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The Impact of Oral Hygiene Educational Programs on the Prevention of Gingivitis in Pediatric Patients

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ABSTRACT

Introduction: Gingivitis is the most common and simplest form of periodontal disease, affecting both adults and children, and is characterized by inflammation of the gingival tissue. This study aimed to evaluate the impact of implementing structured oral health education programs in schools and kindergartens, with a focus on promoting oral and periodontal health from early childhood. **Materials and Methods:** Two questionnaires on oral hygiene were administered before and after educational programs to children aged 6–12 years in Târgu Mureș. **Results:** Most children reported using an electric toothbrush (58.7%), while 25% used a manual toothbrush and 16.3% alternated between both. Improvement in symptomatology was associated with better hygiene habits ($p < 0.0001$). Toothbrushing frequency was significantly associated with the source of oral health information ($p < 0.0001$), confirming the effectiveness of the educational intervention. **Conclusions:** Oral hygiene education programs proved effective in improving children's oral care behavior and had a significant positive impact on reducing the risk of gingivitis.

Keywords: gingivitis, children, oral health, educational programs, prevention

INTRODUCTION

Gingivitis is an inflammatory condition of the gingival tissue characterized by swelling without bone or attachment loss. Among periodontal diseases, it is the most common and is frequently encountered in adults, adolescents, and children.[1–3]

The main etiological factor is bacterial infection caused by the accumulation of dental plaque. Local contributing factors include dental caries, defective restorations, cervical hypoplasia, orthodontic abnormalities such as dento-maxillary crowding, the presence of orthodontic appliances, and mouth breathing. Gen-

eral factors include systemic diseases, hormonal changes, medication use, nutritional deficiencies, smoking, stress, and genetic predisposition.[2–7]

Clinical manifestations may include mild gingival itching, tolerable pain when brushing or chewing hard, sour, or hot foods, and sometimes a burning sensation. Patients often report gingival bleeding during brushing or chewing, as well as pain and halitosis. On examination, the gums appear light red, with swelling of the soft tissues and loss of the normal stippled surface, which becomes smooth and shiny. Gingival consistency may also change, appearing soft and depressible in exudative forms, or firm in those with proliferative tendencies. Radiographically, the alveolar bone does not show any changes.[3,8–10]

Plaque-induced gingivitis is generally considered a localized inflammation triggered by dental plaque accumulation and affects nearly 95% of the global population. The incidence in children aged 4 to 9 years is estimated at 40–60%, with prevalence increasing with age.[8,9]

As in adults, gingivitis in children and adolescents is fully reversible if diagnosed early and managed promptly.[1–3,8] Treatment typically involves three main steps: professional dental cleaning, surgical intervention for advanced cases, and maintenance of results through proper oral hygiene and regular dental check-ups.[2,3,5,11–13]

MATERIALS AND METHODS

Data were collected through two questionnaires, each consisting of ten questions on oral hygiene habits, administered before and after participation in oral health education programs. Additional feedback regarding the education sessions was also obtained. The questionnaires were distributed to parents or guardians of primary school children aged 6–12 years in Târgu Mureș, an age group chosen because it corresponds to mixed dentition, when oral pathologies are common. At the time of the first questionnaire, a training session with demonstrations on proper oral hygiene practices was conducted. Approximately 2 weeks later, the first set of questionnaires was collected and the second set distributed. After another 2 weeks, the second set was collected. The same respondents completed both questionnaires.

All data were entered into Microsoft Excel (Microsoft Corporation) and analyzed using GraphPad Prism v.10.2.3 for Windows (GraphPad Software). Descriptive statistics (mean and standard deviation) were calculated for each data group. Data normality was assessed with the Kolmogorov–Smirnov test. Associations between variables were evaluated using the Chi-square and Fisher's exact tests. Statistical significance was set at $p < 0.05$.

RESULTS

The first questionnaire was completed by 184 parents or guardians of the participating children, while the second was completed by 134 respondents. The difference in response rate was most likely due to participant absence or decreased interest. As the study population was the same for both questionnaires, demographic data from the first questionnaire were used for analysis. Of the 184 respondents, 98 (53.3%) were female and 86 (46.7%) male. Most participants resided in urban areas (177; 97%), while only 6 (3%) were from rural areas.

