Systematic Review Article

The efficacy of chewing gum in the reduction of orthodontic pain at its peak intensity: a systematic review and meta-analysis

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ABSTRACT

Objectives: To evaluate the efficacy of chewing gum on the intensity of pain in patients undergoing orthodontic treatment.

Materials and Methods: A search strategy that included both a manual search and a search of electronic databases was implemented; the electronic databases included PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), ScienceDirect, Scopus, and EBSCO. Only randomized controlled trials were included in this study. All of the studies were assessed independently and in duplicate in accordance with the exclusion and inclusion criteria. The Cochrane risk of bias tool was used to evaluate the risk of bias within the included studies, and the GRADE approach was used to evaluate the certainty of evidence.

Results: Sixteen RCTs were included in the final analysis. The meta-analysis revealed that chewing gum significantly reduced pain intensity in comparison to pharmacologic agents (mean difference [MD] −0.50 [95% confidence interval {CI} −0.90 to −0.10], $P = .01$). When compared with a placebo, chewing gum significantly reduced pain intensity (MD −0.60 [95% CI −1.06 to −0.13], $P = .01$), while bite wafer and chewing gum groups had the same levels of reduction in pain intensity (MD −0.15 [95% CI −0.56 to 0.26], $P = .48$).

Conclusions: In patients undergoing fixed orthodontic treatment, chewing gum was significantly more effective than both pharmacologic agents and placebo in reducing orthodontic pain 24 hours after the initial placement of the archwire. (*Angle Orthod.* 2023;93:580–590.)

KEY WORDS: Orthodontics; Orthodontic pain; Chewing gum; Pharmacologic interventions

INTRODUCTION

Orthodontic treatment often comprises long-lasting, painful, and expensive procedures. Pain is considered the main reason why patients interrupt their treatment, and it negatively influences their level of compliance.[1,2] Different types of orthodontic procedures usually cause pain. These procedures include archwire activation,[3] orthopedic appliances,[4] and the placement of separators.[5] Among patients undergoing fixed orthodontic treatment, 91% complained of pain at some stage of the treatment,[6] and more than 30% of patients reported pain at each stage during the course of treatment.[7] Pain was reported to be the main discouraging reason to discontinue treatment.[2] Therefore, orthodontic pain is a major concern for both orthodontists and patients. It was shown that, in most patients, the peak intensity of pain occurred 1 day following the insertion of an archwire or separators and decreased gradually over the next 7 days.[8] On the other hand, in some studies, it was reported that almost half of patients experienced orthodontic pain even 1 week after the insertion of an archwire.[9]

Orthodontic tooth movement is an inflammatory process that occurs following the application of orthodontic force. During this inflammatory process, several inflammatory mediators, including substance P, prostaglandin, bradykinin, serotonin, and histamine, are released after a series of biological events. In turn, these mediators induce pain by stimulating nerve endings.[10,11] Ibuprofen, acetylsalicylic acid, and para-

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cetamol are the analgesics most commonly prescribed by orthodontists to alleviate pain and discomfort caused by orthodontic treatment.[12–14] On the other hand, these pain relievers may interfere with the inflammatory process responsible for inducing orthodontic tooth movement.[15] In addition, these analgesics have negative side effects and contraindications.[14,15]

The repetitive chewing action performed while chewing gum can reduce orthodontic pain by reducing ischemia through the compression and decompression of the PDL.[16] Thus, chewing sugar-free gum may be a promising nonpharmacologic intervention that reduces orthodontic pain. In addition, sugar-free gum has different uses in dentistry. It can be used as a salivary substitute to improve salivary flow and relieve the symptoms of dry mouth[17]; reduce plaque accumulation, gingivitis, and bleeding score[18]; and it can be used to evaluate chewing function in adults and the elderly.[19,20] Also, several articles emphasized that chewing gum may enhance surgical recovery following postoperative ileus surgical interventions.[21–23]

The aim of this study was to synthesize evidence from the existing literature to explore fully the efficacy of chewing gum in reducing pain intensity in patients undergoing fixed orthodontic treatment, evaluate the quality of evidence of the existing literature and direct future research to develop an improved conclusion regarding the relationship between chewing gum and orthodontic pain.

MATERIALS AND METHODS

A well-structured design was implemented using the PICOS methodology:

- Population: patients aged 12 years or older who were receiving fixed orthodontic treatment
- Intervention: chewing gum
- Comparison: patients receiving different intervention or no treatment
- Outcome: reduction in reported pain intensity 24 hours after the activation of orthodontic force
- Design: randomized clinical trials (RCTs)

Protocol and Registration

The systematic review was registered in Prospero (International Prospective Register of Systematic Reviews) with reference number CRD42019141501 and was reported in adherence to the Prisma checklist guidelines.

