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Chapter

Oral Health Knowledge, Attitudes, and Behavior in Young Adults

Ljiljana Kesic, Radmila Obradovic, Milica Petrovic, Marija Bojovic, Dragoslav Lazic, Branislava Stojkovic and Simona Stojanovic

Abstract

Knowledge about the importance of oral health and oral hygiene practices, attitudes, and behavior among young adults shows the association of insufficient or irregular oral hygiene with the occurrence of gingival/periodontal diseases, caries, and consequently systemic disease occurrence including cardiovascular disease, cancer, diabetes mellitus, infections of the respiratory tract, adverse pregnancy outcomes, and neurological disorders. Public health dentists should be trained for oral health needs assessments as well as for the evaluation of community-based oral health improvement strategies among different population groups.

Keywords: oral health, oral hygiene, young adults, caries, periodontal disease

1. Introduction

Knowledge about the importance of oral health and oral hygiene practices, attitudes, and behavior among young adults shows the association of insufficient or irregular oral hygiene with the occurrence of gingival/periodontal diseases, caries, and consequently systemic disease occurrence including cardiovascular disease, cancer, diabetes, respiratory infections, adverse pregnancy outcomes, and neurological disorders [1–8].

Periodontal diseases are highly prevalent and can affect up to 90% of the worldwide population [9]. Periodontal disease is an inflammatory disease, followed by pathologic loss of tooth-supporting tissues (periodontal ligament, gingiva, cementum, and alveolar bone).

Dental caries affects approximately 36% of the worldwide population and is still one of the major causes of tooth loss and pain in industrialized countries [10–12]. Dental caries is a multifactorial disease in which the signs of carious demineralization can be seen on the hard dental tissues [13]. It could cause pain, discomfort, and anxiety, if dental caries is untreated, cause the development of infection and tooth loss [14]. This condition may not only affect an individual’s ability to eat and speak properly but may also result in lost work and school hours and affect the individual’s...
overall well-being. The crucial role that a healthy oral microbiome plays in preventing caries and promoting oral health is also being increasingly recognized. Caries prevention has traditionally relied on fluoride exposure, diet control, thorough oral hygiene, and antibacterial measures [15].

The most common forms of periodontal diseases in young adults are gingivitis and periodontitis [16]. Gingivitis is characterized by gingival inflammation, swollen and bleeding gums. In the absence of causal therapy, it may progress to periodontal disease, with the appearance of the periodontal pocket, tissue destruction, and bone resorption [17].

Dental caries, in young adults, is associated with bad oral hygiene habits, more gingivitis, higher consumption of sugar, as well as acidic beverages [18].

2. Oral biofilm

The primary etiologic factor responsible for the initiation and progression of periodontal disease, as well as dental caries, is microbial dental biofilm [19, 20].

Oral biofilm is an organic deposit, which consists of—bacteria, leukocytes, immunoglobulins, inorganic substances, mucins, fungi, desquamated epithelial cells, and low-molecular substances. The qualitative and quantitative composition of oral biofilm microorganisms is different in each person, but one gram contains up to $22 \times 10^{14}$ bacteria [21]. The role of microorganisms in the development of periodontitis is very important, the percent of damage of periodontal tissues is a consequence of the interaction of microbiological factors and the immune-host response [22].

The main periopathogens are *Aggregatibacter actinomycetemcomitans*, *Prevotella intermedia*, *Porphyromonas gingivalis*, *Treponema denticola*, and *Tannerella forsythensis*. Oral health is critically dependent upon the maintenance of good oral hygiene [23].

The oral biofilm is also highly resilient, and it is reorganized into remarkable similar communities following perturbations, such as daily brushing and flossing or professionally administered oral prophylaxis. It takes very large and sustained perturbations to disturb this resilience, particularly smoking, antibiotic use, and certain systemic diseases [24].

Also, **local and systemic etiological factors** have an impact on the initiation and progression of periodontitis. There is a number of local and general factors that have an impact on the pathological processing speed of periodontal disease [25–28].

**The various local** factors that facilitate and accelerate the accumulation of oral biofilm include the following:

1. Anatomical anomalies
2. Food impaction
3. Bad habits
4. Dental caries
5. Iatrogenic factors
6. Gingival lesions
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**The systemic factors** included that reduced the general organism resistance and accelerate the action of the harmful agents of oral biofilm. Due to its effect, the destruction was much more severe. These risk factors are subdivided into two subgroups:

1. Invariant risk factors—genetic predisposition, race, and sex;
2. Variable risk factors—intercurrent diseases, use of drugs, diet, age, stress, and smoking [8, 19, 29].