Regarding oral hygiene practices, the majority reported using an electric toothbrush (108; 58.7%). A smaller proportion used only a manual toothbrush (46; 25%), while 30 respondents (16.3%) alternated between manual and electric toothbrushes (Figure 1).

In terms of brushing frequency, 152 participants (82.6%) reported brushing twice daily, and 32 (17.4%) once daily. Dental floss use was less common: 96 respondents (52%)

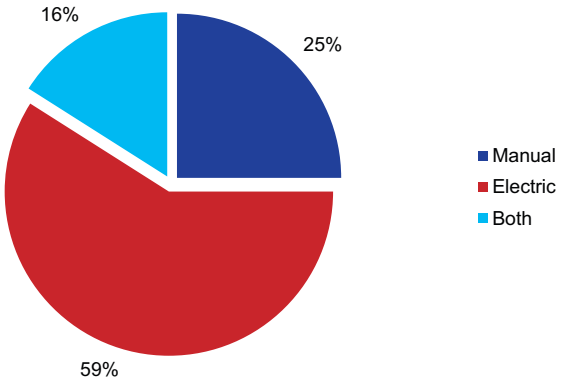

FIGURE 1. Distribution by type of toothbrush used

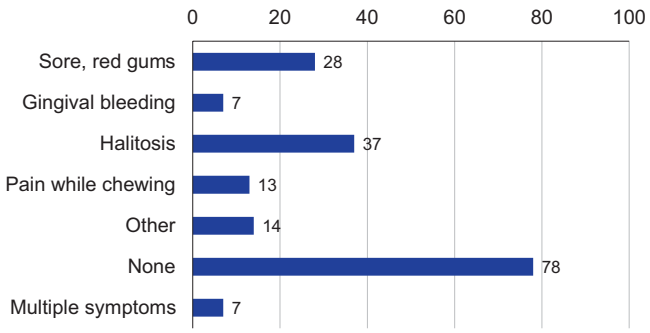

FIGURE 2. Distribution of reported symptoms

reported never using it, 64 (35%) used it occasionally, and only 24 (13%) used it regularly.

Of the 184 respondents, 78 (42.4%) reported no symptoms. The most frequently reported symptom was halitosis (bad breath), present in 37 participants (20.1%), followed by sore, red gums in 28 children (15.2%). Pain when chewing was noted in 13 cases (7.1%), bleeding gums in 7 (3.8%), and other symptoms in 14 respondents (7.2%). Multiple concurrent symptoms were reported by 7 individuals (3.8%) (Figure 2).

Regarding sources of oral health information, most respondents (100; 54.4%) reported obtaining knowledge from multiple sources. Family was the main source for 74 participants (40.2%). A smaller number relied solely on dental offices (8; 4.4%), while only two individuals (1.1%) reported learning about oral health exclusively through educational programs. The questionnaire also assessed the frequency of participation in oral hygiene education programs. More than half of the children (104; 58%) participated once a year, 32 (16%) every six months, and 14 (8%) every three months, while 28 (18%) reported never participating. As for the content of these programs, toothbrushing techniques alone were reported by 60 participants (32.6%). A combination of several techniques was mentioned by 31 (16.9%), while 28 (15.2%) recalled instruction on brushing, flossing, and mouthwash use. Another 13 respondents (7.1%) reported programs including brushing and mouthwash use, and 26 (14.1%) gave no response.

Participants were also asked to provide feedback on the oral hygiene programs. In total, 70 respondents (52.2%) considered the programs very useful, 56 (41.8%) rated them as quite useful, four (3.0%) were neutral, and only two each (1.5%) found them of little or no use. In terms of satisfaction, 66 (49.3%) declared themselves very satisfied, 56 (41.8%) satisfied, 10 (7.5%) indifferent, and two (1.5%) somewhat satisfied. When asked whether they would recommend such programs to others, 128 answered "yes" and 6 "maybe"; none responded negatively.

No statistically significant association was found between the frequency of attending oral health education programs and the use of dental floss ($p = 0.8526$). However, children who cited educational programs as their primary source of information showed a significant improvement in toothbrushing frequency ($p < 0.0001$). No significant association was observed between the source of information and dental floss use ($p = 0.1067$). A statistically significant improvement in toothbrushing frequency was observed between the two sets of questionnaires ($p = 0.0042$). This improvement in oral hygiene habits was accompanied by a decrease in the initially reported symptoms, with statistical analysis confirming a significant association between the two variables ($p < 0.0001$).