Information Sources and Search Strategy

In this systematic review, a comprehensive search strategy was used, which started in September 2021 and ended in September 2022 and incorporated both electronic and manual search methods. The electronic database search included PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, EBSCO, and ScienceDirect. In addition, a thorough manual search was performed to identify articles that were not indexed in databases and to eliminate any chance of excluding related articles.

Journals Manually Searched

The following journals were included in the manual search:

- *European Journal of Orthodontics* (2010–2022)
- *Angle Orthodontist* (2010–2022)
- *American Journal of Orthodontic and Dentofacial Orthopedics* (2010–2022)
- *Journal of Orofacial Orthopedics/Fortschritte der Kieferorthopädie* (2010–2022)

Eligibility Criteria

After the careful inspection of articles in accordance with the exclusion and inclusion criteria, only randomized controlled articles that involved patients who were (1) a minimum age of 12 years old, (2) receiving chewing gum as an intervention to control orthodontic pain, (3) undergoing fixed orthodontic treatment, (4) reporting pain 24 hours following the application of orthodontic force, (5) medically fit, (6) with no contraindication to use chewing gum or analgesics, and (7) currently not consuming analgesics or antibiotics, were considered in this study. Potential articles were assessed independently and in duplicate by two authors to determine their eligibility to meet the inclusion criteria; the titles, abstracts, and full texts of these articles were carefully assessed. In addition, the references of these articles were reviewed thoroughly to assess their eligibility to meet the inclusion criteria.

Primary Outcome Assessment

The intensity of orthodontic pain reported by patients 1 day after the insertion of an initial archwire was the primary outcome. A visual analog scale (VAS) reported on a 100-mm or a 10-cm scale and a numeric rating scale out of 10 points were used as the outcome assessment tool. In a recent article, the same method of combining these 10-point numerical scales into a single scale was used.[24] VAS values reported from multiple functions (while fitting front teeth or back teeth together, while chewing, or when jaws were at rest) were combined into a single estimate using a formula to combine groups, as suggested in the Cochrane handbook of systematic reviews of interventions.[25]