The main causative agents of oral biofilm for the development of dental caries are acidogenic species *Streptococcus mutans*, including members of the mitis, anginosus and salivarius groups of streptococci, *Enterococcus faecalis*, *Actinomyces naeslundii*, *Actinomyces viscosus*, *Rothia dentocariosa*, *Propionibacterium*, *Prevotella*, *Veillonella*, *Bifidobacterium*, and *Scardovia* [30, 31].

3. Treatment

Periodontal treatment consists of—causal therapy (scaling and root planning), antiseptic rinses, and occasionally systemic antibiotics and surgical interventions. Aims at preventing further periodontal disease progression with the intention to reduce the risk of tooth loss, minimize symptoms and perception of the disease, possibly restore loss of periodontal tissue, and provide information on maintaining a healthy periodontium. Therapeutic intervention includes the introduction of techniques to change behavior, such as individually tailored oral hygiene instructions, a smoking cessation program, dietary adjustment, subgingival instrumentation to remove plaque and calculus, local and systemic pharmacotherapy, and various types of surgery.

Periodontal treatment, because of the chronic nature of the periodontal disease, is a lifelong commitment to basic therapy and intricate oral hygiene techniques, which, when properly implemented, will minimize the risk of disease initiation and progression [32, 33].

Dental caries is preventable with simple procedures, such as tooth brushing with fluoride toothpaste or professional applications of topical fluoride treatments [34]. The aim of therapy is to preserve tooth structures and prevent their further destruction. Whether the carious lesion is cavitated or noncavitated dictates the treatment plan. A dental restoration or dental filling with dental restorative material (dental amalgam, composite resin, porcelain, and gold) is used to repair the function, integrity, and morphology of missing tooth structure [35]. Also, the use of antimicrobial peptides for the prevention and treatment of dental caries is justified [36].

4. Discussion

An association between insufficient or irregular oral hygiene with the occurrence of dental caries, gingival/periodontal diseases, and consequently general diseases has been established. The frequency of brushing teeth, interdental cleaning as well as regular examinations are important determinants of periodontal health. Educational level is by far the most important factor of good oral behavior [37].
Numerous studies have been conducted on young adults around the world to assess oral hygiene habits. Interviews on oral hygiene habits were conducted and analyzed in Europe [38–43], North America [44, 45], Africa [46–49], Asia [50–63], and South America [64–66].

Muthu investigated 282 dental students (63 male and 219 female), ages 18–22, and showed the following results—of the total, 38% had never visited a dentist and brushed their teeth only once a day; 56% visited the dentist only when they were experiencing pain; 49% ignore the color of their teeth; 62% do not pay attention to the color of their gums, while 20% reported bleeding from the gums during brushing. Only 64% were satisfied with the color and appearance of their teeth and gums. Male students preferred hard toothbrushes and mouthwash [67].

Brushing twice a day is recommended in industrialized countries [68], but in some other countries, it is far from achieved [49]. Also, Rimondini et al. showed that 81.6% of Italian students used one toothbrush for less than 3 months [68], while Kirtioloğlu and Yavuz found that 49% of Turkish students used one toothbrush for less than 3 months [69]. Rimondini et al. conclude that a strategy to promote the use of dental services for prevention may be useful for improving oral health in the young Italian population [68].

Peltzer, Pengpid have conducted a survey of 3344 university students from five countries (Indonesia, Malaysia, Thailand, Vietnam, and Myanmar) [70]. The mean age of the respondents was 20.5 years. Regarding brushing, the following results were obtained—in Indonesia, 95.2% of respondents; in Malaysia 83.2%; in Thailand 93.2%; while in Vietnam 76.3% and 48.2% in Myanmar brush their teeth two or more times a day. Then, 29% of respondents never went to the dentist, 51.1% went once a year, and 19.9% more than once a year (Indonesia); 25.7% have never visited a dentist, 35.7% once a year, and 38.6% several times a year (Malaysia); 29.4% never went to the dentist, 46.5% once a year, and 24% several times a year (Thailand); 28.3% never, 47.4% once a year, 24.3% more than once a year (Vietnam); 49.8% never go to the dentist, 1.7% once a year, and 48.5% more times a year (Myanmar).

Agrawal et al. conducted a very interesting study on 223 juvenile detainees, aged 6–18 years [71]. The results showed that the detainees' oral hygiene status was poor, with only 28.1% of respondents having good oral hygiene. The findings confirmed that detainees in the juvenile detention center have poor oral hygiene and an increased prevalence of periodontal disease compared to a population of similar age in the general population.

