

Evaluation Of Pain In Orthodontic Patients Wearing Self-Ligating Brackets - Questionnaire Study

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Abstract

Background: Pain is a common and distressing side effect of orthodontic treatment and plays a significant role in patient compliance, acceptance, and satisfaction. Self-ligating brackets (SLBs) have been introduced to reduce friction and allow lighter orthodontic forces, which may influence pain perception during treatment. However, evidence regarding their impact on pain remains inconclusive.

Aim: To evaluate the evolution of pain in patients undergoing orthodontic treatment with self-ligating brackets and to assess its association with gender, previous orthodontic experience, pain tolerability, and willingness to recommend treatment.

Materials and Methods: A cross-sectional questionnaire-based study was conducted among 101 patients receiving orthodontic treatment with self-ligating brackets. Pain intensity, duration, tolerability, and impact on daily activities during the first week after bracket placement were assessed using a structured 15-item questionnaire. Data were analyzed using SPSS version 25.0. Descriptive statistics were computed, and associations between variables were evaluated using the Chi-square test, with a significance level set at $p < 0.05$.

Results: Most participants reported mild to moderate pain during the first week following bracket placement, indicating that discomfort was generally tolerable. No statistically significant association was found between gender and pain perception, pain tolerability, or willingness to recommend self-ligating brackets ($p > 0.05$). A significant association was observed between previous orthodontic treatment experience and pain perception, with previously treated patients reporting higher pain levels ($p = 0.001$). Despite this, participants with prior orthodontic experience were more likely to recommend self-ligating brackets ($p = 0.03$). Pain tolerability showed a significant association with positive treatment recommendation ($p < 0.001$).

Conclusion: Orthodontic treatment with self-ligating brackets is associated with predominantly mild to moderate and transient pain during the initial phase. Gender does not significantly influence pain experience or treatment perception. Previous orthodontic experience and pain tolerability play key roles in shaping patient satisfaction and willingness to recommend treatment. Overall, self-ligating brackets appear to be a patient-friendly option with acceptable pain levels during early orthodontic therapy.

Key Word: Self-ligating brackets, Orthodontic pain, Pain perception, Patient satisfaction, Questionnaire study

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I. Introduction:

Pain experienced during orthodontic treatment is a well-recognized phenomenon and remains one of the most common concerns reported by patients. Discomfort during treatment can influence patient cooperation, acceptance of therapy, and overall satisfaction with orthodontic care. The application of orthodontic forces initiates biological changes within the periodontal ligament and alveolar bone, leading to localized inflammation and the release of mediators such as prostaglandins, cytokines, and histamines, which contribute to pain perception¹.

Orthodontic pain typically begins a few hours after appliance activation, reaches peak intensity within 24–48 hours, and gradually subsides over the following 5–7 days^{2,5}. The magnitude and duration of pain may vary depending on appliance design, force levels, and individual patient factors.

Conventional fixed orthodontic appliances utilize elastomeric or metallic ligatures to engage the archwire within the bracket slot. These ligation methods increase frictional resistance between the bracket and archwire, often necessitating the use of higher orthodontic forces to achieve tooth movement. Increased friction and force application may result in greater compression of the periodontal ligament, thereby intensifying pain and discomfort during the early stages of treatment^{3,4}.

Self-ligating brackets were developed to address these limitations. These systems incorporate an integrated clip or sliding mechanism that secures the archwire without external ligatures, resulting in reduced

frictional resistance. The use of lighter and more continuous forces with self-ligating brackets has been suggested to improve patient comfort, reduce chairside time, and facilitate better oral hygiene maintenance⁴⁻⁶.

Previous studies comparing pain perception between self-ligating and conventional bracket systems have reported inconsistent results. While some investigations suggest reduced pain during initial alignment with self-ligating brackets^{2,5}, others have demonstrated no significant difference in pain experience between the two systems^{1,3,10}. These variations indicate that orthodontic pain is multifactorial and influenced by biological, psychological, and experiential factors. Therefore, evaluating the evolution of pain associated with self-ligating brackets is essential for optimizing patient counseling and clinical management⁸.

II. Materials And Methods:

A cross-sectional questionnaire-based study was conducted among 101 patients undergoing orthodontic treatment with self-ligating brackets. Participants were recruited from individuals receiving active orthodontic therapy and were included based on their willingness to participate and ability to provide informed responses. Patients with systemic illnesses, craniofacial anomalies, or those consuming analgesic medications were excluded to avoid potential confounding effects.