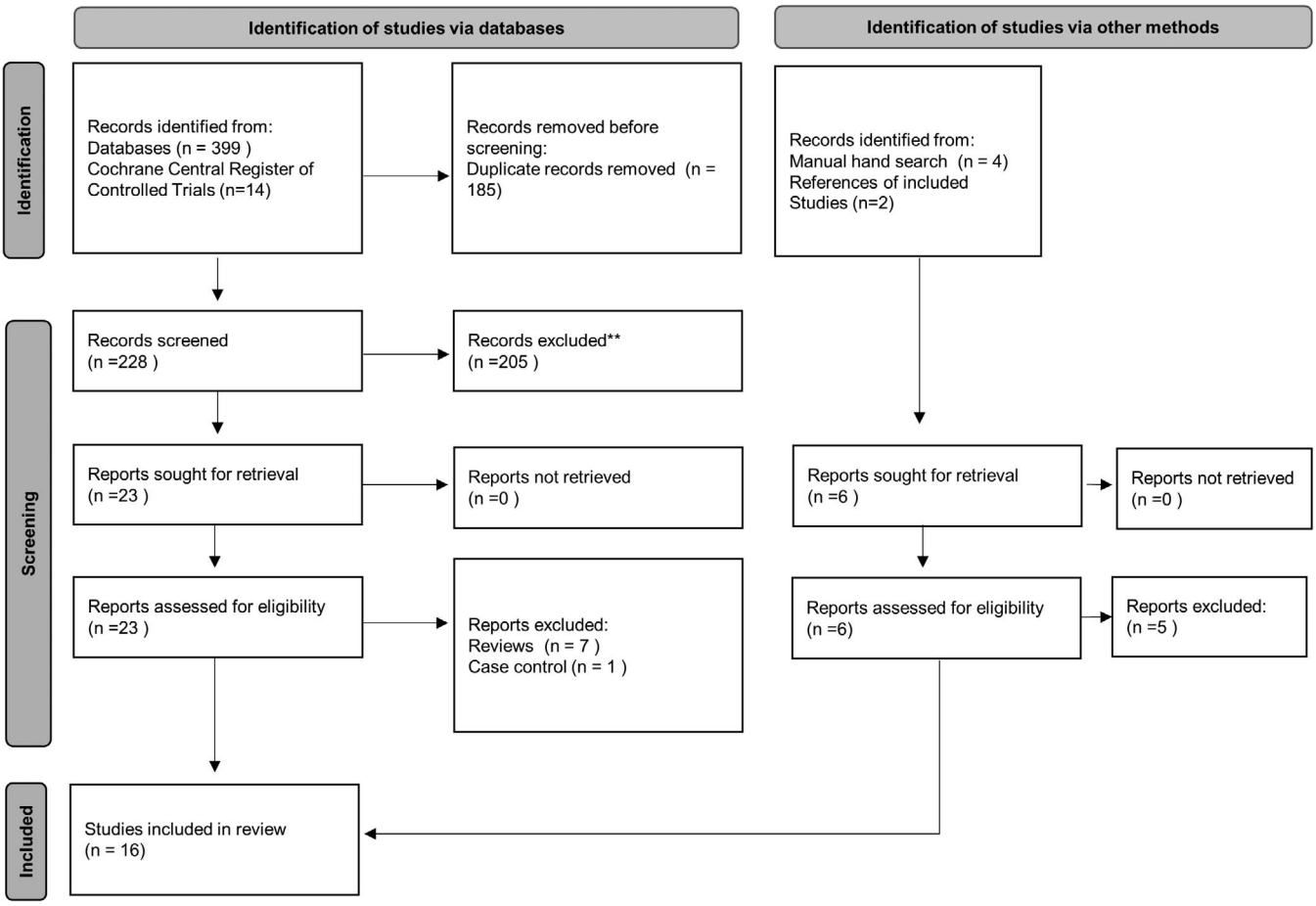

Figure 1. Flowchart showing the process of including and excluding studies at different phases.

Data Extraction and Meta-analysis

For the purpose of statistical analysis, two authors performed data extraction from each included study. The extracted data were later entered into Microsoft Excel 2016. The mean VAS reported by patients in each group 1 day after the insertion of the initial archwire, the sample size, and the standard deviation of the mean VAS represented the extracted data. The extracted data were entered into ReviewManager (Revman 5.4.1) software, which is a Cochrane collaboration software designed to run meta-analyses. The standardized mean difference (SMD), also known as effect size or Cohen's *d*, was inspected, and the corresponding 95% confidence intervals were estimated for the effect sizes. The Q statistic was conducted to test for heterogeneity in this meta-analysis, and the between-study heterogeneity was assessed using the I^2 statistic.

Risk of Bias in Individual Trials

To assess the level of bias among the studies included, two authors evaluated them thoroughly and independently using the Cochrane risk of bias tool.[26] The overall quality of the evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.[27]

RESULTS

Study Selection and Characteristics

The flowchart in Figure 1 illustrates how many articles were excluded and included at different phases. The total number of studies assessed was 419, and of these, 413 studies were obtained from the electronic search, 4 from the manual search, and 2 by checking the reference lists of the studies included. Following the elimination of duplicates, 29 studies were assessed for possible inclusion in this review. A thorough review of the full texts of these articles led to the exclusion of 13 studies, including 1 case control and 12 reviews. As a result, 16 RCTs were considered in this review. The main characteristics of the studies are shown in Table 1.

Table 1. Summarized Published Data of the Studies Included in the Systematic Review