Ohshima et al. compared periodontal health status and oral health behavior between Japanese and Chinese dental students [72]. The study was conducted on 118 students of the Faculty of Dentistry of Nihon University and 92 students of the Dental School of Nanjing Medical University. An occult blood test of saliva was performed to classify whether subjects could have periodontal disease. Further questionnaires were given to assess different lifestyles and habits of oral hygiene. The positive test rate for occult blood of saliva was 13.6% among Japanese dental students and 43.5% among Chinese dental students. Bleeding from the gingiva as a subjective symptom was as follows: Japanese 76%; Chinese 37.0%. Japanese dental students brushed their teeth for 13.5 min each day and Chinese students for 4.6 min. Japanese students (33.1%) used interdental means, while Chinese 76%. It is believed that the recorded differences between Japanese and Chinese dental students are the main reason for the appearance of periodontitis, which indicates the need to improve hygiene measures in the city of Nanjing. It is proposed to establish and strengthen education on oral hygiene, including the importance of brushing teeth for the prevention of gingival/periodontal diseases.
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<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n = 523)</th>
<th>Group 2 (n = 357)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you brush your teeth?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depends</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Sometimes</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Every day</td>
<td>511</td>
<td>338</td>
</tr>
<tr>
<td>$\chi^2 = 18.10$, (df = 2), (p = 0.0001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many times per day do you brush your teeth?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once</td>
<td>57</td>
<td>14</td>
</tr>
<tr>
<td>Twice</td>
<td>247</td>
<td>191</td>
</tr>
<tr>
<td>Three times</td>
<td>183</td>
<td>147</td>
</tr>
<tr>
<td>After every meal</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>$\chi^2 = 30.33$, (df = 3), (p &lt; 0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When do you brush your teeth?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the morning</td>
<td>503</td>
<td>330</td>
</tr>
<tr>
<td>Before dinner</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>After dinner</td>
<td>425</td>
<td>304</td>
</tr>
<tr>
<td>Before getting out</td>
<td>265</td>
<td>196</td>
</tr>
<tr>
<td>$\chi^2 = 4.20$, (df = 3), (p = 0.2407)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you use toothbrush?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Every day</td>
<td>522</td>
<td>342</td>
</tr>
<tr>
<td>$\chi^2 = 19.12$, (df = 1), (p &lt; 0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you use toothpaste?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depends</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Sometimes</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Every day</td>
<td>518</td>
<td>352</td>
</tr>
<tr>
<td>$\chi^2 = 0.37$, (df = 1), (p = 0.5375)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you use toothpaste with fluoride?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>271</td>
<td>204</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>Dont know</td>
<td>206</td>
<td>121</td>
</tr>
<tr>
<td>Sometimes</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>$\chi^2 = 5.44$, (df = 3), (p = 0.1426)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does the toothpaste with fluoride could protect the teeth of caries?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>272</td>
<td>246</td>
</tr>
<tr>
<td>No</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>Dont know</td>
<td>220</td>
<td>10</td>
</tr>
<tr>
<td>$\chi^2 = 32.45$, (df = 2), (p &lt; 0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you use: toothpicks, floss, interdental brushes?</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>107</td>
<td>14</td>
</tr>
<tr>
<td>Rarely</td>
<td>106</td>
<td>51</td>
</tr>
<tr>
<td>$\chi^2 = 3.22$, (df = 2), (p = 0.199)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Kaira et al. surveyed 111 nursing students at Rohilkhand Hospital, Bareilly, India [73]. Most of the respondents had good oral hygiene, which included brushing their teeth twice a day with a brush and toothpaste for 2–3 min. Almost 87% of them knew that oral biofilm causes gingival inflammation and consequently periodontitis. Almost half of the participants visited the dentist solely because of the pain. However, most of them gave the same importance to dental health as to general health. They concluded that the knowledge, attitude, and practice of oral health care students are adequate, but that further improvements can be encouraged.

Sharda surveyed 825 participants (577 men, 248 women) from six different professions belonging to the non-medical, paramedical, and medical categories of the survey [74]. The knowledge was significantly higher among medical students compared to those who were not. Attitude scores were significantly lower for the non-medical category compared to the other two categories. The results indicate that knowledge was not sufficient to influence oral health-related behaviors.

Bojović et al. investigation supplied a new understanding of oral health risk factors among students in the University of Niš medical programs [75]. Namely, the results

<table>
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<th>Group 2 (n = 357)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depends</strong></td>
<td>24</td>
<td>4.59%</td>
</tr>
<tr>
<td><strong>Sometimes</strong></td>
<td>238</td>
<td>45.51%</td>
</tr>
<tr>
<td><strong>Every day</strong></td>
<td>48</td>
<td>9.38%</td>
</tr>
</tbody>
</table>

$\chi^2 = 101.34, \text{df} = 4, p < 0.001$

<table>
<thead>
<tr>
<th><strong>Do you use mouthwash?</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Never</strong></td>
<td>80</td>
<td>15.30%</td>
</tr>
<tr>
<td><strong>Rarely</strong></td>
<td>82</td>
<td>15.68%</td>
</tr>
<tr>
<td><strong>Depends</strong></td>
<td>36</td>
<td>6.88%</td>
</tr>
<tr>
<td><strong>Sometimes</strong></td>
<td>137</td>
<td>26.20%</td>
</tr>
<tr>
<td><strong>Every day</strong></td>
<td>188</td>
<td>35.95%</td>
</tr>
</tbody>
</table>

