

Pain Experience And Analgesic Consumption In Orthodontic Patients After Fixed Appliance Adjustments

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Abstract

Objective: To investigate the frequency of pain and analgesic intake among orthodontic patients on the first day of fixed appliance adjustments.

Methods: This retrospective observational study included 313 orthodontic patients from the Rawal Institute of Health Sciences, Islamabad, conducted between 3rd January 2024, and 30th August 2024. Patients aged 13 years and above undergoing fixed orthodontic treatment for at least three months were included in this study. Patients already taking analgesics for any reason were excluded from the study. Data on pain experiences (mild, moderate, severe) and analgesic intake (type, dosage, frequency) within the first 24 hours of bracket placement were collected from the history. Statistical analysis included descriptive statistics and chi-square tests to assess the association between pain and analgesic use, with significance set at $p \leq 0.05$.

Results: Of the 313 patients, 255 (81.5%) were females and 58 (18.5%) were males. Pain was reported as follows: 75 (24%) patients experienced no pain, 133 (42.5%) reported mild pain, and 105 (33.5%) reported moderate pain. No patients reported severe pain. Regarding analgesic intake, 120 (38.3%) did not take any analgesics, while 105 (33.5%) used acetaminophen, 45 (14.4%) used ibuprofen, and 43 (13.7%) used naproxen. A significant association was found between pain levels and analgesic intake ($p < 0.001$).

Conclusion: The study highlights that while many patients experience mild to moderate pain, a significant portion do not utilize analgesics. Acetaminophen was the most common analgesic used, particularly among females. These findings underscore the importance of tailored pain management strategies in orthodontic care to enhance patient comfort and safety. Further research is needed to develop standardized protocols for analgesic use in orthodontic treatment.

Keywords: Analgesics, Orthodontic appliances, Pain, Patient comfort.

Introduction

Orthodontic treatment is a prevalent dental procedure designed to rectify misaligned teeth and jaw discrepancies. Quantitative analysis revealed a significant increase in mean pain scores following orthodontic adjustments ($P < 0.001$). Qualitative analysis identified themes related to pain experiences, including anticipation of discomfort, adaptation over time, and coping strategies employed by patients.¹ According to a recent study pain after activation of fixed orthodontic appliance is not associated with catastrophizing as well as age, sex, orthodontic wire diameter, and period of activation.²

Pain experienced by orthodontic patients treated with fixed appliances is a well-documented fact. Many patients state that pain starts 24 hours after the placement of fixed orthodontic appliances and causes more pain than removable appliances.³ As a result, many patients utilize analgesics to alleviate discomfort and improve their quality of life during treatment.

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Factors such as age, pain intensity, and the presence of headaches have been identified as predictors of analgesic use. Awareness of these variables can assist clinicians in identifying patients who are likely to self-medicate with pain relievers.⁴

The use of analgesics among orthodontic patients has garnered significant attention in dental research due to its potential impact on patient care and treatment outcomes. However, insufficient focus has been placed on orthodontic pain in both clinical practice and research, and no standardized guidelines for pain management have been established. Approaches to alleviating orthodontic pain vary widely, with non-steroidal anti-inflammatory drugs (NSAIDs) being the most commonly used for pain relief. Specifically, ibuprofen and paracetamol/acetaminophen are frequently recommended.⁵ Analgesic consumption in orthodontic patients was increased by increased age, increased intensity of pain, and presence of a headache. Age, intensity of pain, and headache proved to be predictors of analgesic consumption. Knowledge of such factors may help clinicians identify orthodontic patients who will consume analgesics on their own.⁶

Comprehending the frequency of analgesic intake is essential for orthodontists to formulate appropriate pain management strategies and provide well-informed guidance to their patients. However, the regular consumption of analgesics is not without potential risks. Various adverse effects have been associated with prolonged or excessive use of pain medications, ranging from mild gastrointestinal disturbances to more severe complications such as hepatic damage or increased risk of haemorrhage.⁷ Acetaminophen is one of the commonly used medications for pain. In pediatric patients, the most frequent side effects, regardless of how the medication is administered, include nausea, vomiting, restlessness, constipation, itching, and lung collapse (atelectasis).⁸ In Pakistan, self-medication remains a widespread practice and a significant public health concern. Recent data indicate that the rate of self-medication in the country ranges between 53% and 61.3%.^{9,10}

All these factors raise concerns regarding the safety of frequent analgesic use in orthodontic patients, particularly considering the extended duration typically associated with orthodontic treatment. This study aims to investigate the frequency of pain and analgesic intake among orthodontic patients on the first day of fixed appliance adjustment. By exploring this frequency, we endeavour to contribute valuable insights that can inform evidence-based pain management protocols in orthodontic care, ultimately enhancing patient outcomes and safety.