Data collection was carried out using a structured questionnaire consisting of 15 items designed to evaluate pain intensity, duration, tolerability, and its impact on daily activities. Information regarding age, gender, and previous orthodontic treatment experience was also recorded. Participants completed the questionnaire based on their subjective pain experience during the initial phase of treatment.

All collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize the data, and associations between categorical variables were assessed using the Chi-square test. A *p*-value of less than 0.05 was considered statistically significant.

III. Statistical Analysis

All collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics such as frequency and percentage were calculated for categorical variables, while mean and standard deviation were used for continuous variables. The Chi-square test was applied to determine associations between categorical variables such as gender, previous orthodontic treatment experience, pain levels, pain tolerability, and willingness to recommend self-ligating brackets. A *p*-value of < 0.05 was considered statistically significant for all analyses.

IV. Results

The present study analyzed the responses of participants who underwent orthodontic treatment using self-ligating brackets to assess pain experience, tolerability, and overall satisfaction. A total of 101 participants were included, predominantly females, with most belonging to the early twenties age group. Descriptive and inferential analyses were performed to evaluate demographic distribution, pain perception during the first week, and recommendation tendencies. Associations between gender, previous orthodontic experience, and pain tolerability were assessed using Chi-square tests. The results provide insight into patient comfort, pain adaptation, and willingness to recommend self-ligating brackets, highlighting key determinants influencing treatment perception and acceptance.

Table 1. Age-wise distribution among the study population

Age	Frequency	Percentage
23	16	15.84%
20	15	14.85%
22	13	12.87%
21	11	10.89%
24	9	8.91%
19	9	8.91%
25	8	7.92%
18	4	3.96%
26	4	3.96%

The ages of the study participants ranged from 18 to 26 years, with the majority of participants being in their early twenties. The modal age was 23 years with 15.84% of the participants being 23 years old, followed by 14.85% of participants being 20 years old, and 12.87% of participants being 22 years old. Ten point eighty-nine percent of participants were 21 years of age. Eight point ninety-one percent of participants were either 24 years of age or 19 years of age. There were fewer participants who were 25 years of age, 18 years of age, or 26 years of age, and these three age groups accounted for less than 8% of the total sample each. Overall, the demographics show that the majority of participants were young adults aged 20-24 years of age.

Table 2. Gender-wise distribution among the study population

Gender	Frequency	Percentage
Female	61	60.4%
Male	40	39.6%

The gender breakdown in this study indicated a larger representation of females as compared to males; of the total sample, 61 (60.4%) participants were female while 40 (39.6%) were male, suggesting a small female predominance in the sample. The nearly even gender distribution suggests a reasonable representation of both male and female experiences, allowing for some gender comparisons in the analysis of self-ligating brackets and related variables.

Table 3. Have you previously undergone orthodontic treatment?

Response	Frequency	Percentage
No	52	51.49%
Yes	48	47.52%
Missing	1	0.99%

The researchers found that slightly less than half the participants had previous orthodontic treatment experiences. Fifty-two of the total responders (51.49%) reported that they had no history of orthodontic treatment, while 48 responders (47.52%) indicated that they have received orthodontic treatment in the past. One responder (0.99%) did not provide an answer. The close number of responders with and without prior treatment allows for some comparative interpretation of perceptions and pain experiences of first-time orthodontic patients with those who have had orthodontic treatment prior.

Table 4. Pain during first week after placement

Response	Frequency	Percentage
Moderate pain	23	22.77%
No pain	23	22.77%
Mild pain	21	20.79%
Very severe pain	11	10.89%
Severe pain	9	8.91%
Worst pain possible	6	5.94%
Missing	8	7.92%

In the first week following the placement of self-ligating brackets, most participants stated that they experienced either moderate pain (22.77%) or no pain at all (22.77%), suggesting a degree of variability in pain levels. Mild pain was reported by 20.79% of participants, while severe pain and very severe pain were reported by 8.91% and 10.89% of participants, respectively. A small percentage of participants (5.94%) reported that pain was the worst they had ever had, while 7.92% percent left this question unanswered. Overall, most participants reported only mild to moderate pain, indicating that pain with self-ligating brackets was generally tolerable during the first week of adjustment.