Study ID	Participants' Size, Gender, Age (y), Dropout	Interventions	Instructions	Method of Pain Assessment	Author Conclusion
Basam et al. 2022[31]	N = 42 (only females); 2 dropouts	Group 1 Chewing gum Mean age = 19.6 y Group 2 Tenoxicam Mean age = 20 y	Group 1 Chew sugar-free gum 10 to 12 min whenever you experience pain Group 2 20 mg tenoxicam 1 h before archwire placement	VAS	There was no statistically significant difference between the two groups. Chewing gum was not inferior to tenoxicam.
Celebi 2022[41]	N = 57 (27 males, 30 females); no dropouts	Group 1 Mechanical vibration Mean age = 14.1 y Group 2 Chewing gum Mean age = 15.1 y Group 3 Control group Mean age=15.2	Group 1 N/A Group 2 Chew sugar-free gum for 20 min After initial wire placement, after 24 h and after 48 h Group 3 No intervention	VAS	As compared with the chewing gum, the mechanical vibration has no clinically significant pain relief effect during orthodontic treatment.
Rossi et al. 2022[36]	N = 102 (59 females, 30 male); 13 dropouts	Group 1 Placebo Group 2 Chewing gum Group 3 Ibuprofen	Group 1 Capsules containing harmless material 1 h after initial wire placement and every 8 h Group 2 Chew sugar-free gum for 10 min every 4 h Group 3 400 mg of ibuprofen 1 h after initial wire placement and every 8 h	VAS	No difference between the three methods was observed. Chewing gum may be used adequately for orthodontic pain.
Abdul-Aziz 2021[37]	N = 60 (24 males, 29 females); 7 dropouts	Group 1 Chewing gum Mean age = 21.8 y Group 2 No intervention Mean age = 22.3 y	Group 1 Chew sugar-free gum 10 min every 8 hours and immediately after separator placement. Group 2 No intervention	VAS	Compared with the non–chewing gum group, chewing gum reduced pain significantly.
Celebi et al. 2021[40]	N = 63 (30 males, 33 females); no dropouts	Groups 1 Laser Mean age = 15.4 y Group 2 Chewing gum Mean age = 15.8 y Control group 3 No intervention Mean age = 15.3 y	Group 1 N/A Group 2 Chew sugar-free gum 20 min three times per day. Group 3 Control group with no intervention	VAS	There was no statistically significant difference between the three groups at any time of treatment.
da Silva Santos and Capelli 2021[35]	N = 106 (52 males, 54 females); 25 dropouts	Group 1 Chewing gum Mean age = 16.6 y Group 2 Ibuprofen Mean age = 19.2 y Group 3 Acetaminophen Mean age = 19.5 y Group 4 Control Mean age 18.5	Group 1 Chew sugar-free gum 5 min every 6 h and immediately after archwire placement Group 2 Ibuprofen 400 mg every 6 h and immediately after archwire placement Group 3 Acetaminophen 500 mg every 6 h and immediately after archwire placement Group 4 Control group with no intervention	VAS	Patients in the chewing gum group experienced less pain during biting and at rest compared with the ibuprofen group and less pain at biting when compared with control and acetaminophen groups.

Table 1. Continued

Study ID	Participants' Size, Gender, Age (y), Dropout	Interventions	Instructions	Method of Pain Assessment	Author Conclusion
Al Shayea et al. 2020[30]	N = 105 (90 females); 15 dropouts	Group 1 Ibuprofen Mean age = 24.7 y Group 2 Viscoelastic Bite wafer Mean age = 21.8 y Group 3 Chewing gum Mean age = 25.9 y	Group 1 Ibuprofen 400 mg three times per day and immediately after archwire placement Group 2 Chew on viscoelastic bite wafer three times per day for 5 min Bite wafer Group 3 Chew sugar-free gum for 5 min three times per day	VAS	The experience of pain between all groups was similar. Thus, chewing gum can be used to replace ibuprofen.
Delavarian and Imani 2020[38]	N = 66 (15 males, 35 females); 6 dropouts	Group 1 Placebo Mean age = 18.9 y Group 2 Ibuprofen Mean age = 20.25 y Group 3 Chewing gum Mean age = 19.8 y	Group 1 Placebo 40 mg of vitamin B_{12} three times per day and immediately after archwire placement Group 2 Ibuprofen 400 mg three times per day and immediately after archwire placement Group 3 Chewing gum Chew sugar-free gum for 10 min three times per day	NRS	Patients in the placebo group reported higher pain than those in the chewing gum or the ibuprofen groups. Chewing gum can be used as an alternative to ibuprofen.
Alqareer et al., 2019[29]	N = 75 patients (10 males, 25 females); 40 dropouts	Group 1 Chewing gum Mean age = 16.9 y Group 2 Placebo Mean age = 16.1 y	Group 1 Chew sugar-free chewing gum 5–10 min three times per day Group 2 Rinse for 30 s with a fluoridated, alcohol-free mouth wash (Plax sensitive) three times per day	VAS	Chewing gum does not significantly reduce orthodontic pain compared with placebo.
Alshammari and Huggare 2019[33]	N = 60 patients (28 males, 32 females); 15 dropouts	Group 1 Chewing gum Mean age = 14.2 y Group 2 Paracetamol Mean age = 14.3 y	Group 1 Chew gum 10 minutes 3 times per day. Group 2 Paracetamol 1000 mg or 500 mg three times per day if patient weighs less than 40 kg	VAS	Chewing gum and paracetamol are equivalent in the reduction of orthodontic pain without having any negative effect on bracket loss.
Azeem et al., 2018[39]	N = 120 (54 males, 66 females); no dropouts	Group 1 Chewing gum Mean age = 15.6 y Group 2 Ibuprofen Mean age = 15.5 y	Group 1 Chew sugar-free gum 5 minutes three times per day and immediately after separator placement Group 2 Ibuprofen 400 mg four times per day and 1 h before separator placement	VAS	Chewing gum can be recommended as a nonpharmacologic option instead of ibuprofen for orthodontic pain control associated with separator placement.
Ireland et al., 2016[34]	N = 1000 (370 males, 630 females); 164 dropouts	Group 1 Chewing gum Mean age = 13.7 y Control group 2 Ibuprofen Mean age = 13.6 y	Group 1 Chew gum for pain relief if required and ibuprofen 250 mg if chewing gum is not effective Group 2 Ibuprofen 250 mg when required	VAS	The use of sugar-free chewing gum after fixed appliance placement reduces the need for ibuprofen without having any significant effect on the bracket.