Materials And Methods

This was a retrospective observational study which employed a quantitative approach to investigate the frequency of pain and analgesic intake in orthodontic patients. This study was conducted on 313 orthodontic patients undertaking treatment in the orthodontic department at Rawal Institute of Health Sciences, Islamabad. The sample size was calculated using the formula:

$$n = Z^2 \times (p \times q) / e^2$$

n = required sample size

p = prevalence of pain due to orthodontic treatment (90%)¹¹

q = 1-p

e = margin of error, 5%

Z = 1.96 at 95% Confidence Interval

The study was conducted from 3rd January 2024 to 30th August 2024. Informed consent was taken from all patients verbally. Non-probability convenience sampling was done. Inclusion criteria were set as patients aged 13 years and above, undergoing fixed orthodontic treatment for at least one year. Patients with chronic pain conditions or taking analgesics for unrelated reasons were excluded from the study. Each patient was asked about their pain experience and history of any analgesic intake on the first day of the monthly adjustment of their fixed appliance. Their pain response was recorded on a Likert scale from 1-5 where 1-2 was considered mild, 3 as moderate and 4-5 as severe pain on the first day of bonding. History of analgesic intake was recorded as type, dosage, and frequency. Descriptive statistics including age, gender and frequency of analgesic intake were recorded. The association between analgesic intake and pain was studied by using the chi-square test. The chi-square test is an ideal test to study the association between categorical variables such as pain and analgesic intake in our study. The level of significance was set as $p \leq 0.05$.

Results

Out of 313 patients, 255 (81.5%) are females and 58 (18.5%) are males. Patients were asked about their pain experience as mild, moderate and severe on the first day of bracket placement. 75 (24%) patients experienced no pain, 133 (42.5%) and 105 (33.5%) experienced mild and moderate pain respectively (Figure I). None of the patients reported severe pain. Frequency of analgesic intake was also recorded along with pain (Figure II). 120 (38.3%) patients did not take any analgesic, 105 (33.5%) took Panadol (Acetaminophen), 45 (14.4%) took Ibuprofen, while 43 (13.7%) patients took Naproxen for pain relief. When analgesic intake was studied concerning gender (Table I), 90 females and 30 males did not take any analgesic. Acetaminophen was taken by females only while Ibuprofen and Naproxen were taken by both males and females. Analgesic intake was also studied concerning pain (Table II). The highest number of patients took Acetaminophen in mild and moderate pain while Ibuprofen and Naproxen were

taken by almost equal number of patients. Overall 76% of patients experienced mild to moderate pain out of which 14.3% did not take any analgesic despite pain. A chi-square test was applied to study the association between pain and analgesic intake (Table III). The results were statistically significant with $p = .000$.