DISCUSSION

The analysis of participants' environment of origin revealed a clear predominance of children from urban areas (97%), with only 3% from rural settings. This distribution may have influenced the results, as access to oral health education programs, dental services, and preventive materials is generally more readily available in urban environments. Moreover, children living in cities may benefit more frequently from school- or kindergarten-based oral health interventions.

The relatively high use of electric toothbrushes among children may reflect both their greater effectiveness in bacterial plaque removal and their attractiveness to this age group, which can encourage more regular brushing. These findings suggest a positive trend toward the adoption of modern oral hygiene methods, while also indicating that preferences may vary depending on factors such as parental education, dentist recommendations, economic resources, and individual child characteristics. Our results are consistent with an 8-week study comparing electric and manual toothbrushes in reducing dental plaque and gingivitis. That study demonstrated a statistically significant reduction in plaque with electric toothbrush use, with improvements observed after a single session and maintained throughout the study period.[13]

Regarding the use of dental floss, the results indicate that it is not yet part of the oral hygiene habits of most respondents. This may reflect a lack of education or awareness about the importance of cleaning interdental spaces to prevent gingivitis and other periodontal diseases. It could also be related to practical difficulties in correct flossing at younger ages, when dexterity is limited, or to insufficient parental involvement. These findings point to the need to include training in flossing more clearly within oral health education programs for children, as well as in parental counseling.

Toothbrushing frequency was assessed in both questionnaires. The results showed generally good frequency in both, with the proportion of children brushing twice daily increasing by 3.96% from the first to the second questionnaire, while those brushing once daily decreased by 5.45%. A small percentage of respondents (1.49%) reported brushing more than twice daily, which may reflect increased personal motivation following the educational intervention. The difference in brushing frequency was

statistically significant ($p = 0.0042$), suggesting that the program contributed to improved oral hygiene habits.

By analyzing the association between the source of information on oral hygiene and the frequency of toothbrushing, we found a statistically significant result ($p < 0.001$). This suggests that individuals who obtain information from professional sources, such as dentists or educational campaigns, tend to brush their teeth more frequently than those relying mainly on informal sources such as family. In line with our findings, Park *et al*. highlighted the importance of toothbrushing frequency not only for oral health but also for general health, noting associations with chronic conditions including cardiovascular disease, diabetes mellitus, hypertension, and chronic kidney disease.[14]

The second questionnaire results indicate that the educational intervention had a positive influence on oral hygiene behavior. More than half of the respondents (50.7%) reported an improvement in toothbrushing technique, reflecting good receptivity to the information provided. Smaller groups reported additional changes in their daily oral care routine. These observations are consistent with recent literature emphasizing the important role of oral health education programs in preventing oral diseases.[15–19]

The correlation between improved oral hygiene habits and reduction in reported symptoms was statistically significant ($p < 0.0001$). This finding supports the idea that adopting correct oral hygiene practices has a measurable impact on perceived oral health. It is also consistent with literature highlighting the role of adequate oral hygiene in the prevention and management of periodontal diseases.[20–23]

Participant feedback regarding the educational programs indicated a generally high level of satisfaction. Most respondents reported being very satisfied, suggesting that the initiative was well received and broadly met participant needs. A small proportion expressed indifference or only slight satisfaction, which may reflect areas where the programs could be refined. For these participants, the content may not have fully met expectations, or other barriers may have influenced their experience.

The high level of satisfaction with the programs is further supported by respondents' willingness to recommend them to others. This reflects strong confidence in their quality and usefulness, while the absence of negative responses suggests that participants did not have unpleasant or disappointing experiences. Those who answered "probably" may be seen as an indirect indicator of success and a potential driver of organic promotion within the community.

A limitation of this study is that most participating children were from urban areas, which may affect the generalizability of the findings to rural populations. This aspect highlights the need for future research that includes a more balanced representation of children from both urban and rural environments.

The smaller sample size for the second questionnaire represents another limitation of this study, as not all participants initially enrolled continued into the second stage.

CONCLUSIONS

Oral hygiene education programs proved effective in improving children's oral health behaviors and showed a significant positive impact on reducing the risk of gingivitis. Their effectiveness was further supported by the favorable attitude of parents or guardians, most of whom expressed satisfaction with the results and a willingness to recommend such programs to others. Given the study's limitations, future research should include larger samples and ensure adequate representation of children from rural areas.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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