Table 1. Continued

Study ID	Participants' Size, Gender, Age (y), Dropout	Interventions	Instructions	Method of Pain Assessment	Author Conclusion
Ul-Hamid et al., 2016[42]	N = 250 (133 males, 117 females); mean age 14.03 y; no dropouts	Group 1 Chewing gum	Group 1 Chew a sugar-free gum (Orbit; The Wrigley Company) for 5 min immediately after this and repeated three times per day	VAS	Chewing gum was more effective in reducing orthodontic pain when compared with ibuprofen. This difference in the reduction in pain intensity was statistically significant.
		Group 2 Ibuprofen	Group 2 400 mg ibuprofen immediately after first visit and repeated three times per day		
Nadeem et al., 2016[43]	N = 60 (29 males, 31 females); no dropouts	Group 1 Chewing gum	Group 1 Chew sugar-free gum twice daily for 10 min and after initial wire placement	VAS	A statistically significant reduction in orthodontic pain was reported in the chewing gum group.
		Group 2 No intervention	Group 2 Control group with no intervention		
Farzanegan et al., 2012[28]	N = 50; 50 females; no dropouts	Group 1 Placebo	Group 1 B_6 vitamin after archwire placement and three times per day for 1 wk	VAS	Both chewing gum and bite wafer can reduce pain intensity in orthodontic patients and can be used as nonpharmacologic substitutes for ibuprofen.
		Group 2 Ibuprofen	Group 2 400 mg ibuprofen after archwire placement and three times per day for 1 wk if pain persisted		
		Group 3 Chewing gum	Group 3 Chew a sugar-free gum (orbit) for 5 min after archwire placement and three times per day for 1 wk		
		Group 4 Hard wafer Group 5 Soft wafer	Group 4 and 5 Bite on wafer for 5 min three times per day		
Benson et al., 2012[32]	N = 57 (31 males, 26 females); no dropouts	Group 1 Chewing gum Mean age = 13.8 y	Group 1 Chew sugar-free gum (Orbit Complete) when required at the bonding/separator appointments	VAS	Chewing gum reduced pain from fixed orthodontic appliances without causing appliance breakage.
		Group 2 No chewing gum Mean age = 14.7 y	Group 2 Non–chewing gum group was specifically asked not to chew gum for the duration of the study		

Risk of Bias Within Studies

Figures 2 and 3 illustrate the results of the Cochrane risk of bias tool. According to the quality of the evidence, 10 articles were evaluated as having a high risk of bias,[28–37] 1 article was evaluated as having moderate risk of bias,[38] and 5 articles were evaluated as having unclear risk of bias,[39–43] either due to a lack of information regarding random sequence generation, randomization, allocation concealment, or blinding the outcome assessors and blinding the patients.

The quality of the evidence across studies was evaluated according to the GRADE approach, and it was found that there was a very low quality of evidence (Table 2).

Results of Individual Studies

Chewing gum vs pharmacologic agents. Seven randomized controlled trials[28,30,33,34,38,39,42] compared the effect of chewing gum and pharmacologic agents (ibuprofen and paracetamol) on the reduction in pain 1