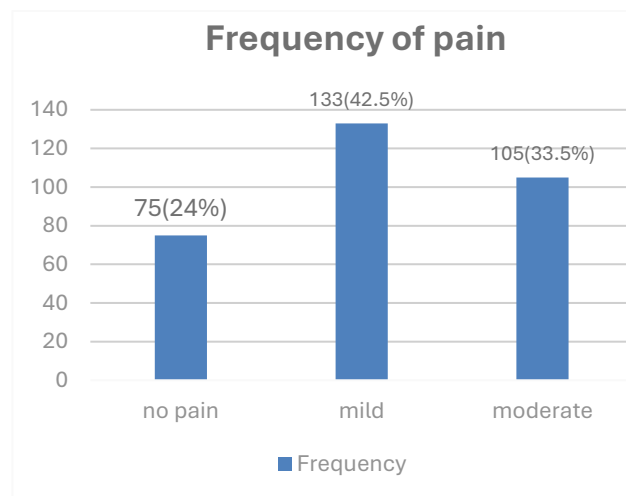


Figure 1: Frequency Of Pain On First Post Bonding Day

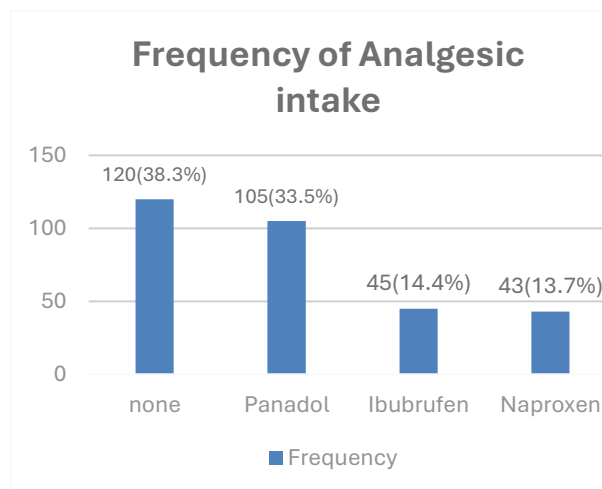


Figure 2: Frequency Of Analgesic Intake

Table 1: Analgesic Intake Concerning Gender

Analgesic	Pain		
	female	male	Total
No analgesic	90	30	120
Acetaminophen	105	0	105
Ibuprofen	30	15	45
Naproxen	30	13	43
Total	255	58	313

Table 2: Analgesic Intake According To Severity Of Pain

Analgesic	Pain			Total
	No pain	mild	moderate	
No analgesic	75	30	15	120
Acetaminophen	0	45	60	105
Ibuprofen	0	30	15	45
Naproxen	0	28	15	43
Total	75	133	105	313

Table 3: Chisquare Test B/W Analgesic Intake And Severity Of Pain

	Value	df	Significance
Pearson chi-square	173.934	6	<0.001
Likelihood ratio	198.959	6	<0.001
N of valid cases	313		

Discussion

The objective of our study was to evaluate the frequency of pain and the consumption of analgesics among orthodontic patients. A significant number of participants reported mild to moderate pain on the day following bonding, leading to the necessity for analgesic use. Notably, none of the patients experienced severe pain, and 24% reported no discomfort at all. This aligns with findings from a recent study by Olteanu et al., which indicated that the most painful period typically occurs within the first 3 to 4

days following orthodontic procedures. Overall, most patients experienced moderate pain after undergoing the examined orthodontic interventions.¹² Rakhshan et al. observed that pain and discomfort can persist for more than four weeks following the initiation of fixed orthodontic treatment.¹³ In another study, a significant increase in pain was noted 24 hours after the insertion of separators, bands, and brackets, with bands being the most painful component at baseline and brackets causing the most discomfort after 24 hours.¹⁴ These findings align with our own, as our patients reported pain and required analgesics on the first day following bonding. While all these studies¹²⁻¹⁵ assessed pain using a Likert scale, we qualitatively categorized pain levels as mild, moderate, or severe.

Orthodontic pain has not received adequate attention in either clinical practice or research, and there are no universally accepted guidelines for pain relief interventions. Approaches to alleviating orthodontic pain vary significantly, with non-steroidal anti-inflammatory drugs (NSAID) being the most commonly used for pain management. Specifically, ibuprofen and paracetamol/acetaminophen are frequently recommended for this purpose.^{16,17} NSAIDs work by inhibiting the synthesis of arachidonic acid thereby reducing the formation of prostaglandins. It is well known that prostaglandins are key mediators in the inflammatory response that follows the application of orthodontic forces.¹⁸ Moderate statistical evidence supports the efficacy of analgesics in managing short-term orthodontic pain. Naproxen demonstrates a stronger analgesic effect at both the 2-hour and 6-hour marks, with its effects lasting up to 24 hours, compared to ibuprofen and acetaminophen. Both ibuprofen and naproxen exhibit a stable analgesic effect that peaks at around 6 hours, while acetaminophen's analgesic effect gradually increases from 2 hours to 24 hours.¹⁶ In our study, acetaminophen was the most frequently used analgesic, with a usage rate of 33.5%. Interestingly, 38.5% of patients reported no pain and consequently did not require any analgesics. This underscores the highly variable perception of pain among different individuals. A relatively smaller proportion of patients opted for ibuprofen and naproxen.

