Polymorphonuclear Neutrophil Counts Among Adolescents at Different Stages of Fixed Orthodontic Treatment: A Cross-Sectional Study

S. Ravikkumar[1*], W.B.M.C.R.D. Weerasekera[2], B.S.M.S. Siriwardana[2]

[1]*Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Faculty of Dental Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**sarmika2001@gmail.com*

Fixed orthodontic appliances introduce a persistent foreign body into the oral environment, creating plaque-retentive niches and initiating localized inflammatory responses. Polymorphonuclear neutrophils (PMNs), as key mediators of innate immunity, are rapidly recruited during inflammation and may reflect systemic changes associated with orthodontic treatment. This study aimed to compare PMN counts among adolescents at different stages of fixed orthodontic therapy. A cross-sectional analytical study was conducted at the Dental Teaching Hospital, University of Peradeniya, involving 60 adolescents (20 per group) aged 12–18 years. Participants were categorized into three groups: pre-treatment controls, patients undergoing treatment for 1–3 months, and patients treated for more than one year. Individuals with recent infections, systemic diseases, periodontal disease, smoking habits, or medications known to influence neutrophil counts were excluded. Capillary blood samples were obtained via finger-prick, and PMN counts were determined by manual microscopic analysis performed by a single examiner. Statistical analysis was performed using Jamovi (version 2.3.28). Group comparisons were conducted using one-way Welch's ANOVA followed by Games-Howell post-hoc tests, with significance set at $p < 0.05$. Statistically significant difference in PMN counts was observed among the three groups ($F = 35.5$, $p < 0.001$). The 1–3-month treatment group showed the highest mean PMN count (70.3 ± 2.03), compared with the control group (64.8 ± 3.13) and the >1-year treatment group (64.3 ± 3.36). PMN counts were significantly higher in the 1–3-month group than in both the control and >1-year groups ($p < 0.001$), whereas no significant difference was observed between the control and >1-year groups ($p = 0.876$). These findings suggest that fixed orthodontic treatment is associated with a transient inflammatory response during the early phase of treatment, with PMN counts returning to near-baseline levels after prolonged treatment. Understanding these immunological changes may help clinicians optimize patient monitoring and reinforce oral hygiene practices during orthodontic therapy.

Keywords: fixed orthodontic treatment, polymorphonuclear neutrophils, inflammation, adolescents, immune response