Table 5 describes the association between Gender × Pain during first week after placement of self-ligating brackets

Pain level	Mild	Moderate	No pain	Severe	Very severe	Worst pain possible	Chi square	P value
Female (n=61)	13	11	13	6	8	4	2.54	0.77
Male (n=40)	8	12	10	3	3	2		

A Chi-square test was conducted to see if there was any association between gender and pain expressed during the first week following self-ligating bracket placement. The pain ratings for females were more evenly distributed across the pain category, with 21.3% reporting mild pain, 18.0% reporting moderate pain, and 21.3% reporting no pain. Males expressed similar trends as 20.0% had mild pain and 25.0% reported moderate pain. The Chi-square value of 2.54 and p-value of .77 indicates no statistical difference between, or association of, pain level and gender. Hence, it appears that male and female patients had similar painresponses to orthodontic self-ligating bracket placement during the initial adjustment period.

Table 6 describes the association between Gender × Pain tolerability

Pain tolerability	No	Yes	Chi square	P value
Female	17	38	1.39	0.24
Male	7	32		

The relationship between gender and overall pain tolerability among participants was examined using the Chi-square test. Out of 61 females, 38 (62.3%) found the pain tolerable, while 17 (27.9%) reported it as intolerable. Similarly, among 40 males, 32 (80%) tolerated the pain, and 7 (17.5%) did not. The Chi-square value of 1.39 with a p-value of 0.24 indicates no statistically significant association between gender and pain tolerability. This finding suggests that both male and female participants were able to tolerate the discomfort caused by self-ligating brackets to a similar extent.

Table 7 describes the association between Gender × Pain during first week after placement of self-ligating brackets

Pain Level	Mild	Moderate	No Pain	Severe	Very Severe	Worst Pain	Chi square	P value
No	10	11	21	2	1	1	27.82	0.001
Yes	11	12	2	6	10	5		

The relationship between previous orthodontic treatment history and pain perception during the first week following self-ligating bracket placement was analyzed using Chi-square. Subjects who did not have a previous orthodontic treatment history usually categorized their pain as none (21) or mild-moderate. Conversely, subjects who exhibited a previous orthodontic treatment history usually categorized their pain as moderate to very severe (10) or the worst painful experience possible (5). The Chi-square value of 27.82 with a p-value of 0.001 indicates statistical significance for the relationship between prior orthodontic treatment and pain experience. The results imply that individuals with prior orthodontic exposure experienced more discomfort after self-ligating bracket placement

Table 8 describes the association between Previous orthodontic treatment × Recommendation to others

Recommendation	May be	No	Yes	Chi square	P value
No	16	9	21	6.95	0.03
Yes	9	4	34		

Using the Chi-square, we analyzed the relationship between prior orthodontic treatment experience and likelihood of recommending self-ligating brackets. There were 21 (40.4%) of those with no prior orthodontic treatment experience who would recommend the treatment, 9 (17.3%) of those who would not, and 16 (30.8%) were uncertain. On the contrary, a more favorable response was reported among respondents with prior orthodontic experience: 34 (70.8%) indicated that they would recommend self-ligating brackets. The Chi-square of 6.95 and the p-value of 0.03 suggested a significant association, indicating those with prior orthodontic treatment experience were more likely to recommend self-ligating brackets.

Table 9 describes the association between Gender × Recommendation to others

Recommendation	May be	No	Yes	Chi square	P value
Female	17	7	31	1.45	0.48
Male	8	7	24		