Jawaid et al.¹⁴ found that males report higher pain levels than females at both baseline and 24 hours, MD Failla¹⁹ less consistently reported, females tend to report higher pain unpleasantness than males. In another study, males showed higher pain perception after the placement of all three fixed orthodontic components both at baseline and after 24 hours when compared with females.²⁰ It is observed that women are more likely to be prescribed analgesic medications, especially NSAIDs. Women also use more over-the-counter analgesics compared to men.²¹ In our study, acetaminophen was not utilized by male patients, while it was the preferred analgesic among females as shown in Table I. A recent investigation indicated that orthodontic patients commonly require analgesic medication, with Nurofen, ketone, and paracetamol being the most frequently used options. Notably, 19% of the studied sample did not feel the need for self-medication, whereas a significant majority (81%) opted to take medication to alleviate pain. Among those who self-medicated, approximately 68% chose ibuprofen, 15.6% selected metamizole, 13.7% opted for paracetamol (acetaminophen), and around 3% used other drugs such as codeine.²² Similarly, in our patient sample, analgesics were not prescribed by the orthodontist; instead, they were taken as self-medication. In Pakistan, self-medication is a prevalent practice and poses a significant public health concern. This practice should be discouraged, and orthodontists should recommend analgesics with appropriate dosage, as pain is often inevitable during the initial phase of fixed appliance treatment. Our study found a strong correlation between pain and analgesic intake ($p = .000$). It is noteworthy however, that 24% of patients reported no pain, while a significant number (14.3%) did not take analgesics despite experiencing mild to moderate pain. These findings may indicate a higher pain tolerance among these patients. Additionally, the retrospective nature of the study could lead to inaccuracies in pain reporting, although this is less likely to affect the reporting of analgesic intake. Other limitations of the study are that pain is a subjective experience, and relying on patients' self-reports can lead to variability in pain perception and reporting, secondly, this study only examines pain and analgesic intake on the first day of appliance adjustment, which does not account for variations over time or the long-term effects of pain management strategies.

Conclusion

This study highlights the prevalence of pain and the patterns of analgesic intake among orthodontic patients on the first day of fixed appliance adjustments. Our findings indicate that a significant portion of patients, 76%—experienced mild to moderate pain, out of which 14.3% did not take any analgesic despite pain. 38.3% of patients did not experience any pain, and hence took no analgesics. Acetaminophen emerged as the most used pain relief medication, particularly among female patients, while ibuprofen and naproxen were used by both genders. Overall, our study underscores the importance of developing evidence-based protocols for pain relief that not only enhance patient comfort but also ensure safety during orthodontic care. Further research is warranted to explore the long-term implications of analgesic use in this patient population and to establish standardized pain management guidelines.

References

1. Mohanty B, Chekka M, Sowmya C, Khurana R, Manga UM, Varma Datla PK, Somaraj V. Evaluation of Pain and Discomfort Associated with Orthodontic Adjustments. *J Pharm Bioallied Sci.* 2024;16(Suppl 3):S2400-S2402. https://doi.org/10.4103/jpbs.jpbs_269_24.
2. Costa EOD, Blagit MN, Normando D. Impact of catastrophizing on pain during orthodontic treatment. *Dental Press J Orthod.* 2020 ;25(1):64-69. <https://doi.org/10.1590/2177-6709.25.1.064-069.oar>.
3. Çoban Büyükbayraktar Z, Öztekin Kuruca T. The effects of orthodontic treatment type, depression, and treatment need on perceived pain intensity. *APOS Trends Orthod* 2023;13:223-9. https://doi.org/10.25259/APOS_21_2023