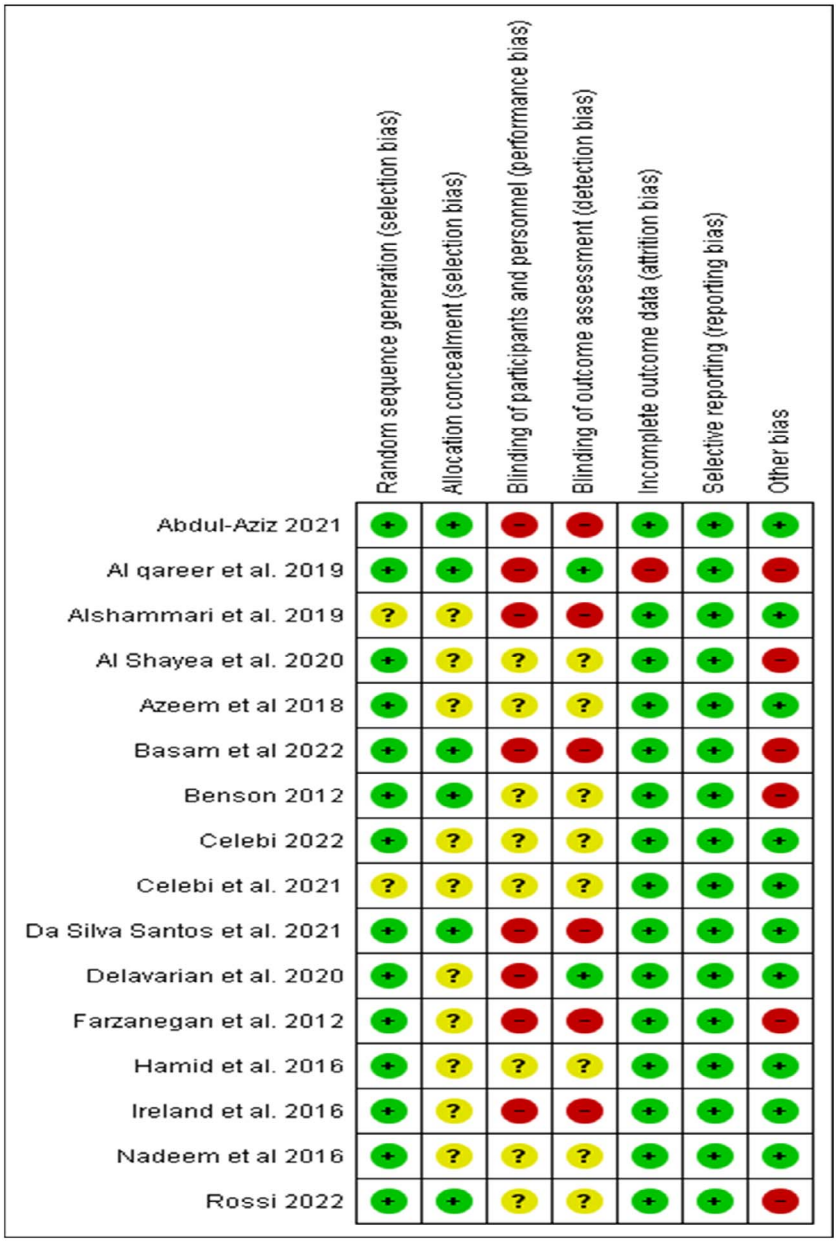

Figure 2. Results of the Cochrane risk of bias tool for quality assessment.

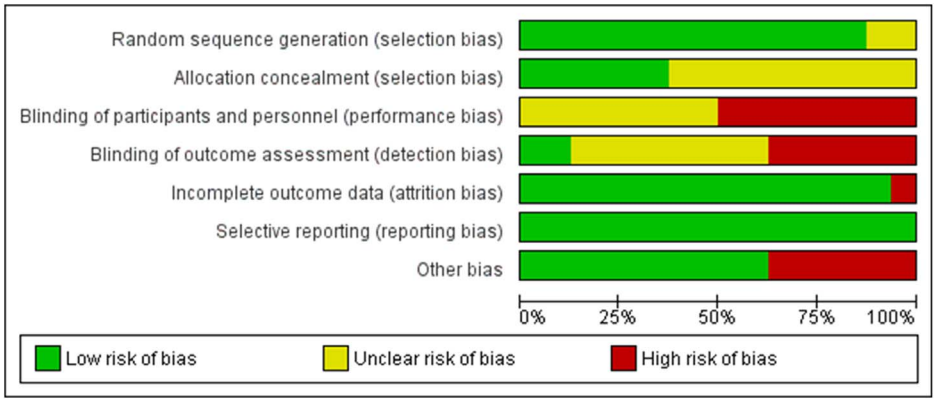

Figure 3. Results of the Cochrane risk of bias tool for quality assessment presented as percentages.

