
| Number of cigarettes | 0.311 | 0.118 | p < 0.01 |
| Brushing frequency | -1.925 | 0.778 | p < 0.05 |

$R^2 = 0.22$

Table 4. *Stepwise multiple regression analysis with filled surfaces as dependent variable*

| Predictor | Regression coefficient | SE | Significance |
|----------------------|------------------------|-------|--------------|
| Number of teeth | 0.596 | 0.130 | p < 0.001 |
| Plaque index | 0.024 | 0.007 | p < 0.001 |
| Number of cigarettes | 0.309 | 0.120 | p < 0.05 |

$R^2 = 0.17$

Table 5. *Stepwise regression analysis with gingival index (GI) as dependent variable*

| Predictor | Regression coefficient | SE | Significance |
|--------------|------------------------|-------|--------------|
| Plaque index | 0.779 | 0.035 | $p < 0.001$ |
| Snuff-taking | 0.269 | 0.069 | $p < 0.001$ |

$R^2 = 0.70$

Table 6. *Stepwise multiple regression analysis with gingival index (GI) in the upper front jaw as dependent variable*

| Predictor | Regression coefficient | SE | Significance |
|--------------------|------------------------|-------|--------------|
| Plaque index | 0.709 | 0.048 | $p < 0.001$ |
| Snuff-taking | 0.542 | 0.115 | $p < 0.001$ |
| Brushing frequency | -0.135 | 0.062 | $p < 0.05$ |

$R^2 = 0.56$

DISCUSSION

Few studies have been carried out in children concerning the effect of tobacco on oral health. According to social class the material presented in this study is fairly typical of the surroundings of a large Swedish city. In relation to the country as a whole, the number of middle class children in our sample was larger in relation to the number of working class children. The indices PI I and GI were used in the statistical analyses. By using the method plaque contra no plaque and gingivitis contra no gingivitis, the results were similar in the essentials.

The study confirms that smokers have a higher prevalence of plaque than non-smokers. Comparing plaque index in the upper front jaw between non-smokers and heavy smokers, only boys showed a statistical significant difference. The boys who smoked 1-9 cig./day also differed significantly, from the heavy smokers among the boys with respect to plaque index. However, several authors (2, 5, 15, 16) have reported that the plaque level

appeared to be higher in smokers than non-smokers but that the difference was not significant. The difference in the results may to some degree be due to the fact that the smoking habits in our study were differentiated in contrast to above mentioned studies. The higher prevalence of plaque accumulation for heavy smokers among the boys was not dependent on poor toothbrushing habits in our study, as opposed to the findings reported by Ainamo (1). The higher plaque deposition in heavy smokers may to some degree be explained by the fact that smoking impairs the ability of the leucocytes to phagocytose, which decreases the defense of gingival tissue against oral bacteria (9).

In stepwise multiple regression analyses with filled surfaces and decayed surfaces as dependent variables, smoking, expressed as «number of cigarettes», was a significant predictor. With respect to the short duration of smoking, this result is difficult to explain. The study could not confirm that the habits of the children were influenced by their parents.

Boys who were heavy smokers showed a significant difference from non-smokers according to gingival index. However, in groups with the same oral cleanliness the difference with respect to the degree of gingivitis was not significant. This agrees with Preber and Kant (15) and Bastiaan and Waite (5).

The use of snuff showed significant relation to gingivitis but only after controlling for plaque. This means that snuff-taking may influence the gingival tissue directly and cause gingivitis. The effect of snuff on gingival tissue was not only related to the location of the substance, as the use of snuff was also found to be a predictor of gingivitis in general. This has not been shown earlier. Smoking and the use of snuff seem to act in different ways on the periodontal tissue. In contrast to snuff, smoking affects plaque accumulation which increases the degree of gingival inflammation. The effect of snuff was remarkable in spite of the short duration.

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