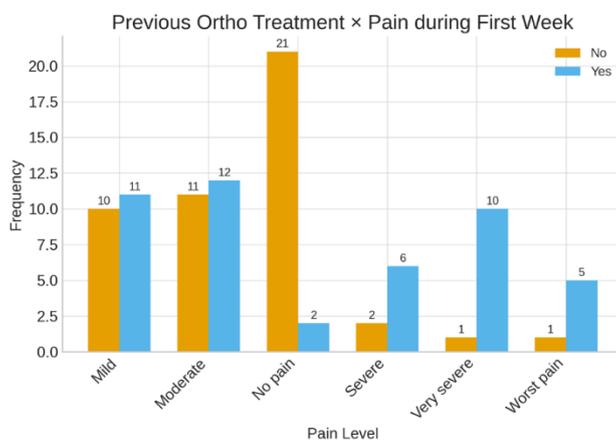
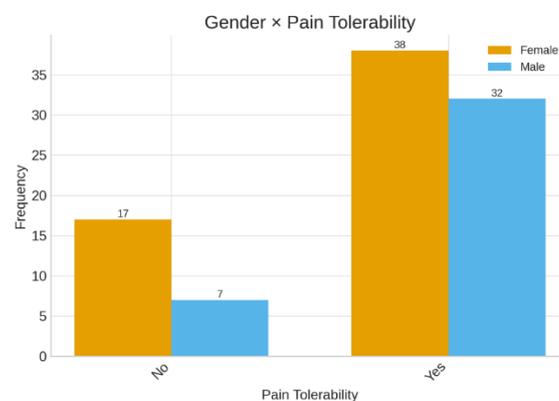
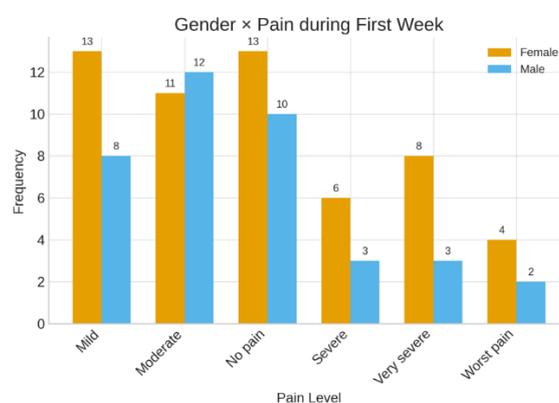
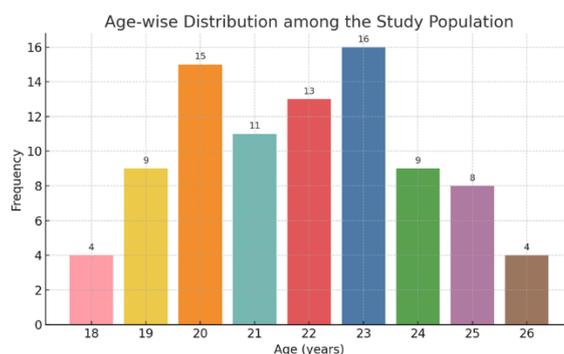
Using the Chi-square test, the link between gender and endorsing self-ligating brackets to others was examined. Of the females who participated, 31 (50.8%) of them would recommend the treatment, 7 (11.5%) would not, and 17 (27.9%) were unsure. Of the males, 24 (60%) would recommend, 7 (17.5%) did not, and 8 (20%) were unsure. The Chi-square statistic of 1.45 and a p value of 0.48 indicated that there was no statistically significant association between gender and recommendation intent, with no differences noted when male and female recommendations were compared. Overall, males and females expressed similar similar recommendations for self-ligating brackets.

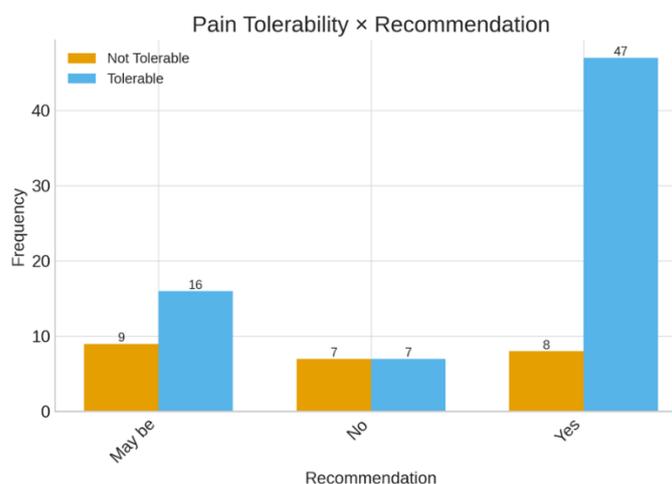
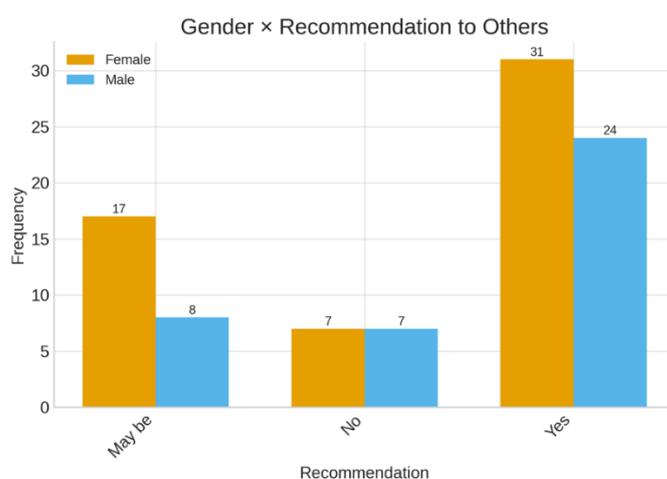
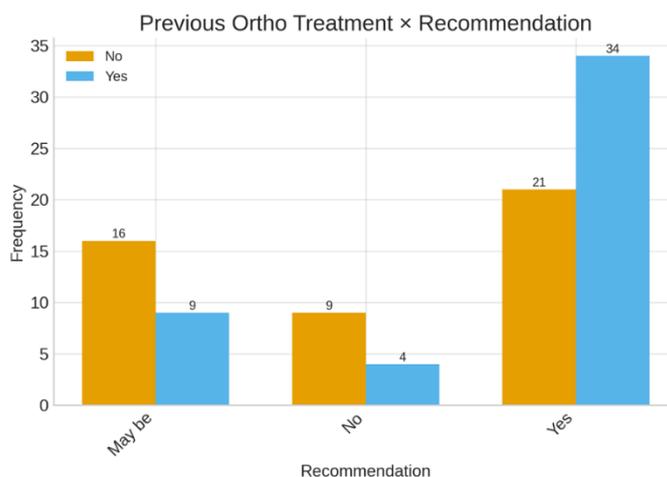
Table 10 describes the association between Overall pain tolerability × Recommendation to others