Table 2. Summary of Overall Quality of Evidence of Studies Included in Each Meta-analysis Using GRADE:

	Certainty Assessment							
Outcome	Number of Studies	Study Design	Risk of Bias	Inconsistency	Indirectness	Imprecision	Others	Certainty
Chewing gum vs pharmacological agents	7	RCTs	Serious[a]	Serious[b]	Serious[c]	Not serious	Not serious	⊕○○○ Very low
Chewing gum vs placebo	4	RCTs	Serious[a]	Serious[d]	Not serious	Serious[e]	Not serious	⊕○○○ Very low
Chewing gum vs hard bite wafer	2	RCTs	Serious[a]	Serious[f]	Not serious	Serious[e]	Not serious	⊕○○○ Very low

[a] Downgraded due to unclear or absence of blinding of both patients and outcome assessors.
[b] Downgraded due to high heterogeneity ($P < .00001$); $I^2 = 88\%$.
[c] Downgraded due to the inclusion of studies that reported mean pain at 24 h in females only.
[d] Downgraded due to moderate level of heterogeneity; $I^2 = 44\%$.
[e] Downgraded due to small sample size.
[f] Downgraded due to small number of studies and imprecise I^2.

day after the insertion of an initial archwire, as seen in Figure 4. Statistically significant study heterogeneity was found ($\chi^2 = 49.19$, $I^2 = 88\%$; $P < .00001$). Therefore, the analysis was conducted using a random effect model. There was a statistically significant difference in the reduction in pain intensity between the chewing gum and the pharmacologic interventions. The SMD was –0.50 ([–0.90, –0.10], $P = .01$).

Chewing gum vs placebo. Four randomized controlled trials[28,29,38,40] compared the effect of chewing gum and a placebo on the reduction in pain 1 day after the insertion of an initial archwire, as seen in Figure 5. No statistically significant study heterogeneity was found ($\chi^2 = 5.34$, $I^2 = 44\%$; $P = .15$). Therefore, the analysis was conducted using a fixed effect model. There was a statistically significant difference in the reduction in pain intensity between the chewing gum and the placebo. The SMD was –0.60 ([–1.06, –0.13], $P = .01$).

Chewing gum vs hard viscoelastic bite wafer. Only two randomized controlled trials[28,30] compared the effect of chewing gum and a hard viscoelastic bite wafer on the reduction in pain 1 day after the insertion of an initial archwire, as seen in Figure 6. No statistically significant study heterogeneity was found ($\chi^2 = 0.05$, $I^2 = 0\%$; $P = .82$). Therefore, the analysis was conducted using a fixed effect model. No statistically significant difference was found between the hard bite wafer and the chewing gum. The SMD was –0.15 ([–0.56, –0.26], $P = .48$).

DISCUSSION

This was the first meta-analysis to directly investigate the role of chewing gum in the reduction in pain intensity during fixed orthodontic treatment.

Four studies reported median VAS pain scores but not the means. As a result, these studies were excluded from the quantitative analysis. Benson et al.[32] compared patients who received chewing gum to those who did not receive any treatment. There was no statistically significant difference in the median VAS between the two groups.[32] However, this study had an unequal gender distribution between the two groups, with more female participants in the non–chewing gum group and more male participants in the chewing gum group. In addition, the participants in the chewing gum group were instructed to chew only sugar-free gum if needed, and the patients in both groups were instructed to take painkillers if required.

Da Silva Santos and Capelli[35] investigated the difference in pain intensity during different functions between patients who received chewing gum and those who received pharmacologic agents. The patients in the chewing gum group experienced less pain during biting and at rest compared with those who

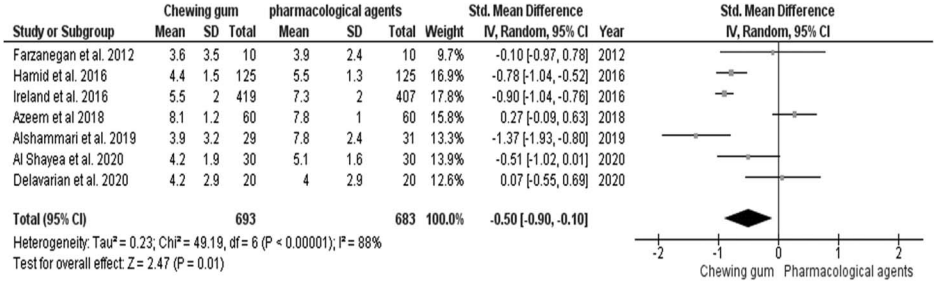

Figure 4. A comparison between chewing gum and pharmacological interventions in decreasing pain intensity.