4. Juloski J, Vasovic D, Vucic L, Pajevic T, Gligoric N, Mirkovic M, Glisic B. Predictors of Analgesic Consumption in Orthodontic Patients. *Applied Sciences*. 2022; 12(7):3390. <https://doi.org/10.3390/app12073390>.
5. Basam LC, Singaraju GS, Obili S, Keerthipati T, Basam RC, Prasad M. Orthodontic pain control following arch wire placement; a comparison between pre-emptive tenoxicam and chewing gum: a randomized clinical trial. *J Dent Anesth Pain Med*. 2022;22(2):107-116. <https://doi.org/10.17245/jdapm.2022.22.2.107>
6. Juloski J, Vasovic D, Vucic L, Pajevic T, Gligoric N, Mirkovic M, Glisic B. Predictors of Analgesic Consumption in Orthodontic Patients. *Applied Sciences*. 2022; 12(7):3390. <https://doi.org/10.3390/app12073390>
7. Queremel Milani DA, Davis DD. Pain Management Medications. [Updated 2023 Jul 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan.
8. Gerriets V, Anderson J, Patel P, et al. Acetaminophen. [Updated 2024 Jan 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan
9. Azhar H, Tauseef A, Usman T, Azhar Y, Ahmed M. Prevalence, attitude and knowledge of self medication during Covid-19 disease pandemic. *Pak J Med Health Sci*. 2021;15(5):902-905. <https://doi.org/10.53350/pjmhs21155902>.
10. Dhedhi NA, Ashraf H, Ansari NB, Iftikhar S. Self-medication among people visiting outpatient clinics of a Tertiary care hospital, Karachi. *J Family Med Prim Care*. 2021;10(2):773-779. https://doi.org/10.4103/jfmpe.jfmpe_1887_20.
11. Banerjee S, Banerjee R, Shenoy U, Agarkar S, Bhattacharya S. Effect of orthodontic pain on quality of life of patients undergoing orthodontic treatment. *Indian J Dent Res*. 2018 Jan 1;29((1)):4-9. https://doi.org/10.4103/ijdr.IJDR_113_16.
12. Olteanu, C.D.; Bucur, S.-M.; Chibelea, M.; Bud, E.S.; Păcurar, M.; Festil ă, D.G. Pain Perception during Orthodontic Treatment with Fixed Appliances. *Appl. Sci*. 2022; 12: 6389. <https://doi.org/10.3390/app12136389>.
13. Rakhshan H, Rakhshan V. Pain and discomfort perceived during the initial stage of active fixed orthodontic treatment. *Saudi Dent J*. 2015 ;27(2):81-7. <https://doi.org/10.1016/j.sdentj.2014.11.002>.
14. Jawaid M, Qadeer TA, Fahim MF. Pain perception of orthodontic treatment – A cross-sectional study. *Pak J Med Sci*. 2020;36(2):160-5. <https://doi.org/10.12669/pjms.36.2.619>.
15. Consuelo VM, Chiara F, Francesca SM, Patrizia D, Andrea S. The Use of Questionnaires in Pain Assessment during Orthodontic Treatments: A Narrative Review. *Medicina (Kaunas)*. 2023 ;59(9):1681. <https://doi.org/10.3390/medicina59091681>.
16. Cheng C, Xie T, Wang J. The efficacy of analgesics in controlling orthodontic pain: a systematic review and meta-analysis. *BMC Oral Health*. 2020 ;20(1):259. <https://doi.org/10.1186/s12903-020-01245-w>.
17. Costa EOD, Blagitz MN, Normando D. Impact of catastrophizing on pain during orthodontic treatment. *Dental Press J Orthod*. 2020 ;25(1):64-69. <https://doi.org/10.1590/2177-6709.25.1.064-069.oar>.
18. Yamaguchi M, Fukasawa S. Is Inflammation a Friend or Foe for Orthodontic Treatment?: Inflammation in Orthodontically Induced Inflammatory Root Resorption and Accelerating Tooth Movement. *Int J Mol Sci*. 2021;22(5):2388. <https://doi.org/10.3390/ijms22052388>.
19. Failla MD, Beach PA, Atalla S, Dietrich MS, Bruehl S, L. Cowan R, Monroe TB. Gender Differences in Pain Threshold, Unpleasantness, and Descending Pain Modulatory Activation Across the Adult Life Span: A Cross Sectional Study, *The Journal of Pain* 2024;25(4):1059-69. <https://doi.org/10.1016/j.jpain.2023.10.027>.
20. Jawaid M, Qadeer TA, Fahim MF. Pain perception of orthodontic treatment - A cross-sectional study. *Pak J Med Sci*. 2020;36(2):160-165. <https://doi.org/10.12669/pjms.36.2.619>.
21. Ngan P, Kess B, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. *Am J Orthod Dentofacial Orthop*. 1989;96(1):47-53. [https://doi.org/10.1016/0889-5406\(89\)90228-X](https://doi.org/10.1016/0889-5406(89)90228-X)
22. Rakhshan H, Rakhshan V. Pain and discomfort perceived during the initial stage of active fixed orthodontic treatment. *Saudi Dent J*. 2015;27(2):81-7. <https://doi.org/10.1016/j.sdentj.2014.11.002>.

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Contributions:

S.N - Conception of study

- Experimentation/Study Conduction

S.N - Analysis/Interpretation/Discussion

H.G.K - Manuscript Writing

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All authors approved the final version to be published & agreed to be accountable for all aspects of the work.