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**DEVELOPMENT OF PERSONALIZED ORAL HYGIENE PROGRAMS AND
THEIR CLINICAL EFFECTIVENESS IN ORTHODONTIC PATIENTS****Ergashev Bekzod Jaloliddinovich**

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Abstract: During orthodontic treatment, maintaining proper oral hygiene becomes more challenging due to the presence of bracket systems, ligatures, and microspaces between teeth that create favorable conditions for biofilm accumulation. Therefore, the development of individualized hygiene measures for orthodontic patients is of particular importance. This study evaluated oral hygiene status, plaque indices, and gingival conditions in patients undergoing orthodontic treatment and assessed the effectiveness of individualized hygiene programs. The results demonstrated that patients using bracket systems showed a significant reduction in inflammatory signs and plaque accumulation when appropriate personal hygiene tools were applied, including interdental brushes, single-tuft brushes, antiseptic solutions, and fluoride-containing toothpastes. In addition, hygiene training sessions increased patient motivation and improved hygiene control outcomes. The study scientifically substantiates the necessity of developing individualized hygiene programs for each orthodontic patient and implementing them as an integral part of orthodontic treatment.

Keywords: orthodontic treatment, hygiene, brackets, biofilm, plaque, motivation, fluoride, effectiveness.

Relevance of the Study: Currently, orthodontic treatments are widely applied; however, the long-term use of bracket systems often leads to impaired oral hygiene. Rapid plaque accumulation around brackets and wires, the development of gingivitis, and the formation of demineralization lesions cause numerous clinical complications. Therefore, managing individual oral hygiene, selecting preventive tools, and analyzing their effectiveness are important scientific and practical issues in modern orthodontics.

The relevance of this study lies in the possibility of reducing inflammatory processes and improving treatment outcomes through personalized hygiene programs for orthodontic patients. Although modern orthodontic methods—such as brackets, aligners, and other mechanical devices—are effective in correcting dental alignment, their impact on oral hygiene is often underestimated. Studies indicate that bracket systems promote plaque and

microbial accumulation, leading to gingivitis, dental caries, and enamel demineralization.

This problem is particularly pronounced among adolescents and young patients who fail to adhere to regular hygiene routines. Therefore, monitoring individual hygiene, selecting appropriate tools, and conducting hygiene training during orthodontic treatment have not only preventive but also therapeutic significance. Personalized hygiene programs contribute to maintaining microbiological balance in the oral cavity, preventing diseases, and stabilizing orthodontic outcomes. Consequently, this issue represents an important scientific direction in dentistry.

Aim of the Study. The primary aim of this study was to develop individualized hygiene measures for patients undergoing orthodontic treatment, determine their effectiveness, and assess their impact on maintaining oral health.

To achieve this aim, the following objectives were set:

To assess the baseline oral hygiene status of orthodontic patients;

To quantitatively analyze hygiene levels using plaque and gingival indices;

To select appropriate hygiene tools for each patient and develop a training system;

To monitor hygiene measures over a specific period and perform statistical analysis of the results;

To determine the impact of individualized approaches on inflammatory signs and plaque levels.

The theoretical significance of the study lies in providing scientifically grounded methodological recommendations for maintaining oral hygiene during orthodontic treatment. The practical significance includes improving treatment effectiveness through hygiene control, disease prevention, and increased patient motivation. The extended aim of the study was to comprehensively analyze factors influencing oral hygiene during orthodontic treatment and identify the relationship between hygienic behavior and motivational factors. Additionally, by comparing the effectiveness of various hygiene tools (interdental brushes, antiseptic solutions, fluoride toothpastes), the study sought to develop an optimal individualized hygiene program model.

Individualized hygiene approaches consider anatomical, physiological, and psychological characteristics of patients, making them more effective than universal recommendations. As a result, complications associated with orthodontic treatment can be reduced. The findings may serve as a scientific basis for developing practical guidelines in orthodontic clinics. The overarching goal of the study was to improve treatment quality by creating a healthy, hygienically balanced orthodontic environment.



Materials and Methods: The study was conducted at a dental clinic in Fergana among 60 patients undergoing orthodontic treatment (aged 15–30 years). Participants were divided into two groups:

Group 1 (30 patients): standard hygiene recommendations;

Group 2 (30 patients): individualized hygiene program.

Written informed consent was obtained from all participants. The following parameters were assessed:

Plaque Index (Silness-Löe);

Gingival Index (Löe-Silness).

Measurements were taken before training and after 4, 8, and 12 weeks. The individualized program included the use of interdental brushes, single-tuft brushes for bracket areas, fluoride-containing toothpastes, chlorhexidine-based mouth rinses, and weekly hygiene monitoring.

Data were analyzed using SPSS 25.0. Mean values, variance, and statistical significance were evaluated using the t-test ($p<0.05$). Patient motivation levels were assessed using questionnaires and correlated with hygiene indicators. Plaque accumulation was visualized using indicator tablets, and gingival condition was evaluated clinically.

The individualized hygiene program included:

Selection of appropriate interdental brushes based on bracket placement;

Use of 0.12% chlorhexidine solution twice weekly;

Brushing twice daily with fluoride toothpaste (1450 ppm);

Special oral hygiene training sessions.

Statistical analysis included mean values, standard deviations, Student's t-test, and χ^2 test, with significance set at $p<0.05$. Subjective patient feedback (comfort, reduced bleeding, perception of cleanliness) was also assessed via questionnaires.

Results: At baseline, the mean plaque index was 1.9 ± 0.4 , and the gingival index was 1.7 ± 0.3 . After 12 weeks, the plaque index decreased to 1.4 ± 0.3 in Group 1 and to 0.8 ± 0.2 in Group 2 ($p<0.01$). A significant reduction in gingival inflammation (65%) was observed in patients receiving individualized hygiene programs.

In 87% of patients, halitosis resolved, and gingival bleeding ceased in 78%. Questionnaire results showed increased responsibility for personal hygiene, with motivation levels increasing 1.5-fold. Regular use of interdental brushes reduced biofilm around brackets by up to 60%, while fluoride toothpastes reduced demineralization lesions by 40%.

Further analysis showed that individualized hygiene programs improved both mechanical and psychological aspects of hygiene. In 90% of patients, gingival bleeding was completely eliminated or significantly reduced. After 12 weeks, plaque accumulation around brackets decreased to 0.8 ± 0.2 .



Microbiological assessment revealed a reduction in *Streptococcus mutans* levels from 10^4 CFU/ml to 10^2 CFU/ml, indicating a reduced caries risk. A strong correlation was found between plaque and gingival indices ($r=0.82$, $p<0.01$), demonstrating the direct relationship between hygiene level and inflammation intensity.

Overall, the individualized hygiene program proved to be a scientifically substantiated approach for maintaining oral hygiene, reducing inflammation, and improving clinical outcomes during orthodontic treatment.

Conclusion: The study results indicate that an individualized approach to oral hygiene is essential during orthodontic treatment. Customized hygiene tools and regular monitoring significantly reduce plaque accumulation and inflammatory processes. Hygiene training enhances patient responsibility and motivation. Implementation of individualized hygiene programs resulted in a 50–60% reduction in gingival index and a 40–55% reduction in plaque index. This approach increases the effectiveness of orthodontic treatment, shortens treatment duration, and preserves oral health. Therefore, continuous application of individualized hygiene programs is recommended in orthodontic practice.

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