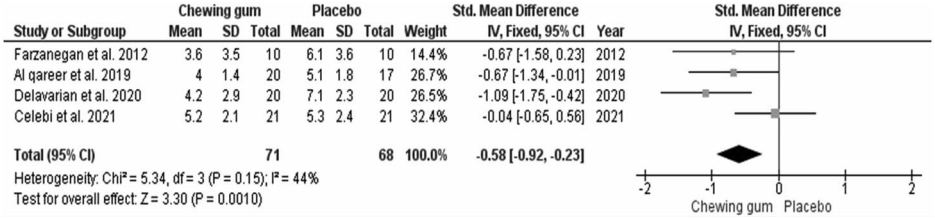

Figure 5. A comparison between chewing gum and placebo in decreasing pain intensity.

received ibuprofen and less pain when biting when compared with the control and acetaminophen groups.[35]

Basam et al.[31] compared the pain intensity between patients who received chewing gum and those who received 20 mg of tenoxicam. Comparing the two groups 1 day after the placement of initial archwires, the patients in the chewing gum group experienced less pain when chewing, and the patients in the tenoxicam group experienced less pain when both biting and fitting their posterior teeth together. However, there was no statistically significant difference between the two groups.[31]

Celebi[41] investigated the difference among mechanical vibration, chewing gum, and control groups. There was no statistically significant difference among the interventions at any time point during the treatment.[41] The results of that study can be questioned due to the participants' minimal exposure to the intervention during treatment as compared with other studies included in this review, as the patients were instructed to chew sugar-free gum for only 20 minutes at three time points.

According to Rossi et al.,[36] the reduction in pain intensity during initial orthodontic treatment caused by ibuprofen, chewing gum, and the placebo was not statistically significant.

Nadeem et al.[43] compared the reported pain intensity between patients in the chewing gum group and those who did not receive any intervention. In the chewing gum group, the median visual analog scale of the reported pain was significantly less after 24 hours and after 1 week of chewing sugar-free gum for 10 minutes twice a day over a period of 1 week.[43] Similarly, patients who received sugar-free gum and were instructed to chew three times a day over a period of 1 week reported a statistically significant decrease in pain intensity compared with patients who received no intervention.[37]

The results of the current meta-analysis revealed a statistically significant reduction in pain intensity after 24 hours of the application of orthodontic force between chewing gum and the placebo as well as chewing gum and pharmacologic agents.

Wiedel et al.[44] investigated the difference in the pain intensity experienced by patients undergoing fixed appliance treatment vs those undergoing removable appliance treatment. The results of that randomized controlled trial revealed that patients undergoing removable appliance therapy experienced less pain intensity in the first few days of treatment compared with those who received fixed appliance therapy.[44] Therefore, patients undergoing fixed orthodontic treatment may benefit from chewing gum alone or in combination with analgesics by alleviating pain, improving quality of life, and reducing analgesic consumption.

In a few studies, the authors reported that pain was experienced by the participants when performing multiple jaws functions,[28,33,36] and it is important to consider that the sensation of pain differs from function to function or when the jaws are at rest.[33] Therefore, future studies should focus more on how chewing gum reduces the pain intensity during different functions in order to gain a better understanding of its role.

In this meta-analysis, the evidence was synthesized 24 hours following the activation of orthodontic force.

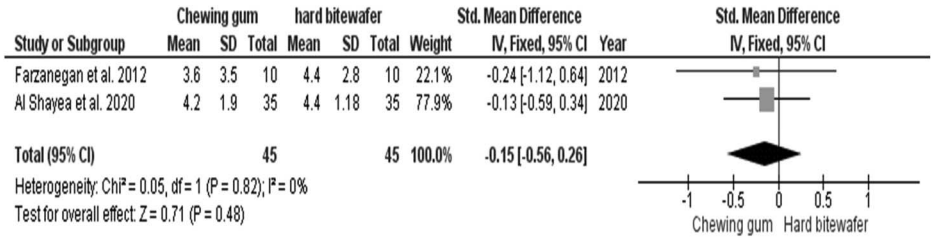

Figure 6. A comparison between chewing gum and viscoelastic bite wafer in decreasing pain intensity.

This limitation can be attributed to differences in reporting the VAS at different time points among the included RCTs. Therefore, future studies regarding chewing gum should investigate the intensity of pain at similar and multiple time points. In addition, the results of the Cochrane risk of bias tool revealed a high risk of bias among the studies included, and the quality of evidence across the studies was graded according to the results of GRADE approach to be a very low quality of evidence, which belongs to the GRADE's category stating that "we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect."

CONCLUSIONS

- In patients undergoing fixed orthodontic therapy, chewing gum is an effective intervention for reducing orthodontic pain after 24 hours of initial wire placement.
- Chewing gum may be considered a good substitute for pharmacologic interventions during fixed orthodontic treatment.
- The results of the GRADE approach revealed a very low quality of evidence across the studies included and emphasized the need for better quality RCTs regarding the role of chewing gum in reducing orthodontic pain so that future practice can be based on scientific evidence.

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