$\chi^2 = 9.00, \text{df} = 4, p = 0.0610$

<table>
<thead>
<tr>
<th><strong>Do you use electrical toothbrush?</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Never</strong></td>
<td>431</td>
<td>82.41%</td>
</tr>
<tr>
<td><strong>Rarely</strong></td>
<td>44</td>
<td>8.41%</td>
</tr>
<tr>
<td><strong>Depends</strong></td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Sometimes</strong></td>
<td>17</td>
<td>3.25%</td>
</tr>
<tr>
<td><strong>Every day</strong></td>
<td>31</td>
<td>5.93%</td>
</tr>
</tbody>
</table>

$\chi^2 = 3.81, \text{df} = 3, p = 0.2824$

Attribute variables are given as frequencies and percentages.

*p < 0.05, **p < 0.01, ***p < 0.001 ($\chi^2$ test).

The daily frequency of brushing teeth is 2 and 3 times more common in group 1 with statistically significant difference between the groups ($p < 0.001$). Morning tooth brushing was statistically more represented in group 1 ($p < 0.05$). There is a statistically significant difference between the groups in the frequency of using a toothbrush ($p < 0.001$). The groups did not differ in the use of fluoride toothpaste, but differed in the opinion that fluoride toothpaste protects teeth from caries ($p < 0.001$), which is a consequence of the statistically more frequent confirmatory opinion of group 2 respondents ($p < 0.001$). Groups of respondents differ statistically significantly in the frequency of use of toothpicks, floss and interdental brushes ($p < 0.001$). But, mouthwash, statistically more often never used by subjects of group 1 ($p < 0.05$).

Table 1.
Oral hygiene practices among students.

Kaira et al. surveyed 111 nursing students at Rohilkhand Hospital, Bareilly, India [73]. Most of the respondents had good oral hygiene, which included brushing their teeth twice a day with a brush and toothpaste for 2–3 min. Almost 87% of them knew that oral biofilm causes gingival inflammation and consequently periodontitis. Almost half of the participants visited the dentist solely because of the pain. However, most of them gave the same importance to dental health as to general health. They concluded that the knowledge, attitude, and practice of oral health care students are adequate, but that further improvements can be encouraged.

Sharda surveyed 825 participants (577 men, 248 women) from six different professions belonging to the non-medical, paramedical, and medical categories of the survey [74]. The knowledge was significantly higher among medical students compared to those who were not. Attitude scores were significantly lower for the non-medical category compared to the other two categories. The results indicate that knowledge was not sufficient to influence oral health-related behaviors.

Bojović et al. investigation supplied a new understanding of oral health risk factors among students in the University of Niš medical programs [75]. Namely, the results
of this research indicate that students in the clinical medical program have better knowledge about oral hygiene issues compared with students in the preclinical medical program. The authors suggested that it is necessary to educate preclinical students to raise awareness of the importance of oral health.

Bojović investigated risk factors for oral health conditions by examining oral hygiene practices, attitudes, and behaviors among the students in the medical program of the University of Niš, collecting data using questionnaires [76]. The study included 880 students of medicine, dentistry, pharmacy, and vocational studies. Students were divided into two groups—those who were in preclinical (group 1) and those who were in clinical subjects (group 2). Prior to the clinical examination, subjects completed an anonymous survey, which contained four aspects—(1) sociodemographic data; (2) oral hygiene habits and behaviors; (3) health risk behaviors, disorders, drug use, parafunctional habits; (4) maintaining oral health. Oral hygiene, as expected, showed that a high percentage of respondents brush their teeth daily (97.22%). The largest percentage of all respondents (45.45%) sometimes use interdental brushes/floss/toothpicks. Tooth brushing lasted 3 min in 39.39% of subjects (Table 1).

Today, in the world, there is a tendency to evaluate, analyze, and propose education programs for medical students, but also for students of other study programs [75–100]. Also, there is a need for other groups of the population (chronic patients, diabetics, pregnant women, patients with blood dyscrasias, oncology patients, etc.) to be educated, acquired and adopted knowledge, attitudes, and behaviors about oral health.

5. Conclusion

Oral health education and promotion through dentists, electronic media, print media, and public health programs are needed to improve oral hygiene practices among young adults as well as the general population. Regular visits to the dentist for prevention, prophylaxis, and professional referral to oral hygiene are key to the prevention of oral diseases [75].

Public health dentists should be trained to assess the need for oral health, implement and evaluate strategies to improve oral health among different population groups.

Conflict of interest

The authors declare no conflict of interest.
Author details

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