Recommendation	May be	No	Yes	Chi square	P value
Pain not tolerable	9	7	8	9.34	0.00
Pain tolerable	16	7	47		

The association between overall pain tolerability and the likelihood of recommending self-ligating brackets to others was evaluated using the Chi-square test. Among participants who found the pain not tolerable, only 8 (27.6%) were willing to recommend the treatment, while 9 (31.0%) were uncertain and 7 (24.1%) would

not recommend it. Conversely, among those who found the pain tolerable, 47 (65.3%) expressed a positive recommendation. The Chi-square value of 9.34 with a p-value of 0.00 indicates a statistically significant association, suggesting that participants who could tolerate pain were more likely to recommend self-ligating brackets to others.





V. Summary Of Findings

Most participants experienced mild to moderate pain during the first week after bracket placement.

Gender differences did not significantly affect pain perception, tolerability, or willingness to recommend.

Participants with previous orthodontic treatment experienced greater discomfort but were more likely to recommend self-ligating brackets.

Pain tolerability was a key determinant of positive treatment recommendation.

VI. Discussion

The present study evaluated pain perception and tolerability in patients treated with self-ligating brackets and explored factors influencing treatment recommendation. The findings revealed that the majority of participants experienced mild to moderate pain during the first week following bracket placement. This observation is consistent with previous studies reporting that orthodontic pain is most pronounced during the early post-activation period and diminishes thereafter^{1,2,5}.

The relatively tolerable pain levels observed may be attributed to the biomechanical characteristics of self-ligating brackets. Reduced friction at the bracket–archwire interface allows for the application of lighter forces, potentially minimizing periodontal ligament compression and inflammatory response^{4,6,7}. Such mechanical advantages may contribute to improved patient comfort during the early stages of orthodontic treatment.

The present study demonstrated no significant association between gender and pain perception, pain tolerability, or willingness to recommend treatment. This finding is in agreement with earlier clinical trials and systematic reviews, which have reported that gender does not consistently influence orthodontic pain experience^{1,4,5}.

Participants with previous orthodontic treatment experience reported significantly higher pain levels during the first week following bracket placement. This may be attributed to increased awareness or sensitivity to orthodontic discomfort based on prior experiences. Similar findings have been reported in earlier studies, suggesting that previous exposure may heighten pain perception rather than enhance tolerance⁸.

Despite reporting higher pain levels, participants with prior orthodontic treatment were more likely to recommend self-ligating brackets to others. This suggests that perceived long-term benefits such as treatment efficiency, improved hygiene, and overall comfort may outweigh short-term discomfort^{9,10}. Additionally, a significant association was observed between pain tolerability and willingness to recommend treatment, highlighting the importance of effective pain management and patient education in improving treatment acceptance⁷.

VII. Conclusion:

Within the limitations of this study, self-ligating brackets were associated with predominantly mild to moderate pain during the initial phase of orthodontic treatment, which was generally tolerable for most patients^{1,4,5}. Gender did not significantly influence pain perception or treatment recommendation. However, previous orthodontic experience and individual pain tolerability played a key role in shaping patient acceptance and willingness to recommend treatment^{8,10}.

Overall, self-ligating brackets appear to provide a patient-friendly orthodontic treatment option with acceptable levels of discomfort. Emphasis on patient education, reassurance, and appropriate pain management strategies may further enhance compliance and satisfaction during orthodontic therapy⁷.

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